Long-term Delivery Strategy

Technical Annex

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Chapter 1

Ambition

1. Purpose, vision and values

Our purpose is to deliver water for life for our customers, receive and recycle wastewater and return it safely to the environment. This is why we exist.

Purpose

Our purpose is to provide water for life to:

- Enhance health and wellbeing
- Protect and improve the environment
- Sustain the economy

Vision

Our vision is to create a resilient water future for our customers in the South-East

As a water and wastewater business, our strategy defines how we operate. Our purpose, vision and values underpin the cultural framework that shapes our decision making and business strategy.

Values

Our four values sit at the core of our ethical decision-making framework.

Ethical decision making helps our leadership team, employees and partners do the right thing.

We want to be seen as an organisation with a strong ethical base at its heart, we have learnt from our past mistakes and we have shown that we can improve. Our long-term strategy sets out an infrastructure and environmental enhancement agenda that is extremely ambitious in its size and scope. Our ability to learn, improve and do the right thing will be essential to ensuring the delivery of our ambition over the next 25 years.

We recognise that achieving our ambition cannot be done in isolation. Our core plan will require innovation and the successful engagement of communities and partner organisations to work with us to enhance the services we deliver and improve and protect the environment within which we operate.

2. Long-term priorities

We intend to deliver our ambition through a focus on five long term priorities which sit at the centre of our planning framework and outline the context of what we want to do. Our five long-term priorities are shown below and have been driven by the trends and issues that are facing our industry along with the unique challenges our business faces.

Our long-term priorities have been shaped through significant customer and stakeholder consultation, both on our long-term investment plans[1], and specifically on our long-term strategy. In 2022 we published a consultation on our then four long term priorities[2]. In addition they have been reviewed and updated through Board engagement and consideration. The Board has identified a fifth priority on developing renewable power sources. We intend to update our published priorities later in the year to reflect feedback received and the additional priority.

Figure 1: Our long-term priorities in context

1. Drainage and Wastewater Management Plan (DWMP) and Water Resources Management Plan (WRMP).
2. www.southernwater.co.uk/media/7224/5951_long-term_strategic_plan_v12.pdf"5951_long-term_strategic_plan_v12.pdf

Trends generate challenges and they also present opportunities. We can utilise these opportunities to "enable" new ways of working to help deliver our priorities.

Our five long-term priorities are described below:

1. **Ensuring a reliable supply of high-quality water for the future.** Customers expect to turn on the tap and receive a high-quality, reliable supply of drinking water, all day, every day whatever the weather. The look, taste and smell of the water is important.
2. **Protecting and improving the environment.** We recognise the important role we play in protecting the environment. We also know how important our duties are to go further and look to improve and enhance it where we can. We plan to be responsible when we take water from our rivers and streams and meet or exceed our permits for discharges back into those same rivers and streams. We are also planning to significantly reduce discharges into rivers, estuaries and coasts (including bathing waters and shellfish waters) from storm overflows.
3. **Understanding and supporting our customers and communities.** Customers want us to deliver great service – whatever the issue and whenever it happens. This is particularly important since most of our customers have no choice but to use us as their water or wastewater supplier. From billing queries, to responding to burst mains and blocked drains and sewers, we are planning for our service to be easy, quick, seamless and sympathetic.
4. **Enabling and empowering our people.** In order to make our business fit for the future we will continue to invest in our people and corporate systems so we can be resilient as future employment expectations change. Ensuring the health, safety and wellbeing of our teams will remain a key component of this long-term priority.
5. **Renewable power generator.** Our infrastructure surrounding the collection and disposal of the biomatter output of the water usage cycle is aging. Utilising new technology there is a significant opportunity for the potential generation of electricity or use of biogas for energy from our biosolid waste product. We also have sites that could support increased use of solar power. This presents an opportunity to enhance operational resilience at reduced cost and contributes to our net zero ambition.

For Long-term Delivery Strategy purposes, our ambition and associated enhancement activities will be predominantly focussed upon three of our five long-term priorities, these being: Ensuring a reliable supply of high-quality water for the future, Protecting and improving the environment, and Renewable power generator. The other two do not contain significant enhancement expenditure.

When translating our long-term priorities into a delivery strategy our Water and Wastewater businesses sub-divided our priorities into localised "strategic themes." These themes group associated investment activities together and help articulate the agenda of our delivery strategy.

Performance commitments are then presented in terms of their associated strategic theme. This shows a clear alignment between our ambition, what we want to do, how we plan to do it, and how we plan to measure our success.

Water has five strategic themes:

1. Provide extra water supply
2. Make our supplies more resilient to severe drought
3. Reduce leakage
4. Lower water use in homes and businesses
5. Improve water quality

Wastewater has four strategic themes:

1. Network flow management to reduce flooding and spills
2. Recycling wastewater and nutrient removal
3. Asset health and resilience
4. Bioresources

Wastewater also includes "Net zero", a set of initiatives intended to reduce our carbon footprint. The primary strategic Net zero enhancement activities predominantly relate to activities identified within Wastewater strategic themes, however the scope of Net Zero is business wide.

3. Vision impact

3.1 Performance commitments

Outlined below are the key performance commitments that detail how we plan to measure the outcome of the enhancement activities intended to deliver our ambition.

We recognise that Ofwat guidance stated that compliance-based performance commitments can be excluded from the list. However, whilst developing our Long-term Delivery Strategy we found it useful to benchmark our ambition against compliance metrics to facilitate Board and stakeholder discussion. This enabled us to have a wider perspective when considering varying ambition targets. Our ambition performance commitments are shown below alongside relevant compliance metrics to demonstrate our overall ambition.

Water strategic themes	Ambition outcome/ Performance commitment	Mandatory regulatory requirement	Customer priority	Ambition target (beyond mandatory)	
1 Provide extra water supply	Deliver modular approach to new infrastructure build (Core plus adaptive planning)	Legal requirement to sustain population water supply	✓	–	Ambition is **same** as Mandated Targets
2 Make our supply more resilient to severe drought	Drought resilience	Withstand 1 in 500 year drought event in 2040	–	–	
	Unplanned outage	–		Percentage unplanned loss of peak week production capacity over the year – 2%	
3 Reduce leakage	Reduce leakage	By 50% in 2050	✓	WRMP target 51.5%	Aligns to WRMP
	Mains repairs	–		No. of mains repairs per 1,000km 98.1	
4 Lower water use in homes and businesses	Reduce personal water usage	Reduce personal usage to 110 l/p/d by 2050		Reduce personal usage to 105.6 l/p/d by 2050	Ambition is **greater** than Mandated Target
5 Improve water quality	Exceptional water quality	Compliance Risk Index at zero with margin less than one	✓	–	Ambition is **same** as Mandated Target
	Lead reduction	–	–	Lead free network by 2050	Ambition aligns to DWI aspiration

Figure 2: Water: Performance commitments to 2050

Wasterwater strategic themes	Ambition outcome/ Performance commitment	Mandatory regulatory requirement	Customer priority	Ambition target (beyond mandatory)	
1 Network flow management to reduce flooding and spills	Reduce storm flow overflows	Deliver < average 10 spills per overflow by 2050 (80% reduction)	✓	–	
	Reduce bathing water pollution	Protect bathing waters by ensuring < 3 spills per season	✓	Improve all bathing areas to excellent standard (< 2 spills per season)	Ambition is **greater** than Mandated Targets
	Reduce shellfish water pollution	Protect shellfish waters by ensuring < 10 spills per annum	✓	–	
2 Recycling wastewater and nutrient removal	Comply with discharge permits	Deliver 100% WPS permit compliance by 2028	✓	–	
	Nutrient neutrality	Reduce phosphorous load reduction by 80% by 2038, ensure nitrogen treatment to TAL where receiving water course unsatisfactory by 2030		–	
3 Asset health and resilience	Reduce pollution	Zero serious pollution incidents by 2025	✓	Reduce all pollution incidents to zero by 2040	Ambition is **greater** than Mandated Targets
	Sewer collapse	–		Sewer collapses per 1,000km sewers 5.61	No mandated targets
	Internal sewer flooding. External sewer flooding	–	✓	Flooding incidents per 10k properties 0.78 4.6	
4 Bioresources	Renew bioresources infrastructure			2040	
Net zero	Reduce carbon	Achieve net zero operational carbon and embedded carbon by 2050		–	

Figure 3: Wastewater: Performance commitments to 2050

3.2 Key outputs from strategic planning framework

The other key outputs from WRMP and DWMP are shown below:

Table 1: Long term metrics from strategic frameworks

Other key metrics	2029-30	2034-35	2039-40	2044-45	2049-50
Supply-side benefit delivered (Ml/d) (cumulative)	179	247	778	952	1032
Effective network storage benefit (m^3)	143,000	391.000	140,000	154,000	122,000

Note: These values can be found in data tables LS1 and LS2

The outputs of these metrics are highly reliant on future uncertainty as explained in our adaptive pathways.

3.3 Other outcomes and metrics

We have considered other outcomes and metrics that could be targeted and monitored over the long-term. For this first Long-term Delivery Strategy, given the significant challenges faced by our business in the short and long-term, we have focussed on the key outcomes that our customers want us to prioritise.

3.4 Customer and Stakeholder preferences

Our long-term priorities lie at the centre of our strategy and provide the context of what we want to do. Our long-term priorities have been derived and refined over a five-year timeline which has involved extensive customer and stakeholder feedback along with Executive and Board engagement. An outline of the co-creation of our Long-term Delivery Strategy with customers and stakeholders can be found below.

Engagement has shown that our customers and stakeholders recognise the trends / issues that are impacting and driving change in our business. They support the focus of our long-term priorities and want us to be ambitious. Consultation on our long-term priorities and strategy for delivering them was carried out together with our extensive programme of customer and stakeholder engagement. See our customer engagement annex for details.

Following the publication of our draft consultation on Southern Water's Long-term Priorities in June 2022, three virtual workshops were held in July 2022 with stakeholders representing Kent, Hampshire and the Isle of Wight, and Sussex respectively. The primary stakeholder groups represented were local authorities and councils. The workshops were designed to seek feedback on our draft long-term priorities and the importance of key specifics within those priorities which would need to be addressed in our Long-term Delivery Strategy.

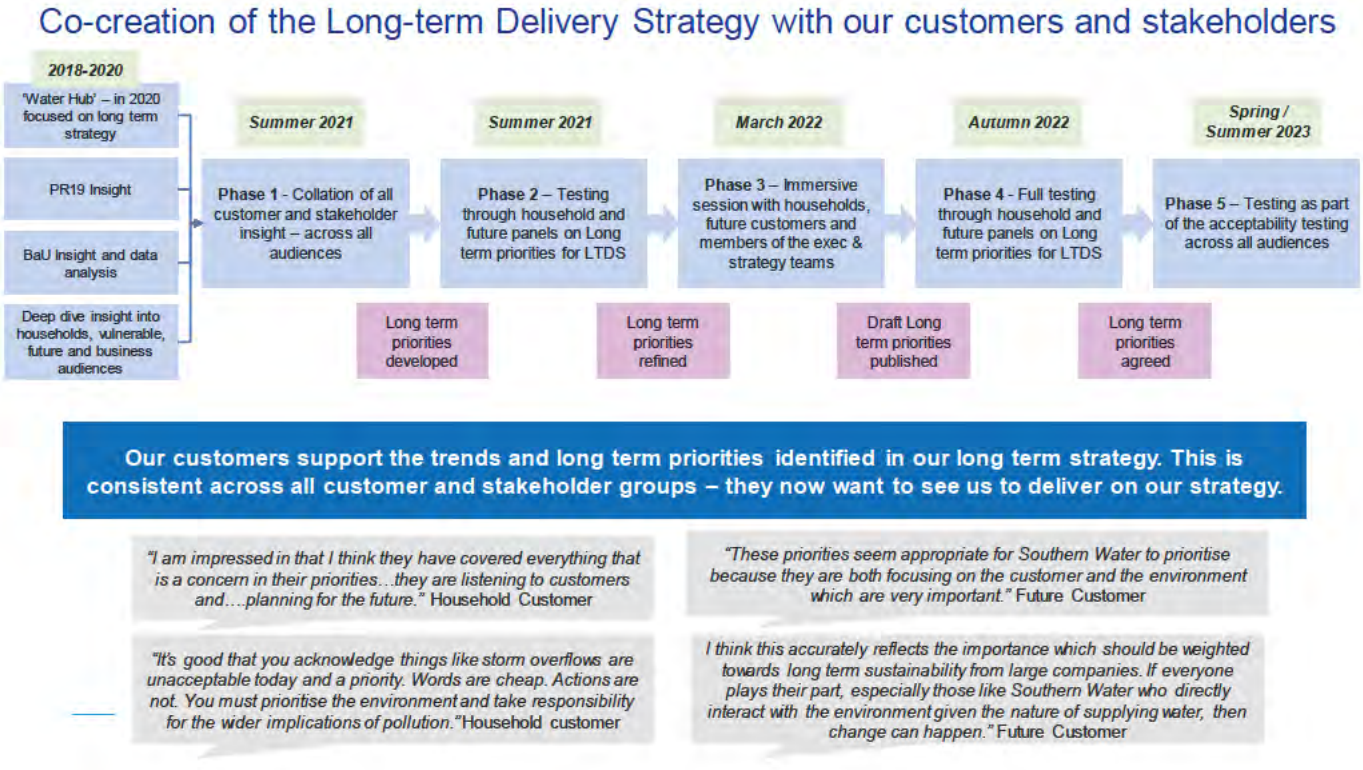


Figure 4: Co-creation of the Long-term Delivery Strategy with our customers and stakeholders

In 2022, we had four draft long-term priorities. Our fifth long-term priority, becoming a renewable power generator, was added in January 2023 following executive consideration of stakeholder and customer feedback. Stakeholder feedback from our July 2022 workshops on the relative importance of a number of key components of our four long-term priorities can be seen in the chart below. Environmental concerns, particularly concerning pollution were clearly presented as the most pressing area of importance and became a clear feedback theme throughout the workshops. The need to protect and secure our fresh water supplies although also considered of great importance was deemed secondary to that of the need to reduce pollution events. Customer issues, although also considered important were deemed less so when compared to the other two key priorities

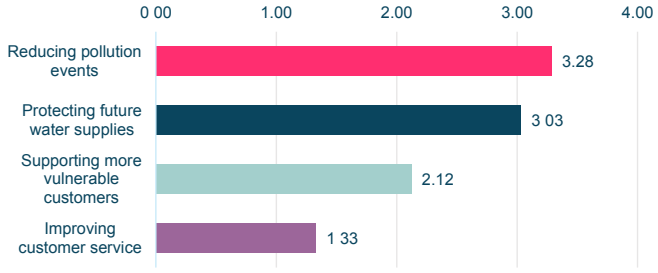


Figure 5: Please rank the following in order of priority for you / your organisation

With regard to environmental concerns, the need for us to prioritise the reduction of storm overflow pollution was an extremely clear message along with the need to protect environmentally sensitive water sources such as chalk streams. The positioning of environmental priorities following feedback can be found in the chart below

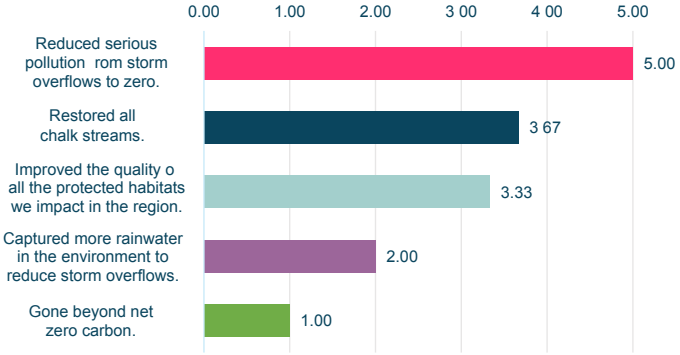


Figure 6: Please rank, in priority order, which environmental commitment you feel should be a priority for Southern Water

This feedback, echoed regularly by customers in other customer feedback opportunities has helped us to focus our investment strategy. Our Long-term Delivery Strategy prioritises enhancement activity to reduce discharges from storm overflows both inland and those along the coast. The investment in storm overflows is required over the next 5 AMP periods, a period of 25 years. This enables us to plan and create a structured programme to address the issue in a more sustainable way that focuses on catchment and nature-based solutions that enhance the environment and build community resilience. We consider this investment activity as an opportunity to move away from traditional storage tank solutions, although we recognise that these will need to remain as part of the solution to meet government targets.

We are applying our environmental principle of Incorporating natural and social capital into decision making. To help address the challenge of reducing discharges from storm overflow pollution we are planning to utilise innovative surface water separation and sustainable drainage system (SuDS) techniques. These nature-based solutions are intended to both divert rainwater away from, and slow the flow of storm rainfall into the sewer network, thus reducing overflow risk. On a pure cost basis this is a more expensive solution to traditional overflow storage tanks but there are significant wider multiple benefits for communities and the environment, including the health and wellbeing of customers through improvements to the local natural environment. This demonstrates our commitment to listening to and responding to customers, and implementing more nature-based solutions. Our delivery strategy concerning storm overflows can be found in Section 7.3.1 Network flow management to reduce flooding and spills.

The protection and restoration of sensitive fresh water sources such as chalk streams in our region is also a major issue that we have addressed within our Water strategy [See section 7.2 Key water enhancement investment]. We are currently in discussion with the Environment Agency as to the level by which we need to reduce the amount of water we currently abstract from sensitive sources so that we ensure their long-term health and sustainability through the need to make significant reductions in abstractions from existing water sources This problem is compounded by expected population growth and the expected impact of climate change. This makes the requirement for us to develop major new sources of supply over the next 25 years not only vital but a significant challenge, as we must rely less and less on the water sources that have long supplied our region.

We recognise the need to protect and improve the quality of all the protected habitats we impact in our region. To this end we are investing to improve the reliability of our wastewater treatment works and the cleanliness of the effluent that is discharged from them [See Section 7.3.2 Recycling wastewater and nutrient removal]. In addition although Net Zero is a less popular measure we are continuing to endeavour to implement

a number of initiatives that when collectively considered form a business-wide carbon reduction programme [See Section 7.3.5 Net Zero].

Considering the vital need to secure new freshwater supply for our growing future customer base, during our workshops stakeholders were requested to rank those supply options in importance. The chart below illustrates the results.

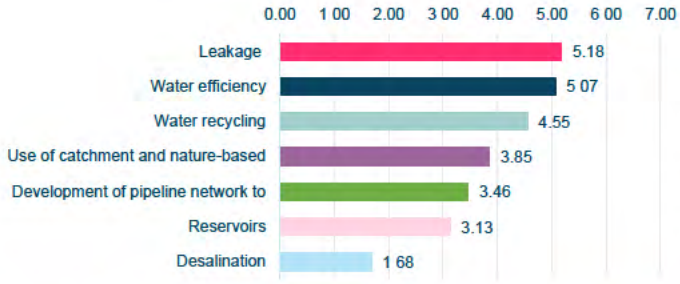


Figure 7: Please rank the following options according to which you think will be the most crucial in securing water supplies for the future

The results have influenced our strategy in that we are aware of our need to prioritise and improve on how we manage the repair of leaking pipes. To this end we have a leakage management plan which is a key component of our core strategy that will run consistently throughout the 25-year duration of our Long-term Delivery Strategy. We also recognise the importance placed upon water efficiency and to this end we have a demand management strategy that will run consistently throughout the 25-year duration of our Long-term Delivery Strategy. However, such is the scale of the need to deliver new freshwater supply to meet our future supply / demand projections every option highlighted above has a place within our Water delivery strategy. Despite their current unpopularity, options such as desalination plants and new reservoirs will be required because existing nature-based water sources in our region are approaching exhaustion.

With our Long-term Delivery Strategy strategically aligned to and reflective of customers and stakeholders' key concerns the focus now is upon demonstrating progress and delivering on our strategy.

4. Current issues and challenges

4.1 Introduction

In 2017, Southern Water published Water Futures in the South-East: Towards 2050, an independent report outlining the unprecedented change, challenges and opportunities facing our already water-stressed region. We have updated this work to identify what has changed in the last five years and how the trends and challenges have altered. We have included new approaches to addressing risks and concerns regarding the environment, new trends in society and opportunities that come from new and emerging technologies. We have used these insights to ensure we are well informed about what our stakeholders expect from us and what is important in their lives.

The way we operate as a business is impacted by a number of external factors – social, political, environmental, economic, regulatory and technological – that we must consider and manage the impact of.

- **Environmental factors.** Our natural environment is under pressure from population growth and climate change. We must continue to adapt and prepare to manage future impacts
- **Economic environment.** We are impacted by changes in financial markets, interest rates, inflation and other commodity prices, and we must manage these to reduce risk
- **Regulatory environment.** We must be responsive to regulatory requirements and prepare for future challenges
- **Social environment.** As a provider of essential services, we have a direct impact on our local communities. We must do all we can to support and understand our customers
- **Innovation and technology.** We are always improving our services, taking advantage of new technologies and innovations, wherever they come from
- **Political environment.** Decisions made by politicians and policymakers have the potential to impact our operations. We must follow any government directions, and adapt to policy developments

4.2 Trends / issues

There are six key trends / issues impacting our business:

1. **Growing demand.** We anticipate population growth will continue to place more pressure on limited resources. This could be exacerbated by the potential growth in domestic and business consumption by existing customers.
    - The UK's population has grown by 8.2m people between 2000 and 2020 [Source: Office for National Statistics]
    - From 2020 to 2050, the population in the South-East is predicted to grow by between 11% and 22% [Source: Office for National Statistics and Local Authority Housing Plans]
    - Increased housing development and reduced open spaces will require new water solutions
    - Greater demand is anticipated for agricultural production
2. **Changing shape of communities.** Communities are adapting due to demographics and societal changes.
    - People are becoming increasingly focussed on health and wellbeing
    - More people are living alone
    - By 2050 one in four people are anticipated to be over 65 [Source: Office for National Statistics]
    - Hybrid working increases demand for local services
3. **Evolving customer expectations.** We consider customer expectations to be evolving, driven by developments in technology and greater access to information.
    - Increasing speed of service expectations are being driven by enhanced customer experiences in other industry sectors such as online order and delivery for a huge range of goods and services, and taxis on demand order by phone
    - Demand for real-time data that improves customer lifestyles and finances is increasing
    - A growing expectation of 100% availability from utility providers with lower or even zero tolerance of failure
    - A desire for personalised services tailored to customers' needs
4. **Increasing use of technology.** Big data, artificial intelligence (AI) and machine learning are all becoming increasingly common
    - Growing ability to unlock valuable insights from data
    - Data becoming increasingly open to all – customers, stakeholders, and government
    - Increasing automation to simplify and speed up processes
    - AI is being utilised to learn and adapt to changing environments
5. **Rising environmental concerns.** Peoples' demand to protect the environment is driving change in government priorities
    - Social media is rapidly exposing environmental harm
    - Pollution now considered highly unacceptable
    - Rare and fragile chalk streams now considered under threat
    - Storm overflow discharges are no longer acceptable to communities
    - Open-water swimming increasing in popularity with an expectation that the water will be clean and safe

6. **Climate emergency.** Climate change is impacting our environment and the way we operate our water and wastewater services.
   - There is an emerging need to reduce carbon emissions
   - Climate forecast projections include more extreme weather; warmer land, air and sea; the melting of polar ice leading to rising sea levels, changes in ocean currents
   - Seasonal storms are increasing in intensity and hyper-locality causing increased flooding
   - Biodiversity is being reduced

4.3 Challenges

We consider we are facing seven key challenges:

1. **Water scarcity.** Water is becoming scarce when considered per person in terms of population in the South-east of England and it is becoming important not to over-tax and damage environmentally sensitive water sources.
   - Need to ensure water resilience against more extreme droughts
   - Need to address environmental pressure to reduce water taken from rivers, especially chalk streams and the ground
   - Need to develop new water sources (e.g. recycling) and ensure that they are acceptable to customers
   - Need to reliably provide water to growing communities
2. **Increased flooding.** We anticipate climate change will place increased stress on our water and wastewater network.
   - Coastal flooding is anticipated to increase with higher sea levels
   - Local flooding is anticipated to increase with heavier storm rainfall

   This results in heightened risk to the operational functioning of coastal assets threatened by rising sea levels. Heavier storm rainfall results in increased risk of internal and external network flooding and increased storm overflows.
3. **Meeting customer expectations.** As expectations rise, we need to raise our level of service to meet heightened customer need. We anticipate this is likely to include:
   - Improving services quickly, in line with other sectors
   - Using technology to prevent issues before the customer is aware of them
   - Provide information for customers, when they need it, via the latest digital channels
   - Offer more tailored services to different customer groups
4. **Affordability.** Balancing affordable increases in bills against the need for significant investment in our network and associated systems will remain a challenge throughout the 25-years of the Long-term Delivery Strategy period.
   - Bills must remain affordable for all as water is an essential service
   - Vulnerable people and those on low incomes need extra protection
   - Inflation at 30-year highs is creating significant pressure on household finances
5. **Decarbonisation.** Decarbonisation remains a key challenge, particularly concerning the extent we prioritise carbon reducing investment at the expense of alternative pressing business needs.
   - We generate CO2 through the delivery of our services, reducing those emissions will help limit our climate change impact
   - Opportunity to improve our waste processes to reduce methane production and other greenhouse gases
   - Potential to reduce carbon content of new infrastructure made of steel and concrete
6. **Reputation.** Learning lessons from the past and rebuilding our reputation as a trusted service provider.
   - Responding to customers' pollution concerns (particularly in connection with storm overflows) and delivering a sustained programme of improvement
   - Increasing network resilience and reducing events such as loss of supply or low water pressure
   - Turning around our performance so we no longer receive regulatory penalties for missing targets
7. **Scope of ambition.** We have listened to the feedback from our customers and stakeholders [Long term priorities consultation exercise] and want to move our business forward engaging with our key Long-term Delivery Strategy priorities of ensuring a reliable supply of high-quality water; protecting and improving the environment; and becoming a renewable power generator. However, the delivery of our ambition over the 25-year Long-term Delivery Strategy period will require a significant level of investment.

   Successful delivery of our ambition will be dependent upon three key factors:

   - **Affordability.** Achieving a mixture of increased income through government, bill increases and alternative income sources to underpin a sufficiently appealing commercial proposition that will attract the necessary investment

- **Financeability.** Securing the necessary corporate or government investment through the demonstration of a reasonable income stream and agreed rate-of-return
- **Deliverability.** We will need to develop and enhance our organisation to work in partnership with associated service providers to deliver a sustained, heightened level of infrastructure build over the 25-year Long-term Delivery Strategy period

4.4 Enablers

We consider there are three key business enablers that can help us achieve our ambition:

1. **Collaboration and partnerships.** We recognise we cannot deliver our ambition in isolation. We will need to work in partnership not just to deliver innovative solutions but to ensure the success of an enhancement plan of extensive scope and scale.
   - New focus from regulators on helping to solve water scarcity
   - Collaborations with other risk management authorities to address the national flood risk management plan priorities
   - Innovative solutions to protect chalk streams are being put in place in Hampshire, which can be extended to other areas
   - Nature-based solutions growing in importance compared to traditional engineering approaches drives new partnerships with SMEs, and provides the chance for us to play a key role in improving the natural capital in our environment
2. **Resilience.** Digital technology has the potential to enhance the resilience of our network and heighten our ability to pre-empt and respond to asset failures.
   - Regional insights to inform engineering and operational readiness
   - Enhanced sensors across our network of systems to inform our decision-making and controls
   - Potential usage of Artificial intelligence (AI) to predict failure
   - Satellite insights and predictions
3. **Technology.** New materials and innovations have the potential for incremental improvements to our network.
   - Considerable nano-technology research continues including focus on filters, sensors, energy efficiency and fuel cells
   - Increasing commercialisation and availability

5. Strategic balance

Our Long-term Delivery Strategy is extremely ambitious. It comprises a 25-year (five AMP) total enhancement spend for our core pathway of £15.5bn. In addition, that rises to £27bn if every adaptive pathway in our plan is considered that could be activated to address key future uncertainties.

These figures are significant. They result from our need to primarily respond to three key strategic drivers:

- Continuing to serve a rising population / customer base with quality fresh water
- Reducing current freshwater abstraction rates from sensitive water sources
- Reducing socially unacceptable pollution particularly from storm overflows

To deliver solutions in these three areas will be costly as it requires significant infrastructure investment. Feedback from customers and stakeholders has clearly indicated that they want us to be ambitious and do not want us to delay investment so that the cost is placed on future generations. Customers and stakeholders want bills to be affordable but not at nature's expense. We have therefore focussed on investing to deliver necessary results and mitigating bill impacts as best we can through value driven investment.

Our Water business has two decision gateways linked to adaptive pathways, one which is demand related at the end of AMP8 and one which is primarily abstraction reduction related at the end of AMP9. We have modelled the water resource needs of our customers across our region to guide us with our proposed investment. Our adaptive pathway structure will allow us to undertake significant planning work in AMP9 without committing to potential construction in AMP10 and beyond. This allows us to protect the potential customer need and if we decide to go ahead with these projects, in taking the decision closer to the time we will be able to ensure the customer need is required and can be met in a timely manner. This provides value for money in delivering critical enhancement infrastructure at the correct time to meet the customer need.

Value is also not just defined in financial terms, value is also derived by incorporating natural and social capital into decision making. To help address the challenge of reducing storm overflow pollution we are planning to not just build more storage tanks but to utilise innovative surface water separation and sustainable drainage techniques. On a pure cost basis this is a more expensive solution, but adopting this approach demonstrates our willingness to balance financial drivers with a more nature-based consideration.

We also recognise from customer feedback that fixing leaks and water efficiency are important. Hence, we have a leakage management plan and a demand management plan for lower water use in homes and businesses in place throughout the 25-year Long-term Delivery Strategy timeframe.

Our Long-term Delivery Strategy is a balance. It has been shaped by the key strategic drivers impacting our business and our industry. We have reflected customer feedback within our strategy and have prioritised those areas of key concern. We have considered future uncertainties with our adaptive planning approach and we have key metrics that we can monitor to ascertain how future uncertainties unfold. We are delivering value in insuring key infrastructure build is delivered in a timely manner, when it is needed, and we are also considering the wider value of natural and social capital-based decision making. In addition we are considering alternative funding solutions that have the potential to improve the finance-ability of our plan. If we are to deliver this plan, we understand that associated bill increases will be sizeable. However, we are positioning our business so that those bill increases will deliver the best possible value.

Chapter 2

Strategy

6. Strategic overview

6.1 High level summary outlining how the plan meets the ambition

As introduced in Chapter One, our Long-term Priorities are key to providing the context for our Long-term Delivery Strategy. As illustrated below our Water and Wastewater businesses have sub-divided our priorities into localised areas of targeted improvement or "strategic delivery themes". The illustration below highlights how the strategic delivery themes which group numerous related enhancement activities link and map to our Long-term Priorities.

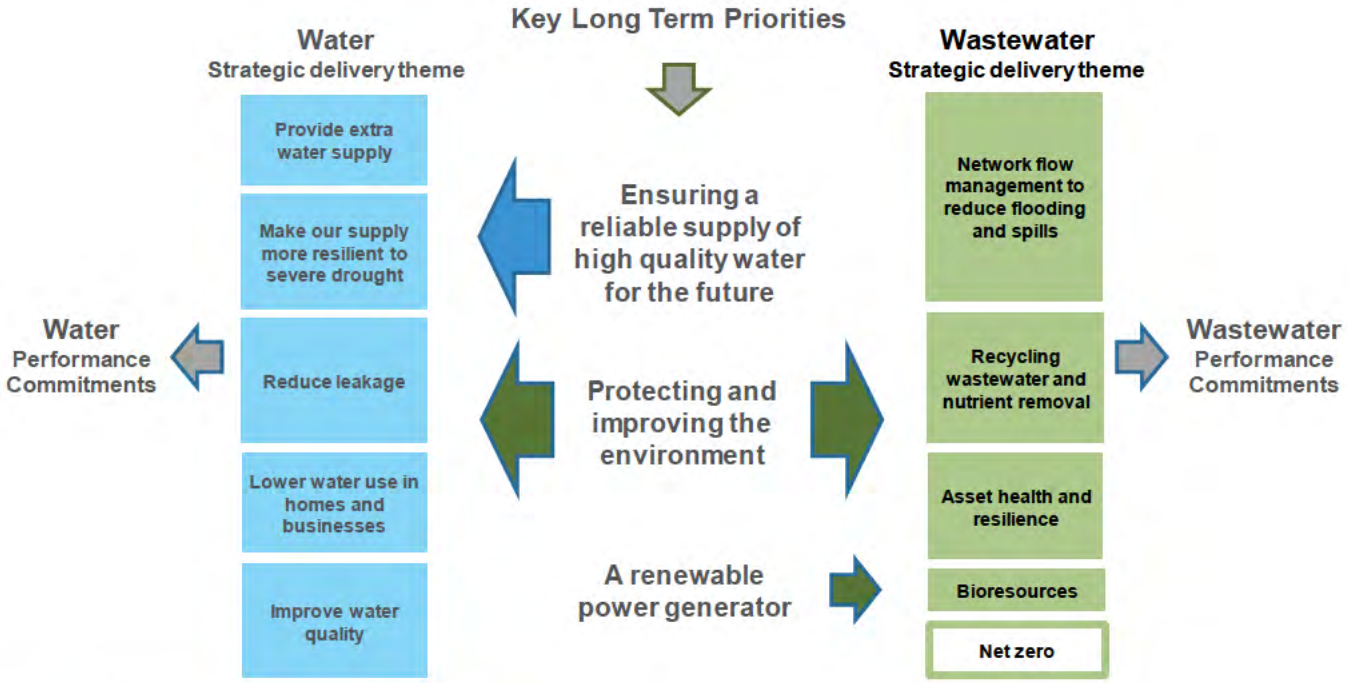


Figure 8: Strategic delivery of our Long-Term Priorities

6.1.1 Water

The key Water enhancement activities that will deliver our Long-term Priorities are outlined below and are identified in accordance with their strategic delivery theme.

1. **Provide extra water supply to meet future population growth and environmental demands.** By 2050, the population of the south-east of England is projected to grow by between 11% - 22% [Source: Office for National Statistics and Local authority housing plans]. It is essential we ensure water supply capacity continues to meet future demand. This strategic theme outlines those key enhancement activities which will allow us to keep pace as future demand unfolds.
2. **Make our supplies more resilient to severe drought.** As population growth increases the demand for water supply, there is a need to not over-stress environmentally sensitive water sources such as chalk streams. To this end, the Environment Agency is driving the introduction of significant reductions in the amount of water we are able to abstract from sensitive sources. This already sets us a challenge within existing operating conditions especially when faced with a drought such as that experienced in 2022. This challenge could be exacerbated further in the future should climate change bring forth potentially longer, dryer summers and as a consequence ever more regular drought conditions. Enhancement activities within this strategic theme will focus on improving our supply resilience in the face of these challenges.
3. **Reduce leakage.** Customer feedback has clearly articulated that we need to improve the way we maintain and repair our network to reduce water leakage so that public confidence in our operations may be increased. We recognise this and have positioned leakage management as a key component of our long-term strategy from both an enhancement and base expenditure improvement perspective.
4. **Lower water use in homes and businesses.** Ensuring a successful balance of water supply against demand will not be achieved in the south-east of England over the Long-term Delivery Strategy period without a managed reduction of domestic and commercial consumption.
5. **Improve water quality.** Improving and maintaining water quality remains a key component of our long-term strategy.

Figure 9: Water: Core enhancement activity pathway (WRMP Situation 6) roadmap

6.1.2 Wastewater

The key Wastewater enhancement activities that will deliver our Long-term Priorities are outlined below and are identified in accordance with their strategic delivery theme.

1. **Network flow management to reduce flooding and spills.** This strategic theme focusses on those enhancement activities which will contribute to improving the performance of our network particularly in connection with storm rainfall flow. Improving the management of storm rainfall flow will be crucial in reducing pollution incidents, a major concern that has been highlighted by our customers.
2. **Recycling wastewater and nutrient removal.** Here the focus is on our enhancement activities that are designed to improve the quality of the water we return to our environment following usage. Activities will include learning and testing as we aim to maximise the quality of our wastewater recycling capability to the technically achievable limits (TAL) of available operational methodology.
3. **Asset health and resilience.** Our sewer network is aging so we need to focus on ensuring our assets perform effectively and efficiently throughout their anticipated lifespan. Relevant enhancement activity includes the utilisation of data and modelling to help focus targeted network improvement.
4. **Bioresources treatment and disposal.** Our bioresources infrastructure is aging and there is a major opportunity to utilise new technologies to extract gas or electricity from our waste product and feed that energy back into the national grid.

Wastewater also includes "Net zero", a set of initiatives intended to reduce our carbon footprint. The primary strategic Net zero enhancement activities predominantly relate to activities identified within Wastewater strategic themes, however the scope of Net Zero is business wide.

Figure 10: Wastewater: Core enhancement activity pathway roadmap

6.2 Adaptive planning approach

Our Long-term Delivery Strategy core pathway outlines our low / no-regret enhancement activities that will be required across a range of both benign and adverse scenarios in order for us to achieve our ambition. However, uncertainties exist and our core pathway is sensitive to a number of potentially adverse scenarios. If these are not planned for and appropriately responded to in the future, should they occur then a likelihood could arise of us not being able to achieve our ambition and our associated performance commitments.

Our Long-term Delivery Strategy therefore includes eight adaptive plans. These are in response to adverse regulatory, technology, demand, abstraction reduction and climate change scenarios. The adaptive pathways detail an adjustment to the core pathway strategy. In most cases this involves increased enhancement spend as additional investment is required to offset the "headwind" generated by the adverse scenario so that we are still able to achieve our ambition.

An outline of our adaptive planning approach and eight adaptive pathways can be found below.

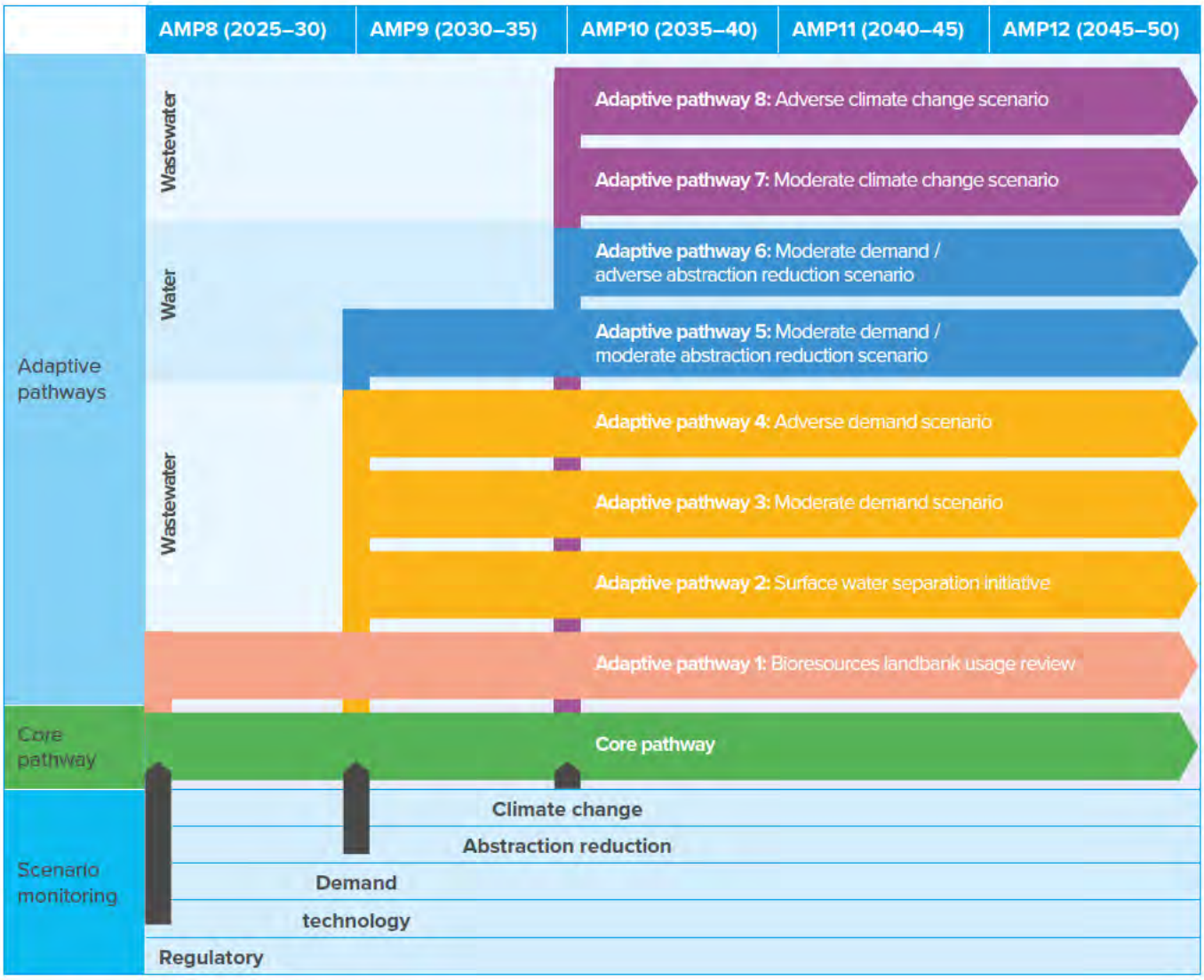


Figure 11: LTDS: Holistic adaptive pathway overview

6.3 High level summary of costings and bill impacts

Total 2025-50 enhancement spend for our core pathway has been estimated at £15.5bn. We also have an additional £11.5bn identified as part of our adaptive planning process which has considered a number of key uncertainties. Should all adverse uncertainties come to pass (which we do consider to be unlikely) then our plan contains a full enhancement spend of £27bn.

Table 2: LTDS Total enhancement expenditure (2025–2050)

	AMP8 £m	AMP9 £m	AMP10 £m	AMP11 £m	AMP12 £m	(All AMPs) £m
Water core pathway	1,466	2,511	2,426	1,338	1,445	9,186
Wastewater core pathway	1,619	1,565	1,421	884	780	6,269
Core pathway	**3,086**	**4,075**	**3,847**	**2,222**	**2,225**	**15,455**
Adaptive pathway 1	0	141	-190	0	0	-49
Adaptive pathway 2	0	309	134	36	-7	472
Adaptive pathway 3	0	4	4	2	2	11
Adaptive pathway 4	0	5	5	3	3	16
Adaptive pathway 5	0	13	565	92	105	774
Adaptive pathway 6	0	28	781	832	562	2,203
Adaptive pathway 7	0	0	666	663	660	1,989
Adaptive pathway 8	0	0	2,980	2,977	2,974	8,931
Total adaptive	**0**	**487**	**3,714**	**3,849**	**3,533**	**11,583**
Full total	**3,086**	**4,562**	**7,562**	**6,071**	**5,758**	**27,039**

Note 1: Adaptive pathway 6 includes costs for Adaptive pathway 5
Note 2: Adaptive pathway 8 includes costs for Adaptive pathway 7

Our £15.5bn core pathway enhancement spend across all AMPs is split between £9.2bn for our Water business and £6.3bn for our Wastewater business.

Adaptive pathway enhancement spend initially becomes noticeable in AMP9. However, beyond AMP9, our core plan could be significantly impacted should long-term adverse uncertainties be realised that require us to consider activating one or more of our adaptive plans.

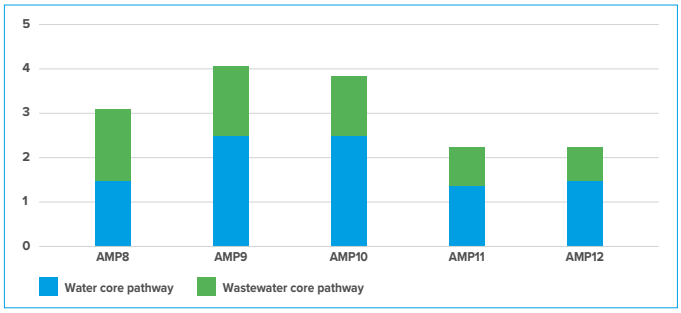


Figure 12: LTDS Core pathways: Total enhancement cost (£bn)

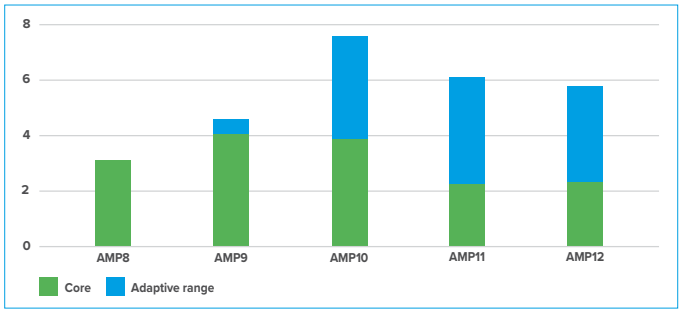


Figure 13: LTDS Core and adaptive pathways: Total enhancement cost (£bn)

The impact upon bills from our planned enhancement costs can be seen in the chart below:

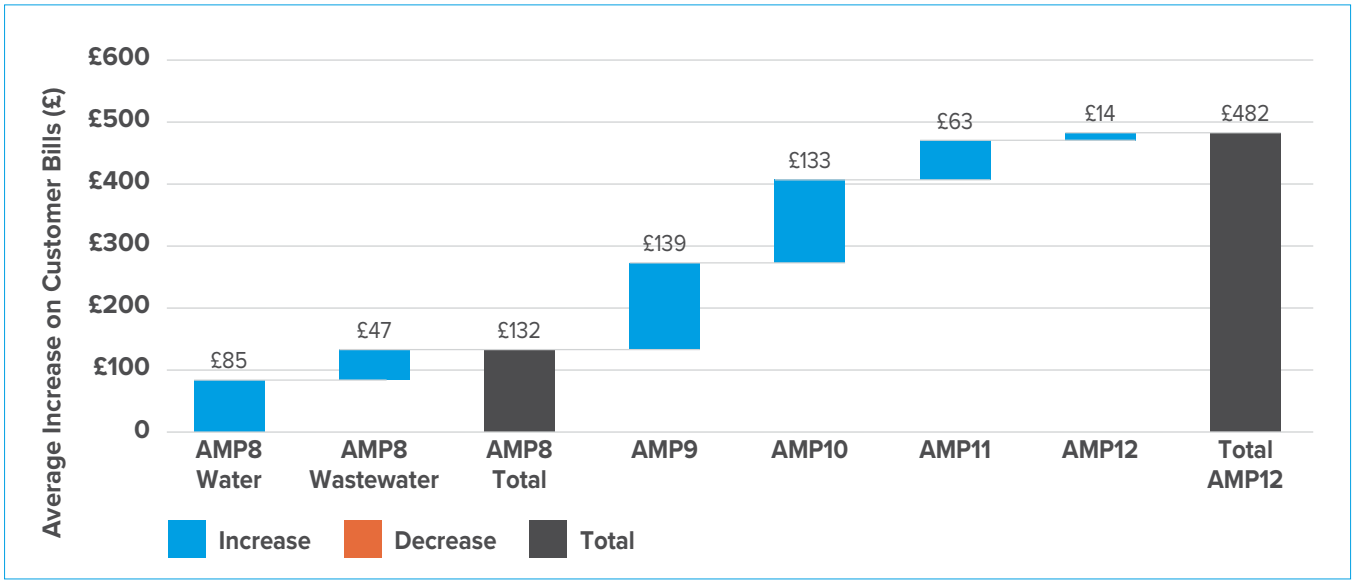


Figure 14: Enhancement Impact on Average Customer Bills to 2050 (22/23 prices)
Note: Average bill impacts have been calculated in accordance with the Ofwat Long-term Delivery guidance and Final methodology. These impacts are based on Enhancement spend only after AMP7 and detailed figures are in LS7.

The impact upon our water bills of our water-related adaptive pathways can be seen below:

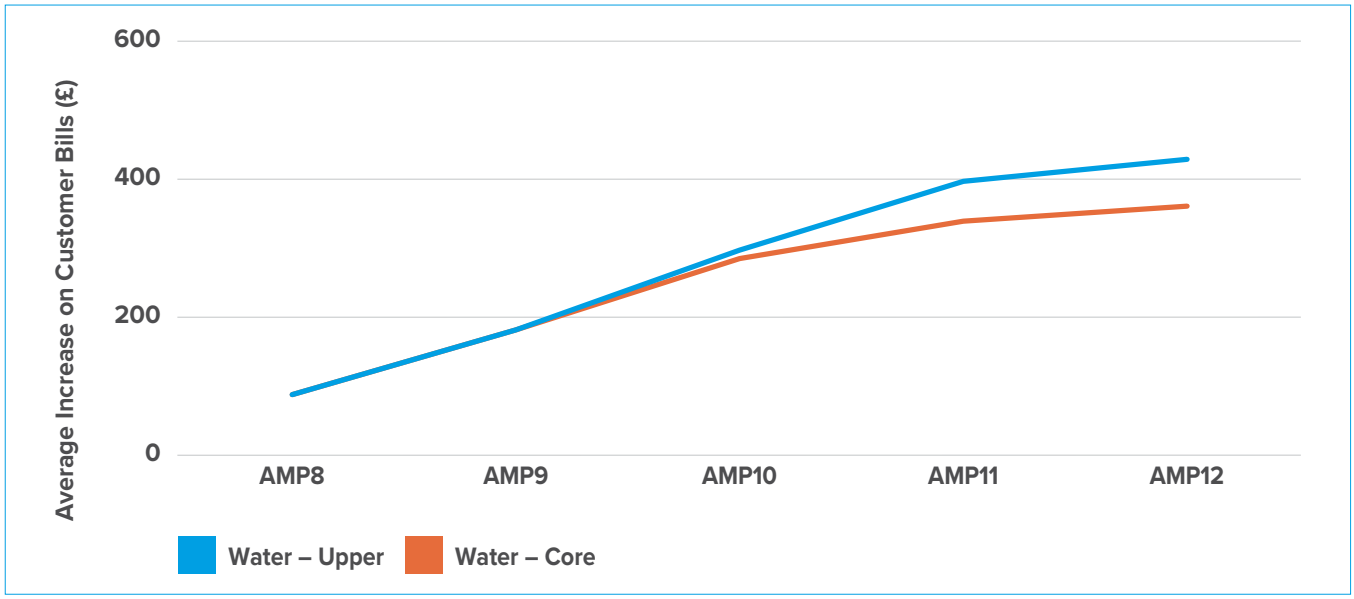


Figure 15: Water Enhancement Adaptive Pathways: Imapct on Average Customer Bills to 2050 (22/23 prices)

The impact upon our wastewater bills of our wastewater-related adaptive pathways can be seen below:

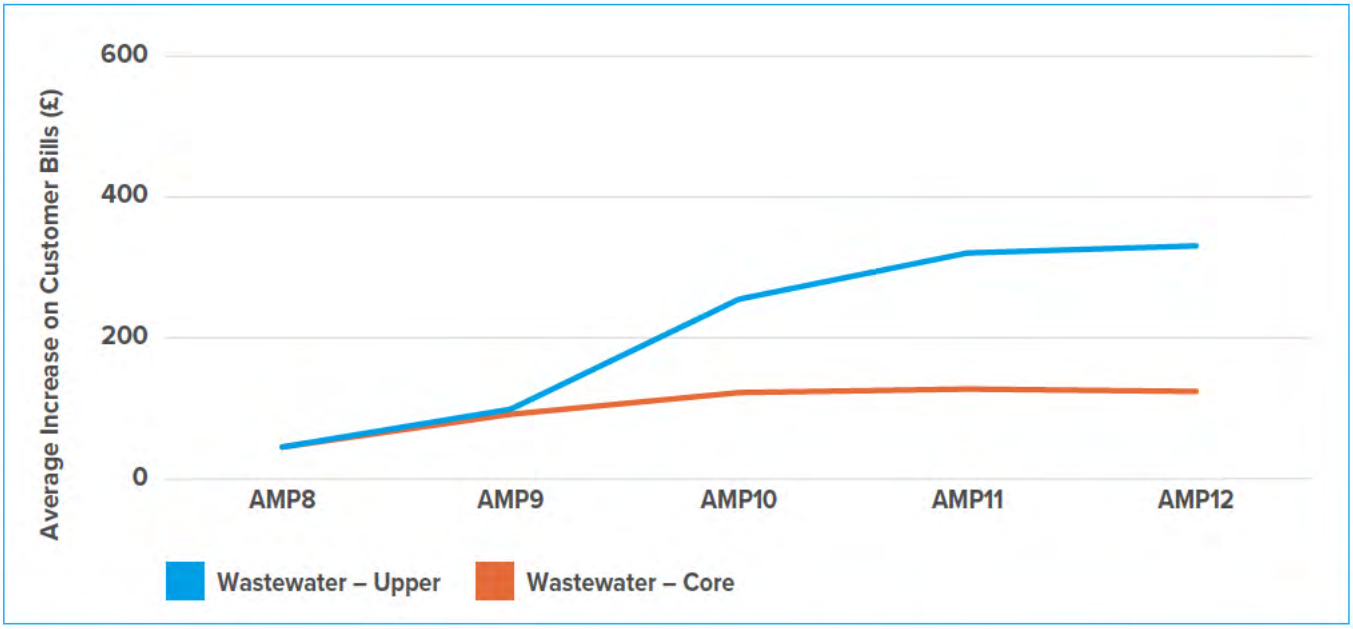


Figure 16: Wastewater Enhancement Adaptive Pathways: Imapct on Average Customer Bills to 2050 (22/23 prices)

6.4 Representation of strategic planning frameworks within LTDS

Our Long-term Delivery Strategy holistically articulates our business strategy up to 2050 and so interlinks with and is representative of all our relevant specialised strategic planning frameworks namely:

- Water Resources Management Plan (WRMP)
- Drainage and Wastewater Management Plan (DWMP)
- Water Industry National Environment Programme (WINEP)
- Long-Term Water Quality Risks
- Bioresources strategic plan
- Environment strategic plan
- Resilience business plan
- Net zero strategic plan

The chart below illustrates the scope and interlinkage of our Long-term Delivery Strategy with our other strategic plans.

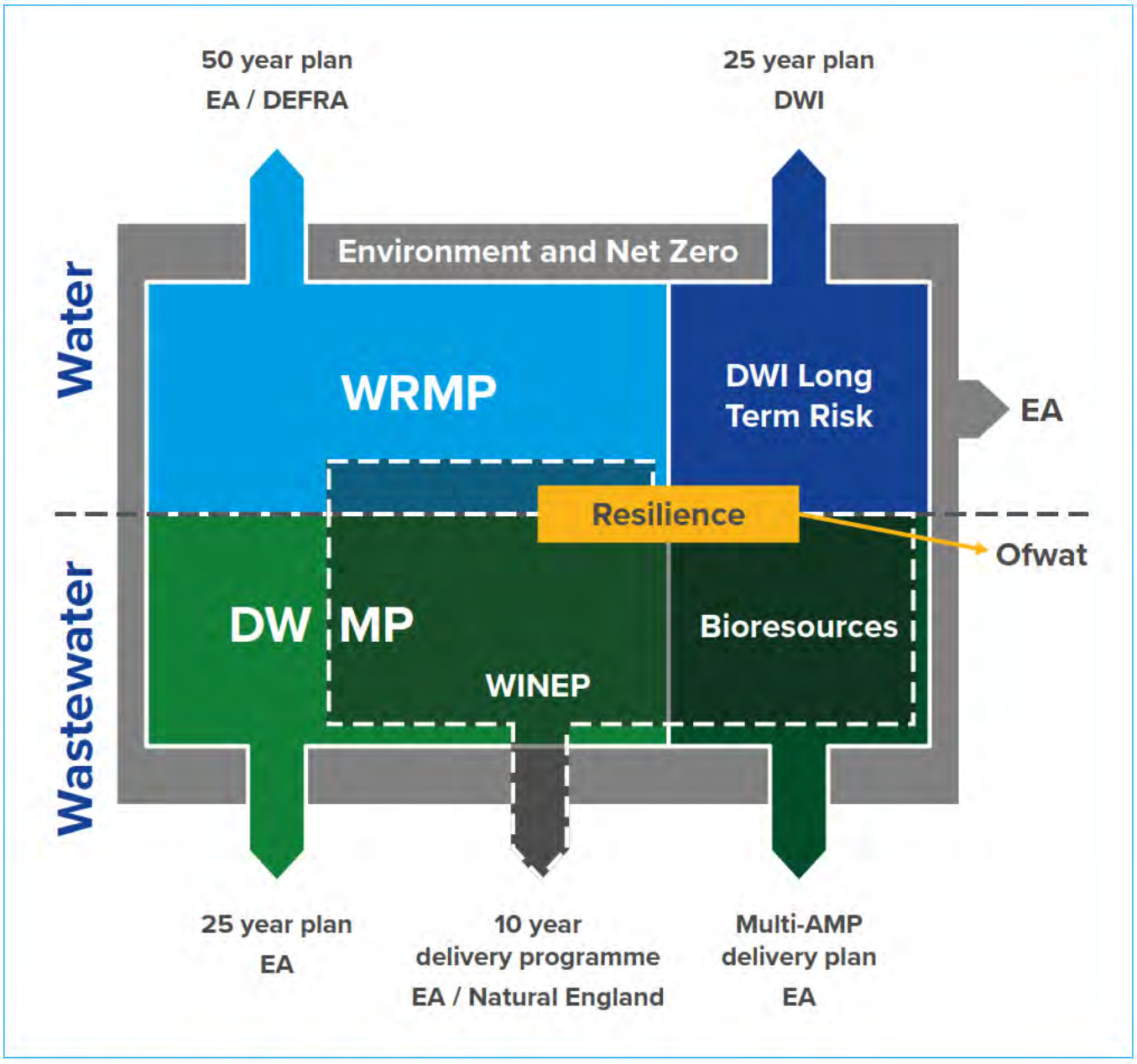


Figure 17: Long-term Delivery Strategy: Contributory strategic plan map

7. Core pathway

7.1 Core pathway definition and parameters

The core pathway is our low-cost plan comprising low and no-regret enhancement activities. It includes enhancement schemes that are required to meet our:

- Ambition outcomes and performance commitments
- Current legislative and regulatory requirements

The core pathway assumes a future which is holistically "benign" when considering key uncertainties that have the potential to impact our operations. The core pathway is based upon limited abstraction reductions and climate change impacts. It assumes the success of unproven technologies and also assumes that population growth can be notably offset by successful demand management schemes that can beneficially influence customer behaviour and reduce residential and business water consumption. In addition, the core pathway assumes a key beneficial regulatory outcome that could have a significant impact upon our Bioresources strategy.

7.2 Key Water enhancement investment

By 2050, if we do nothing, our customers could face a potential shortfall of between 342m and 537m litres per day in fresh water supply. This is due firstly, to the consideration that significantly more fresh water is likely to be required to meet the needs of an increased population. In 2050 the population level in the south-east is anticipated to have grown by between 11% and 22% from 2020 [Source: Office for National Statistics and Local authority housing plans]. Secondly, abstraction reduction regulations are anticipated to come into effect within the Long-term Delivery Strategy planning period which could significantly limit our ability to extract fresh water from a number of existing sources. Sources such as chalk streams are now being considered environmentally sensitive. In addition freshwater supply could be impacted by climate change, however the impact on our supply / demand balance has been projected to be of notably less significance than the two primary uncertainties, demand growth and abstraction reduction.

The core pathway for Water is therefore focussed upon strategic themes which reflect the need for increased water supply, water efficiency, and the development of a more resilient network in the face of serious demand and environmental challenges. The Water core pathway differs from the Wastewater core pathway in that for Water, the number of key projects are fewer in number, but they are much more capital intensive e.g. new recycling or desalination plants as opposed to new wastewater storage tanks.

The Water Long-term Delivery Strategy core pathway is based upon Situation 6 as outlined in our WRMP [See Section 12.1 Circumstance under which adaptive pathways will be followed for a table outline of WRSE / WRMP adaptive pathway situations]. Situation 6 was chosen for two primary reasons:

- Firstly, the pathway contains low or no-regret activities based on a generally benign set of assumed scenarios. Associated abstraction reduction and climate change impacts are considered low and the associated demand increase scenario is moderate at an assumed population increase of 16.9%.
- Secondly, Ofwat feedback has guided us to consider and include schemes that are used across the majority of situations. Only one WRMP situation is less "benign" than Situation 6 and that is Situation 9. Situation 9 does not include The Thames Estuary desalination plant and the Havant Thicket to Pulborough pipeline, investment projects which are included in all situations except Situation 9. Hence Situation 6 on this basis was deemed more appropriate for use as the Long-term Delivery Strategy core pathway.

The chart on the next page outlines the key Long-term Delivery Strategy Water core pathway enhancement activities.

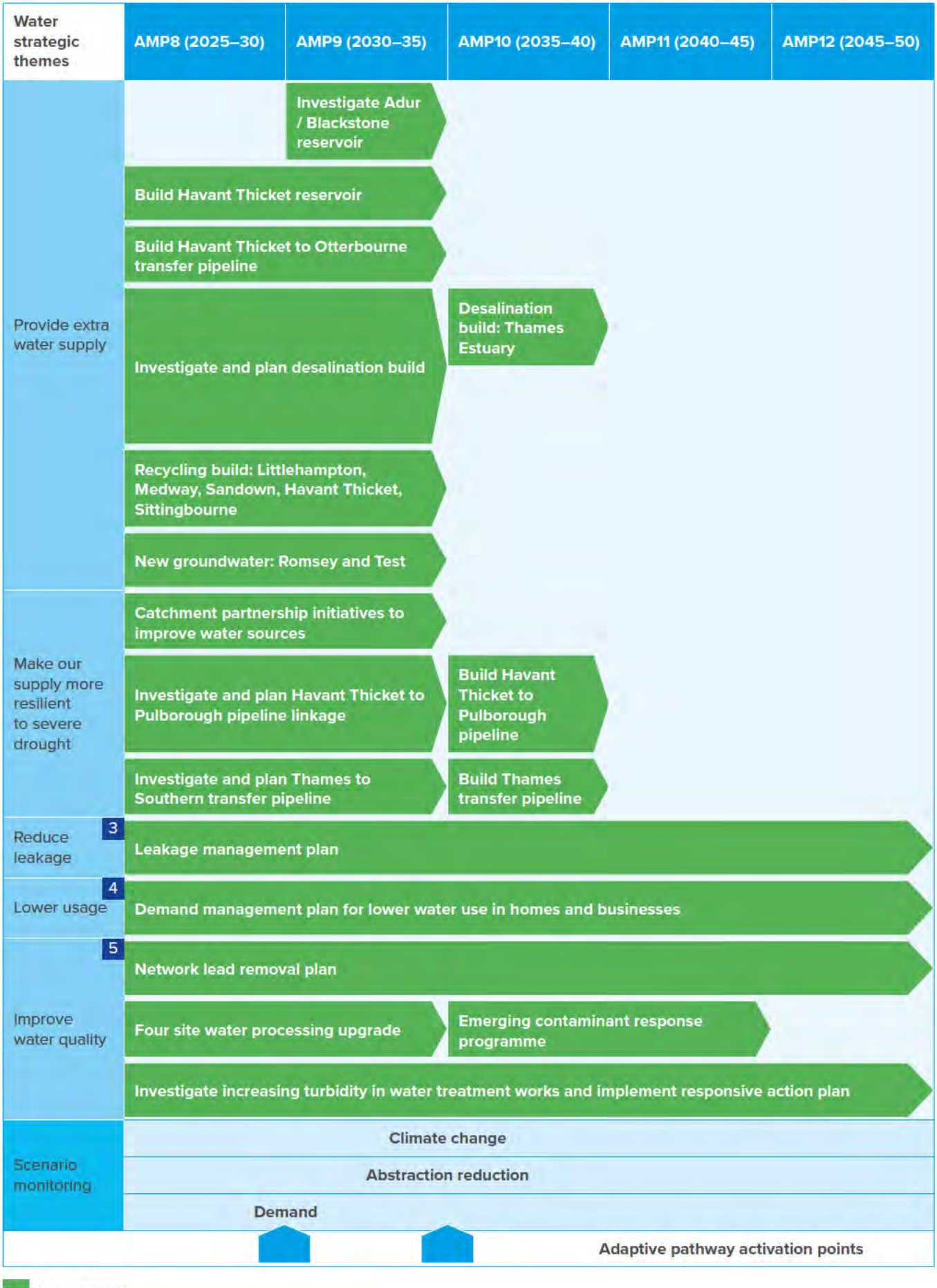


Figure 18: Water: Core enhancement activity pathway (WRMP Situation 6) roadmap

The approach taken towards developing the large, capital-intensive projects that will be required for us to meet our Water supply ambition has been to implement them on a modular basis. Core pathway investment in AMP8 and AMP9 has been applied where there is a clear and obvious need (e.g. the construction of Havant Thicket reservoir and the associated water transfer pipe and water recycling plant). Further high capital-intensive enhancement investment beyond AMP9 is found more in adaptive pathways than the core pathway as future enhancement investment is sensitive particularly to demand and abstraction reduction developments. Low risk investment such as our leakage reduction management plan is an essential central component of our core pathway and so has a place across all five AMPs. This evidences our approach towards the core pathway as only including low/no regret enhancement activities which are applicable to all scenarios. We have deliberately minimised the risk of stranded assets and have ensured that decisions will not be avoided when needed through the potential adoption of a number of adaptive pathways at appropriate times.

The water core pathway has been significantly influenced by customer and stakeholder feedback. Our WRMP statement of response details all our feedback and how we have acted upon it [for more information reference: WRMP24 Survey (southernwater.co.uk)].

7.2.1 Provide extra water supply to meet future population growth and environmental demands

Our key ambition within our first Water strategic theme is to:

- **Deliver a modular approach to new infrastructure build so as to meet our legal requirement to sustain water supply for a growing population**

To do this we are implementing a wide range of key projects in AMP8 and AMP9:

- Developing the Havant Thicket reservoir in partnership with Portsmouth Water
- Constructing the Havant Thicket to Otterbourne pipeline as part of Water for Life Hampshire and water recycling plant, to increase the volume of water that can be taken from the Havant Thicket reservoir
- Investing in new recycling plants at Littlehampton, Medway, Sandown, Havant Thicket and Sittingbourne.
- Developing a new groundwater source at Romsey
- Investigating construction of new desalination build

Beyond AMP9 major infrastructure spend drops and is not included within the core pathway as further sizeable enhancement spend will be assessed in accordance with demand and abstraction reduction variables. Should the need be recognised then additional spend will be implemented on activation of an adaptive pathway.

7.2.2 Make our supply more resilient to severe drought

Our Long-term Delivery Strategy includes a plan to make our water supplies more resilient to severe droughts so we are less likely to introduce emergency restrictions such as Temporary Use Bans (TUBs), Non-Essential Use Bans (NEUBs) and drought orders. Our aim is to reduce our reliance on these measures and stop using them by 2040 at the latest.

Our key long-term strategic resilience ambitions are to:

- **Be able to withstand a 1 in 500-year drought event by 2040, while reducing abstraction form chalk streams and aquifers**
- **Reduce unplanned outage by lowering the unplanned loss of peak week production capacity over the year to 2%**

We intend to deliver our ambition by:

- Continuing to work with neighbouring water companies such as Thames Water, Portsmouth Water, SES, and South-East Water to improve pipeline connectivity so that water can be transferred around the region flexibly in accordance with demand.
- In AMP8, continue investigating the case for a strategic pipeline which could transfer up to 120m litres per day from Thames Water into Hampshire. The pipeline however, is dependent upon new water sources becoming available in the Thames Water area, in particular the new South-East Strategic Reservoir (SESRO). If the building of the reservoir is either smaller than anticipated or ends up being cancelled then we would need to invest in alternative sources in Hampshire such as recycling or desalination. Construction is intended in AMP10 with operational delivery scheduled late in AMP10 / early in AMP11.
- Investigating a new transfer pipeline from Havant Thicket to Pulborough.
- Developing catchment partnerships with land users and environmental groups to improve water sources for the future e.g. utilising sustainable extractions, reducing groundwater nitrate levels.

7.2.3 Reduce leakage

We recognise from customer and stakeholder feedback that reducing leakage from our network should be considered a top priority. To this end we therefore plan to invest across the 25-year Long-term Delivery Strategy period to support our ambition to:

- **Reduce leakage by 50% in 2050**
- **Increase number of mains repairs per 1,000 km to 98.1 in 2050**

We intend to deliver our ambition by:

- Implementing an enhanced programme of renewing old water mains
- Increasing our sensor network and utilising digital information technology to improve our management of the pipe network
- Utilise emerging technology such as thermal imaging, satellites and fibre optics to improve leak detection methodology

7.2.4 Lower water usage in homes and businesses

Water efficiency, next to reducing leaks has proved a highly popular demand management option amongst customers and stakeholders. Successfully helping customers to use less water is an essential component of our strategy if we are to balance our potential supply / demand deficit. Our key strategic ambition is to:

- Reduce personal water usage to 110 l/p/d in 2050
- This is ambitious. Influencing changes to working patterns and household demand will undoubtedly be challenging, however we intend to drive this ambition by:
    - Increasing the number of homes with smart meters
    - Running public campaigns to encourage water efficiency – including working with the education sector
    - Potentially introducing innovative tariffs, subject to customer acceptability, that incentivise water efficiency
    - Working with government to promote the adoption of more water efficient policies and standards

7.2.5 Improve water quality

Maintaining, if not improving the quality of our water to customers over the Long-term Delivery Strategy period is another central component of our plan. Our key strategic ambition is to:

- **Achieve a Compliance Risk Index of One**
- **Achieve a lead-free network by 2050**

We intend to deliver our ambition by:

- In AMP8 and AMP9 implementing major water treatment processing enhancements to four key sites [redacted]
- Conducting investigations during AMP8 so as to identify and quantify key areas of climate change impact in particular the growing stress on water treatment works of increasing turbidity. From AMP9 onwards we plan to pilot then implement treatment solutions to counteract the assessed climate change impacts
- During AMP8, targeting lead pipe removal from public buildings in high-risk areas. A programme of lead comm-pipe replacement as part of the WRMP mains renewal plan will also be initiated in AMP8 and then continued throughout the 25-year LTDS period
- Expanding catchment management and monitoring of nitrate levels. Intervening where required to maintain water quality
- Implementing sampling and monitoring programme in AMP8 to identify new and emerging contaminants. Piloting and then implementing potential treatment options in AMP9 out to 2050

7.2.6 Water core pathway supply / demand balance

Our Long-term Delivery Strategy for the supply of fresh water aims to balance the projected supply / demand deficit through a diversified range of options. The core pathway is based upon a future characterised by benign scenarios, particularly with regard to demand and abstraction reduction variables.

The chart below outlines the core pathway supply / demand projection:

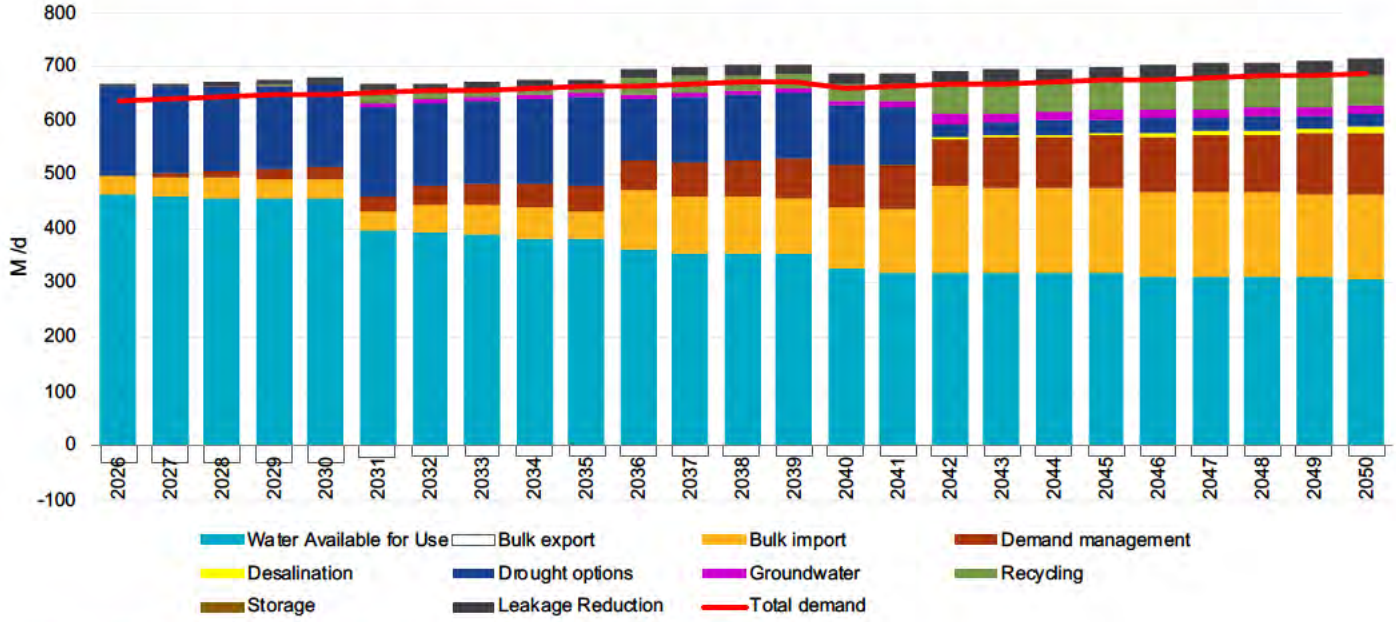


Figure 19: Core pathway (WRMP Situation 6) supply / demand balance

Key core pathway considerations:

- Demand follows a moderate growth scenario (16.9% population increase) offset by steady progress in reducing demand to 110 l/p/d
- Water available for use notably decreases even under benign water abstraction scenario conditions
- Drought restrictions drop away post 2040
- Considerable post 2040 plan dependency upon **bulk water import** particularly through Thames to Southern pipeline
- **Recycling** and **demand management** play a vital role to diversify and balance supply / demand mix solutions

7.3 Key Wastewater enhancement investment

Southern Water has 381 Wastewater systems or catchment areas. As part of our DWMP, each area's infrastructure has been tested against 14 planning objectives utilising BRAVA (Baseline Risk and Vulnerability Assessment) methodology.

The chart below outlines the mapping of our DWMP planning objectives onto Long-term Delivery Strategy strategic delivery themes:

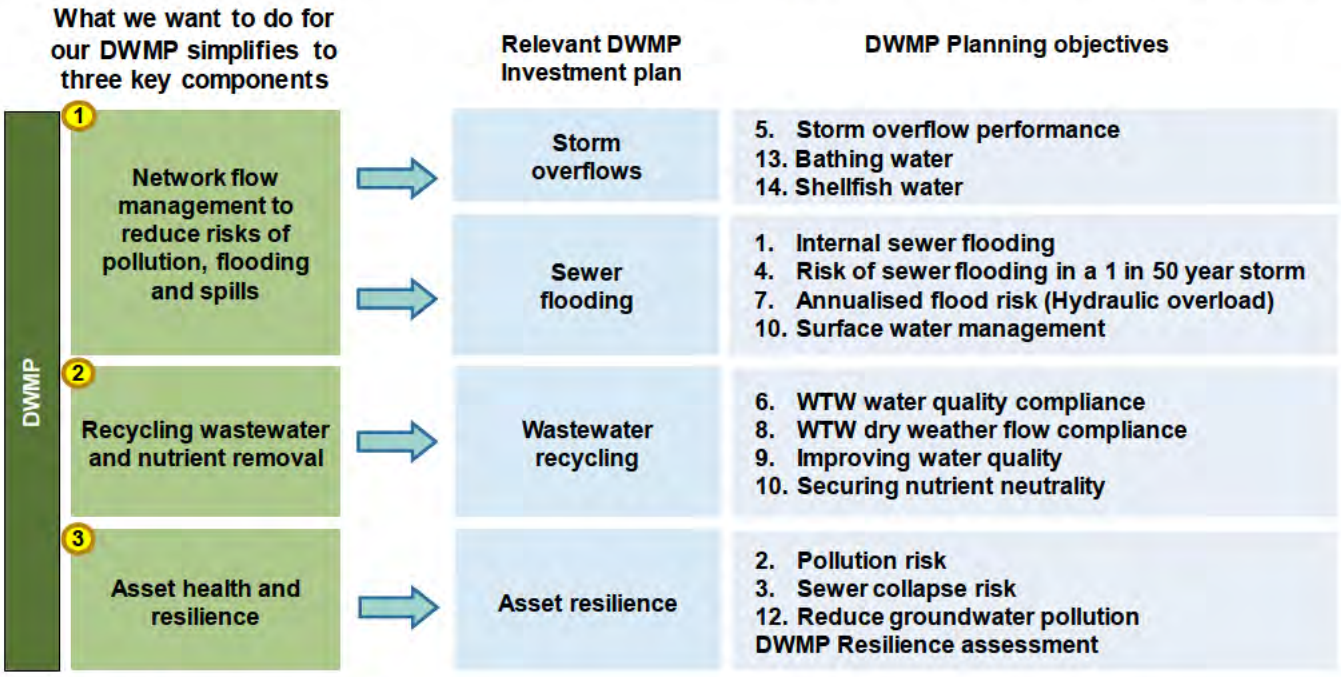


Figure 20: DWMP: Simplifying the narrative

The BRAVA assessment categorised the risk of individual asset failure associated with each planning objective into three bands. The risk bands being:

- Band Zero – Not significant
- Band One – Moderately significant
- Band Two – Very significant

The assessment then identified and costed the remedial activity necessary to reduce all asset risks to Band Zero. This procedure provides the basis for the costings that are presented for Wastewater within the Long-term Delivery Strategy.

61 Wastewater systems or catchment areas of the 381 total were selected for a more detailed assessment as part of the Options Development and Appraisal (ODA) process. These areas were selected primarily on the basis of their size and complexity, but also reflected inclusion requests from partner companies. The selected 61 systems represent 78% of customers. The ODA process refined the identification, timing and costs of infrastructure upgrade to a much higher level of detail than the BRAVA exercise. The remaining 320 areas will receive their own ODA assessment over the next five-year planning cycle (AMP8).

The Long-term Delivery Strategy Wastewater core pathway focusses upon those enhancement activities within the BRAVA / ODA exercise which are considered low or no-regret. This is distinct from the Risk Band categorisation. This means that enhancements within the Wastewater core pathway will have a mixture of BRAVA categorisations. The BRAVA categorisations will influence the prioritisation and ordering of related enhancement activities over the five AMPs of the core pathway as per the DWMP delivery methodology.

The chart opposite outlines the key Wastewater core pathway enhancement activities:

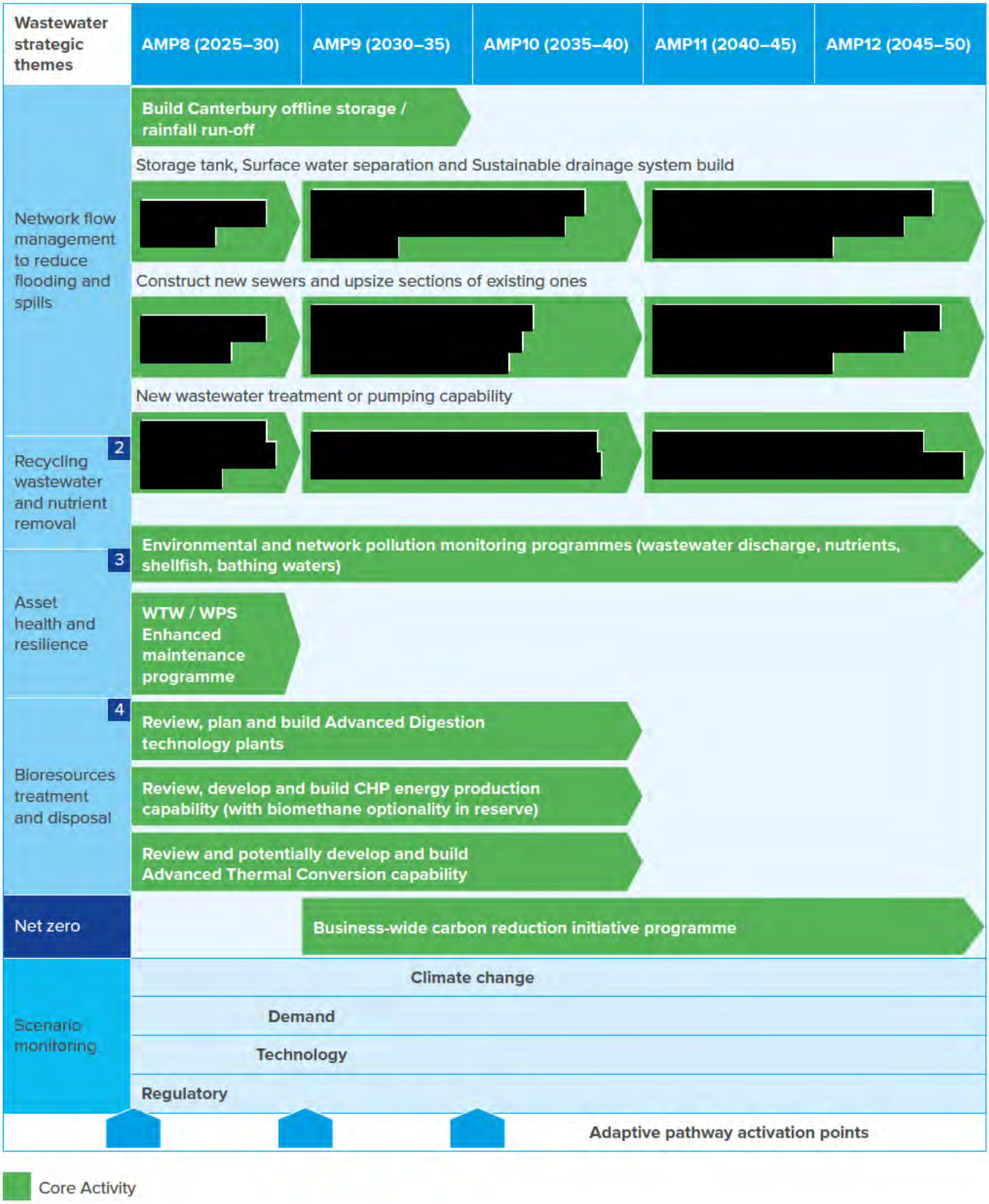


Figure 21: Wastewater: Core enhancement activity pathway roadmap

The Wastewater Long-term Delivery Strategy differs from the Water strategy in that Wastewater is required to deliver significant multiples of a finite number of enhancement activities (e.g. new or enhanced capacity storm overflow tanks). Whereas Water has a smaller number of key enhancement activities, but these individually are of much higher cost (e.g. a new reservoir).

Utilising the storm overflow tank example, the Wastewater core pathway delivery plan includes the construction of multiple storm overflow tanks. The BRAVA / ODA methodology utilised by the DWMP will influence the locational order and prioritisation of the construction of the tanks in accordance with DWMP methodology in order to deliver the Long-term Delivery Strategy core pathway.

The Wastewater core pathway has been designed to include those enhancement activities which are applicable to all scenarios. The pathway enhancement plan is sensitive to adverse changes in regulation, technology, demand, and climate Change. Should such uncertainties prove to ultimately be adverse, our ambition will be put at risk. The associated remedial action articulated in the form of adaptive pathways is specified later in this document.

The wastewater core pathway has been significantly influenced by customer and stakeholder feedback. Our DWMP statement of response details all our feedback and how we have acted upon it [for more information reference: Have your say (**southernwater.co.uk**)].

7.3.1 Network flow management to reduce flooding and spills

Being affected by internal sewer flooding is one of the most devastating things that can happen to a customer, be that residential or commercial. Sewer flooding can be damaging, disrupting and a health hazard. Flooding (both internal and external surface water) is most often caused by a mixture of pipe blockages and rainfall overwhelming the sewer. The sewer network has therefore been built and designed upon a legacy of prioritising the minimisation of internal flooding risk through the use of storm overflows.

Storm overflows have been attracting a significant amount of customer attention due to the concern surrounding releases of untreated sewage. This is partly due to the increasing popularity of open water swimming but also growing public concern about the environment more generally. Storm overflow spills are usually the result of heavy rainfall. The storm overflows provide a release mechanism to discharge excess wastewater into the environment when the network is overloaded so minimising the historically prioritised risk of internal flooding into customers' homes. The majority of the rainwater is run-off from roofs, roads and paved areas (including pavements and car parks). Although the effluent from most storm overflow releases is heavily diluted, there is pollution impact potential upon water users and the local ecology of plant and animal life. The Environment Agency lists storm overflows as one of the causes as to why rivers and seas are not in good ecological condition.

Environmental pollution caused by storm overflows in now considered by customers and stakeholders as seriously unacceptable. We recognise this and it is therefore no surprise then that our key strategic ambitions within this delivery theme are all storm overflow related:

- **Reduce storm overflows to an average of less than 10 spills per overflow by 2050 (80% reduction)**
- **Reduce bathing water pollution by ensuring less than 3 spills per season (or potentially 2 spills per season) within designated bathing water areas**
- **Reduce shellfish water pollution by ensuring less than 10 spills per annum within designated shellfish areas**

Climate change is anticipated to result in more intense storm events which has the potential to put more regular, increased pressure on our network. This could result in overwhelming parts of our existing drainage systems and causing localised flooding. Based on our modelled data for our wastewater systems 93% of all flow during a storm is rainwater. Our core pathway focusses on improving flow throughout the network on a benign climate change scenario basis. Adaptive pathways build in further network flow capability and resilience in accordance with potentially more extreme changes in climate.

Water companies are being actively encouraged by the Environment Agency (EA) and Ofwat to consider green infrastructure to achieve a progressive reduction in the adverse impact of discharges from storm overflows. Our core pathway focusses on utilising a mixture of nature-based solutions and more carbon-intensive options to provide a holistic storm overflow solution. In practice, this means a range of enhancement investment:

- Separating rainwater from wastewater. Diverting rainwater back to the ground by allowing it to flow naturally through permeable surfaces such as fields, parks and playing fields, or to local rivers and streams through separate surface water drainage systems
- Slowing the flow. Holding back or temporarily storing water on the surface where no harm is caused, utilising sustainable drainage systems such as swales, raingardens, ponds and planters. By reducing peak flow, existing drainage systems will drain the water away over a longer period of time
- Building new or increasing the capacity of existing storage tanks
- Constructing new wastewater pumping capability
- Constructing new sewers and upsizing sections of existing ones

Our nature-prioritised strategy is innovative, but it is reliant upon unproven technologies, processes and procedures. The possibility therefore exists that our approach may not deliver the reduction in rainwater flow anticipated. Should this prove to be the case, an adaptive pathway will be triggered which will initiate the development of additional more-proven solutions e.g. additional storage tank capacity to offset any under-performance of the nature-based solutions.

7.3.2 Recycling wastewater and nutrient removal

We have a legal responsibility to operate our wastewater treatment works and pumping stations in compliance with the permits issued by the Environment Agency. The EA permits set limits as to the quality and quantity of recycled water (effluent) that is discharged back into the environment.

A mixture of base and enhancement funded activities will together support our programme of ensuring the quality of wastewater we return to our environment remains in compliance with EA permits. This includes future compliance with dry weather flow requirements i.e. the average daily flow that we expect to reach our wastewater treatment works during a period without rain.

Our key strategic ambitions are to:

- **Achieve an 80% reduction in total phosphorous load released into freshwaters from wastewater releases by 2038**
- **Ensure nitrogen treatment achieves the Environment Agency's "Technically Achievable Limit" permits where receiving watercourse unsatisfactory by 2030**

Enhancement investment within this strategic theme will primarily be targeted at:

- Increasing and enhancing biological treatment capacity

The level of capacity increase will consider long-term population growth forecasts and best estimates provided by local planning authorities (the core pathway itself being based upon a benign scenario growth estimate). A monitoring strategy is in place during AMP8 to review the development of demand across our region. Should actual demand prove notably higher than the benign scenario then adaptive demand-driven pathways will be taken which will result in increased enhancement spend on treatment capacity.

Evidence from studies over the last few decades are showing that many water dependent habitats and ecosystems continue to be in decline. A number of issues are causing this, one of which is the impact of nutrients and other pollutants that come from a variety of sources including recycled wastewater, and agricultural and urban run-off. Increased levels of nutrients, especially nitrogen and phosphorus can speed up the growth of certain plants, disrupt natural processes and impact wildlife. EA permit compliance by water companies does not provide a holistic solution as the pollution comes from more than one source. In addition, more information and understanding is required to understand precisely why habitats are continuing to decline. Consequently, the remaining enhancement activity within this strategic theme will include:

- Working in partnership with other authorities to develop long-term action plans to improve water quality (e.g. around the environmentally sensitive habitats of Chichester, Langstone and Pagham harbours)
- Continuing wastewater discharge studies including nutrient, ammonia, nitrogen and phosphate investigations
- Continuing bathing water studies and improving the analysis model

7.3.3 Asset health and resilience

Within this strategic theme a mixture of base and enhancement funded activities will together support the maintenance and improvement of existing systems.

We have a duty to minimise the negative environmental impact of our operations and it is clear from our customers of their expectation of us in this regard. The most common causes of network-failure driven pollution are pipe blockages and mechanical or electrical failure at wastewater treatment works, pumping stations and rising mains. This can lead to untreated wastewater being released into the environment. In addition, wastewater can rise out of the sewer network through manholes because of groundwater flooding.

Our key strategic ambitions are to:

- **Reduce pollution incidents to zero by 2040**
- **Achieve a rate of 5.6 sewer collapses per 1,000 km of sewers**
- **Achieve a rate of 0.78 internal sewer flooding incidents per 10,000 properties**
- **Achieve a rate of 4.6 external sewer flooding incidents per 10,000 properties**

To this end our strategic activities include:

- Conducting an enhanced maintenance programme to improve wastewater treatment works and wastewater pumping station resilience to reduce the risk of asset breakdowns
- Investing in smart technology to monitor, in real time, the performance of the sewer network and identify blockages and collapses before pollution or flooding occurs
- Utilising enhanced monitoring data to inform and target pollution investigation, network improvement and flood management capability improvement

As we introduce new technologies to improve the health and resilience of our network, analysis and review will be undertaken as to the effectiveness of these initiatives. Lessons learnt, along with the adoption of further innovative technological upgrades will shape future development phases in AMP9 and onwards as we move towards the utilisation of ever-more intelligent sewer management systems.

Our region has a long coastline with major population centres lying along that coastline. A number of our assets are therefore exposed to coastal related risks in particular, coastal erosion and climate change risk through rising sea levels. So as to assess the rising sea level risk we have conducted some preliminary scenario testing to quantify and identify those assets potentially at risk [see Section 16.2.3 Sea level rise]. This investigation has shown that although rising sea level risk is serious, its impact is anticipated to be gradual with the most significant implications due in the second half of the 21st century. Core pathway activity has therefore been focussed on addressing the immediate impact of coastal erosion at a number of key sites whilst planning further sea level rise analysis in AMP8 and 9. Key coastal erosion enhancement activity includes:

- In AMP8, coastal flooding defence work on three key sites [redacted] [Ref: PR24 Coastal Resilience Enhancement Business Case]
- In AMP9, coastal erosion defence work on four further sites

7.3.4 Bioresources treatment and disposal

Our bioresources (sludge) asset base is aging. As these assets become due for replacement the opportunity exists to upgrade our capability with more advanced and innovative technologies. This will allow us to improve the quality of our Biosolids (treated sludge) and extract additional energy from our waste product and feed that energy back into the national grid.

The first step of our Bioresources plan is to consolidate our asset base over the next 10-15 years, particularly in connection with our sites in Kent where we plan to consolidate seven conventional digestion sites into two modern advanced digestion sites. Across the south-east region overall, we plan to consolidate sixteen existing digestion sites to seven advanced digestion sites. In addition, in AMP8 we plan to explore the potential of Advanced Thermal Conversion technology which, should research and trials prove successful, could result during AMP9 and 10 in the commissioning of this new capability at a number of sites.

In AMP8, our core plan also includes a focus on the further development of Combined Heat and Power (CHP) electricity generating technology which will enhance our capability to extract energy from our waste product. Should current commercial considerations (e.g. incentive mechanisms) change, then biogas upgrade into biomethane plants could be considered as an alternative option.

The logistical challenge of upgrading our Bioresources infrastructure, whilst also maintaining our service levels to customers is likely to be a challenge, hence the multi-AMP approach.

In 2025 DEFRA and Environment Agency regulations governing the use of biosolids as a phosphate-based fertiliser will be reviewed. Our Bioresources core pathway plans for a phased reduction in the use of landbank as a disposal mechanism by 2040. However should a partial landbank ban be introduced in 2025, then an adaptive plan will be triggered that will accelerate our move away from landbank use.

7.3.5 Net zero

We have a number of initiatives that when collectively considered form a business-wide carbon reduction programme. We anticipate gradual progress to be made on these initiatives over the 25-year Long-term Delivery Strategy period as they are dependent upon a number of emerging and as of yet unproven technologies. These initiatives include:

- A phased transition to a low carbon fleet of cars, vans and larger vehicles
- Reducing nitrous oxide and methane production from water and wastewater treatment processes
- Building enhanced renewable energy production capability and capacity into our Bioresources operations
- Exploring the adoption and use of low-carbon materials in accordance with industry approval and best-practice

Bullets 2 and 3 above can be referenced as enhancement activities included within the **Recycling wastewater and nutrient removal** and **Bioresources** strategic delivery themes.

7.4 Other enhancement investment

In addition to the areas identified above we will need to protect our assets from external threats either physical or cyber. We are required to comply with a wide range of overlapping legal and regulatory requirements due to the nature of our operations. Now and in the future we will need to continue to invest in:

- Cyber security
- Physical security

This investment will vary depending on current and perceived future threats and the ability of our systems to protect our assets against these threats.

7.5 Summary of outcomes improvement from base and enhancement expenditure

7.5.1 Water supply interruptions

Our long-term ambition is to ensure a reliable supply of high-quality water for the future and this goal is supported by our customers. We have set a target of 2 mins in 2049/50 which will be a 56% reduction from our end of AMP8 position. This target is based on forward looking analysis of customer expectations and improved water sector delivery performance.

Table 3: Long term targets for water supply interruptions

Unit: hh:mm:ss	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	00:04:31	00:03:12	00:02:48	00:02:24	00:02:00
Benefits from enhancement	00:04:00	00:05:19	00:05:43	00:06:07	00:06:31
Performance from base expenditure	00:08:31	00:08:31	00:08:31	00:08:31	00:08:31

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

This target has been set against a position where base expenditure is unable to maintain the assets against the rate of deterioration. Our analysis has shown that this target is not achievable from base expenditure and we would need to undertake significant enhancement investment to achieve this target.

The loss of raw water in drought conditions, we will address through our Water Resources Management Plan (WRMP) investments which aims to:

- Improve available water supply through a major program of new schemes
- Reduce leakage to over 50%

Further detail of this program is available in our WRMP.

This will not address the ability of our works to be resilient in all circumstances and based on the work undertaken at four of our main water treatment works in AMP8, we forecast additional work will be needed at our other main works to achieve this target. These works will need to improve asset resilience at reservoirs and water works and mitigate the risks of deteriorating water quality from surface water sources.

7.5.2 Compliance risk index (CRI)

Our long-term ambition is to ensure a reliable supply of high-quality water for the future and this goal is supported by our customers. We have set a CRI target score of 1 in 2049/50, which will be an improvement from our end of AMP8 position. This target is based on our customer priorities:

- Our customers expect us to get the basics right and value they current quality of water on a day-to-day basis
- Customers expect us to improve in-line with the other companies' performance; however, they have higher priorities for our future investments

We have set a target that we consider reflects sector improvements, customer priorities and aligns with the definition and measurement.

Table 4: Long term targets for CRI

Unit: numeric score	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	2.00	1.33	1.22	1.11	1.00
Benefits from enhancement	2.06	2.73	2.84	2 95	3.06
Performance from base expenditure	4.06	4.06	4.06	4.06	4.06

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

This target has been set against a continuing natural rate of deterioration that the is offset by the base expenditure. Our analysis has shown that this target is not achievable from base expenditure and we would need to undertake significant investment to achieve this target.

Our enhancement expenditure would need to be focussed in the areas measured by the PC:

- Water supply
- Supply points and treatment works
- Service reservoirs

We will need to expand the proposed work to be undertaken at four of our main water treatment works in AMP8 to other main works to achieve this target. In addition, we would need to improve asset resilience at reservoirs and mitigate the risks of deteriorating water quality from surface water sources.

7.5.3 Customer contacts about water quality

Our long-term ambition is to ensure a reliable supply of high-quality water for the future and this goal is supported by our customers. We have set a target of 0.4 contacts per 1,000 population in 2049/50, which will be an improvement from our end of AMP8 position. This target is based on our customer priorities:

- Our customers expect us to get the basics right and value they current quality of water on a day-to-day basis
- Customers expect us to improve in-line with the other companies' performance; however, they have higher priorities for our future investments

We have set a target that we consider reflects sector improvements and customer priorities.

Table 5: Long term targets for water quality contacts

Unit: customer contacts per 1,000 population	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	0.80	0.65	0.57	0.49	0.40
Performance from enhancement	0.12	0.27	0.37	0.51	0.64
Performance from base	0.92	0.92	0.94	1.00	1.04

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

This target has been set against a continuing natural rate of deterioration that exceeds the ability of base expenditure to mitigate. Our enhancement spend on our main water sites to improve our water treatment resilience over the future AMPs should allow us to achieve this target. However, this is caveated that customers will accept water from Water Recycling Plants and Desalination, as a negative response to these would cause a significantly higher level of complaints. This would be exacerbated by the transient impact in drought years when we would need to move from normal to alternative sources.

7.5.4 Internal sewer flooding

Our long-term ambition is to achieve the reduce internal sewer flooding for our customers from current levels by about 50%. This is a priority as it is potentially damaging, disrupting and a health hazard, and can be deeply upsetting and distressing for our customers. Hence, this was a key part of our DWMP with specific planning objectives that focussed on internal sewer flooding and the risk of sewer flooding in a 1 in 50-year storm. We have a target 172 incidents by 2050 for internal sewer flooding incidents.

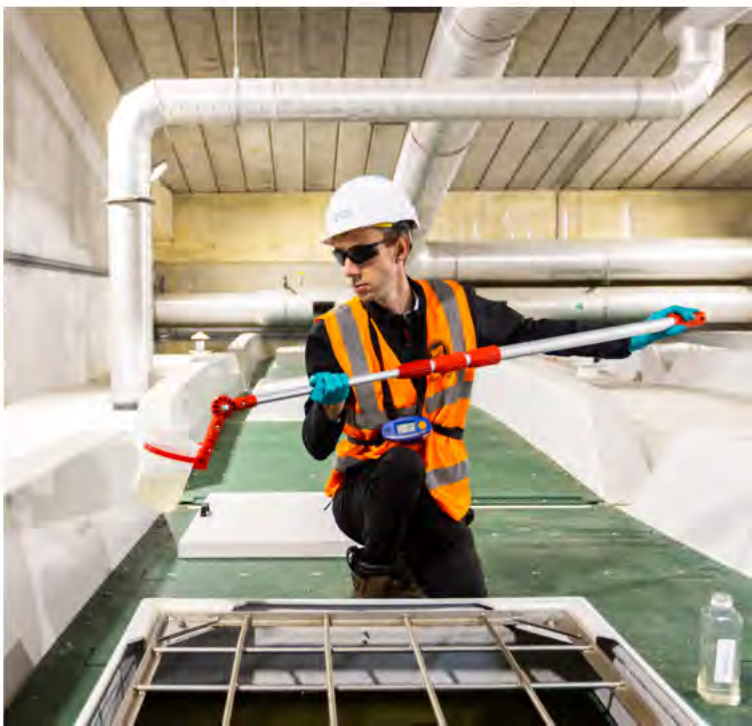
Table 6: Long term targets for internal sewer flooding

Unit: Number of Incidents	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	240	235	214	193	172
Performance from enhancement	4	9	35	61	87
Performance from base expenditure	244	244	249	254	259

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

Our DWMP highlighted a number of key areas in our region where we need to focus. These are detailed in our BRAVA maps7. Blockages of sewers account for approximately 70% of internal flooding incidents and our data shows that the main cause of blockages is through the misuse of toilets and sinks for the disposal of fats, oils and grease (FOG), as well as 'unflushable' items such as wet wipes, plastics, sanitary products and nappies. This is an UK wide issue and we will be focussing on running customer education campaigns to inform and change customer behaviour. In addition, we will be advocating change in line with the House of Commons Environmental Audit Committee recommendations on FOG and unflushables in their report on water quality in rivers published in January 2022. Our focus is to make flooding of homes an exception by 2040, but we recognise that preventing flooding can be technically challenging and cost more than our customers are willing to pay for us to resolve them.

In addition, internal sewer flooding can be caused by rainfall overwhelming the sewer. We have recognised that we need significant investment in reducing flood risk and we plan to continue this into the future. For more detail on this refer to our DWMP.



7.5.5 External sewer flooding

Our long-term ambition is to reduce external sewer flooding for our customers from current levels by about 66%. This is a priority as it is potentially damaging, disrupting and a health hazard, and can be deeply upsetting for our customers. Hence, this was a key part of our DWMP and linked with our internal sewer flooding approach. We had planning objectives that focussed on external sewer flooding and the risk of sewer flooding in a 1 in 50-year storm. We have a target 1000 incidents by 2050 for external sewer flooding incidents.

Table 7: Long term targets for external sewer flooding

Unit: number of incidents	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	3011	2791	2194	1597	1000
Benefits from enhancement	149	369	966	1,563	2,160
Performance from base expenditure	3,160	3,160	3,160	3,160	3,160

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

Our DWMP highlighted a number of key areas in our region where we need to focus these are detailed in our BRAVA maps7. Our approach to reducing flood risk is three-fold:

- **Operational solutions:** For example, improving the resilience of pumping stations, increased sewer cleaning targeted in hotspot areas to reduce the number and impact of blockages.
- **Sustainable solutions:** Work with local councils and other organisations such as developers, catchment partnerships and community groups to separate rainwater from the foul and combined sewer systems, using nature-based and sustainable drainage systems (SuDS).
- **Traditional solutions:**
  - Deliver property level resilience measures to reduce the risk of a repeat flooding for specific properties
  - Increase the capacity of storm tanks at WTWs, increase network storage through underground concrete tanks or increase the size of the network. This will be delivered using an adaptive approach, on a no regrets basis, so that future storage needs may be met through more sustainable solutions

These all need investment to deliver the improvement particularly when faced by the challenges of climate change. For more detail on this refer to our DWMP.

7.5.6 Biodiversity

Our long-term ambition is to achieve a 10% biodiversity gain over our estate by 2050. This supports the goals of the 25-year Environment Plan to increase biodiversity in the UK. This is a second-tier priority for customers although they recognise the benefits. We have phased a steady gain over the period to reflect our ability to deliver at a low level.

Table 8: Long term targets for biodiversity

The [redacted] report estimated a high potential uplift to a number of our sites. The improvements to our sites would not be achieved through base expenditure and we have allowed a small level of enhancement expenditure to improve our sites.

Unit: change in biodiversity units	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	0	163	326	489	652
Performance from enhancement	0	163	326	489	652
Performance from base	0	0	0	0	0

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

7.5.7 Operational greenhouse gas emissions (water and wastewater)

Our long-term ambition is to achieve Net Zero by 2050. The supports the UK Net Zero Strategy and is in-line with the Ofwat Strategic Priorities. The Ofwat guidance has been clear on the approach we should be taking with regard to operational greenhouse gas emissions and linked to our customer priorities we will focus active GHG emissions reductions after AMP8. This is to allow the technologies to be further developed to a position that allows investment with clear quantification of benefits.

Table 9: Long term targets for operational carbon emissions

Unit: kt of CO2e	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	231	227	183	139	95
Performance from enhancement	-11	-3	46	96	146
Performance from base expenditure	220	224	229	235	241

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

The Ofwat definition of this PC does not allow us to show a Net Zero position by 2050 in the targets due to the measurement of UK grid electricity carbon emissions static by using the UK government fixed national grid emissions factor for 2022. The UK government target to de-carbonise the grid by 2035 is not included in this definition.

Our long-term focus will be to:

- Reduce process emissions
- Improve our self-generation capacity
- Use our biogas optimally

Further details on how we intend to achieve Net Zero by 2050 is detailed in our Net Zero technical annex.

7.5.8 Leakage

Our long-term ambition is to reduce leakage below the 50% target set by the UK government in UK government in Statement of Priorities to Ofwat. This PC is a high priority for our customers and we have ensured that we are adopting a multi-facetted approach to reducing leakage. This is an important part of our water resources strategy.

Table 10: Long term targets for leakage

Unit: Ml/d	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	68.4	63.9	58.7	53.7	48.4
Performance from enhancement	10.2	14.0	19.2	24.2	29.5
Performance from Base	78.6	77.9	77.9	77.9	77.9

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

Our WRM24P details our approach to reducing leakage through:

- Advanced find and fix
- Communication pipe replacement
- Advanced Pressure Management
- Smart Metering
- Digitalisation /Smart Networks and
- Mains Replacement

Detailed explanation of the measures to achieve this goal can be found in the dWRMP technical report.

7.5.9 Per capita consumption

Our long-term ambition is to reduce per capita consumption below the 110 l/h/d target set by the UK government in Statement of Priorities to Ofwat and is recommended in the National Framework.

This PC is a lower priority for our customers although they recognise it as a necessity, given the scarcity of water in our region. It is a vital component part of our water resources strategy and at PR19 we identified this as a key area and set ourselves a Target 100 commitment. The COVID-19 pandemic and home working increased per capita demand but despite the additional change, we will endeavour to achieve these targets.

Table 11: Long term targets for PCC

Unit: l/h/d	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	122.4	114.5	115.5	109.5	105.6
Performance from Enhancement	6.4	13.9	21.9	27.8	31.6
Performance form Base	128.9	128.4	137.4	137.3	137.2

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

Our dWRMP details our approach to reducing leakage through:

- Communication and marketing
- Deploying smart meters
- Innovative tariffs
- Water-saving solutions and
- Home audits

Detailed explanation of the measures to achieve this goal can be found in our dWRMP24 technical report.

7.5.10 Business demand

Our long-term ambition is to reduce business demand to 102.4Ml/d in line guidance set by the UK government in the Statement of Priorities to Ofwat. This PC is a lower priority for our customers although they recognise it as a necessity given the scarcity of water in our region. It is an important component of our water resources strategy combined with the improvement of per capita consumption.

Table 12: Long term targets for business demand

Unit: Ml/d	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	106.1	103.6	100.3	101.0	102.4
Performance from enhancement	3.8	7.4	11.6	11.6	11.6
Performance from base	109.9	111.0	111.9	112.6	114.0

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

Our WRMP24 details our approach to reducing business demand, in similar ways to PCC, through:

- Communication and marketing
- Deploying smart meters
- Innovative tariffs
- Water-saving solutions
- Business audits

Detailed explanation of the measures to achieve this goal can be found in the WRMP24 technical report.

7.5.11 Pollution Incidents

Our long-term ambition is to achieve the UK targets for pollution incidents ahead of time against that targets set in the Environment Act 2021. We agree with our customers that this is a high priority for the region. Reducing pollution incidents was a key part of our DWMP with a specific planning objective that focussed on pollution. We have adopted a target 0 by 2040 for pollution incidents, and will continue to target 0 serious pollution incidents from 2025.

Table 13: Long term targets for pollution incidents

Unit: number of incidents	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	63	50	0	0	0
Performance from enhancement	0	0	50	50	50
Performance from base expenditure	63	50	50	50	50

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

The DWMP highlighted a number of key areas in our region where we need to focus these are detailed in our BRAVA maps PO2 pollution 2020. We consider that we can maintain the current number of pollution incidents from base expenditure however to achieve the UK targets we will need to continue to invest in the following areas:

- Replace assets at risk of impacting performance, to reduce risks of asset breakdowns
- Enhance our customer education programmes to reduce blockages
- Extend our programme of proactive jetting to clear debris before blockages occur
- Increase the coverage of sewer level monitors in the system to provide early detection of sewer. blockages and enable active clearance prior to customer and environment impacts
- Invest in smart technology to monitor, in real time, the performance of the sewer network and identify blockages before pollution or flooding occurs
- Deliver an effective and timely emergency response to clear blockages and rectify equipment breakdowns

We also have strategic projects, focused on upgrading our asset maintenance, digitalisation of our networks and logistics, to improve resilience of our assets and systems to reduce pollution risk. For more detail on this refer to our DWMP.

7.5.12 Discharge permit compliance

Our long-term ambition is to ensure that we return wastewater safely to the environment and we are required to do this as part of The Urban Wastewater Treatment Regulations, 1994. Ensuring that we carry out this duty was a part of our DWMP with a specific planning objective that focussed on wastewater treatment works compliance. We have adopted a target of 100% by 2050 for discharge compliance.

Table 14: Long term targets for discharge permit compliance

Unit: % treatment works compliant	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	99.1%	99.1%	99.4%	99.7%	100%
Performance from enhancement	27.9%	27.9%	28.2%	28.5%	28.8%
Performance from base expenditure	71.2%	71.2%	71.2%	71.2%	71.2%

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

The DWMP highlighted a number of key areas in our region where we need to focus these are detailed in our BRAVA maps PO6 pollution 2020. We will focus on proactively managing our assets and systems and to comply with our permits to ensure our services and infrastructure do not lead to environmental harm.

We will need to invest in the future to continue to achieve the required levels for chemicals and population growth. For more detail on this refer to our DWMP.

7.5.13 Bathing water quality

Our long-term ambition is to ensure that we return wastewater safely to the environment and the Storm Overflow Discharge Reduction Plan sets out additional targets in the vicinity of bathing waters. In developing our DWMP we added a planning objective that focussed on improving bathing waters within our region. This was driven by our customers actively demanding that we improve the quality of the water our 84 bathing waters. We have adopted a target of 100% by 2040 for all our current bathing water sites.

Table 15: Long term targets for bathing water quality

	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	88.3%	89.5%	100%	100%	100.0%
Performance from enhancement	0%	0%	13.3%	13.3%	13.3%
Performance from base expenditure	88.3%	89.5%	86.7%	86.7%	86.7%

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

The DWMP highlighted key coastal areas where we need to focus our efforts to improve the bathing water quality PO13 bathing-water. To ensure that these waters meet the targets and we will:

- Reduce releases from storm overflows and minimise pollution incidents from our systems
- Continue with our bathing water enhancement programme, investing in sewer misconnections and other activities with partner local authorities, to deliver excellent classification of all 84 bathing waters across our operating area

We will need to invest in the future to continue to improve those sites that are most at risk. For more detail on this refer to our DWMP.

7.5.14 River water quality

Our long-term ambition is to ensure that we return wastewater safely to the environment and we are required to do this as part of The Urban Wastewater Treatment Regulations, 1994. In addition, we will achieve the target of 80% reduction by 2038 set by the Environment Act. Ensuring that we carry out this duty was a part of our DWMP with a specific planning objectives that focussed on nutrient neutrality and achieving good ecological status.

Table 16: Long term targets for river water quality

Unit: percentage	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	58.5%	66.5%	80%	80%	80%
Performance from enhancement	23.9%	31.9%	45.4%	45.4%	45.4%
Performance from base expenditure	34.6%	34.6%	34.6%	34.6%	34.6%

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

Phosphorus is directly linked to population growth and the DWMP predicted forecast population predictions would need addition P treatment capacity at a number of sites. For further details see the DWMP.

7.5.15 Storm overflows

Our ambition is to make a rapid reduction in the number of discharges from storm overflows ahead of time against the set out Defra's Storm Overflow Discharge Reduction Plan. We agree with our customers that this is a high priority for the region and reducing storm overflows was a key part of our DWMP with a specific planning objective. We have adopted a target of 5.9 (7.9 factoring in data availability) by 2050 for the average number of spills per overflow.

Table 17: Long term targets for storm overflows

Unit: average spills per overflow	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	18.5	13.9	9.8	7.0	5.9
Performance from enhancement	2.5	7.1	11.2	14	15.1
Performance from base expenditure	21	21	21	21	21

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2 and based on 100% data availability

The DWMP highlighted a number of key areas in our region where we need to focus these are detailed in our BRAVA maps8. We will focus on proactively managing our assets and systems and to reduce storm overflows against a backdrop of increased rainfall and storms due to climate change.

7.5.16 Mains repairs

Our long-term ambition is to ensure a reliable supply of high-quality water for the future and this goal is supported by our customers. Mains repairs are a key element in achieving the leakage reductions to achieve the challenges in our WRMP. We have set a target of 98.1 repairs per 1,000 km of mains in 2049/50 which will be a 36% reduction from our end of AMP8 position.

Table 18: Long term targets for mains repairs

Unit: Number per 1,000 km of mains	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	152.9	152.9	134.6	116.3	98.1
Performance from enhancement	5.2	16.3	28.8	41.9	54.7
Performance from base expenditure	158.1	169.2	163.4	158.2	152.8

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

Our WRMP details our approach to our network with regard to leakage management and a essential part of this is improving the assets. There are 2 main activities that will impact the number of mains repairs:

- Mains replacement
- Advanced pressure management

For more details on these activities in the longer term refer to our WRMP.

7.5.17 Unplanned outage

Our long-term ambition is to ensure a reliable supply of high-quality water for the future. Outage is one of the basics that customers expect us to manage in a planned and efficient manner. They also expect us to have a resilient operation that has capacity and a network that can react to unplanned outages. We have set a goal of reducing unplanned outage to 2% by 2050 This is aligned with our WRMP expectations to reduce overall outage to a level that supports our ability to deliver in a drought.

Table 19: Long term targets for unplanned outage

Unit: % of peak capacity	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	3.13	3.07	2.71	2.36	2.00
Performance from enhancement	0.18	0.24	0.60	0.95	1.31
Performance from base expenditure	3:31	3.31	3.31	3.31	3.31

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

Our analysis from historical data has shown that base allowances are insufficient to deliver improvements in unplanned outage leading to the major resilience works being under taken, as set out in our Supply Resilience Enhancement case (four main surface water works upgrading programme). This work will only address the issues at these 4 works and we will need to carry out similar enhancement activity at our other main works.

In the future, we expect climate change to also impact our resilience through heat stress and localised flooding from storm activity. This is being started through our operational resilience enhancements and we expect further work will need to be done over the future AMPs as the actual impact starts to manifest.

7.5.18 Sewer collapses

Our long-term ambition is to maintain our sewers in a similar condition to the current condition over the majority of our network. Our DWMP had a specific planning objective that focussed on sewer collapse. For this iteration of DWMP it was only able to assess the current condition and priority risk areas. It was not able to forecast the interventions needed out to 2050 under the different uncertainty areas expected in the Long-term Delivery Strategy. As such we have forecast a target that maintains our position from the end of AMP8.

Table 20: Long term targets for sewer collapses

Unit: number of sewer collapses	2029-30	2034-35	2039-40	2044-45	2049-50
Performance	230	230	230	230	230
Performance from enhancement	0	0	0	0	0
Performance from base expenditure	230	230	230	230	230

Performance = Performance from base – performance from enhancement
Note: These values can be found in data tables LS1 and LS2

The DWMP highlighted a number of key areas in our region where we need to focus. These are detailed in our BRAVA maps7. We consider that we can maintain the current condition of our sewers from base expenditure without the need for major enhancement investment. For more detail on this refer to our DWMP.

Further details on how these have been evaluated is in SRN18 Performance Commitment Methodologies.

7.6 Bill impacts for current and future customers

The impact of our planned core Water enhancement costs upon future bills can be seen in the chart below:

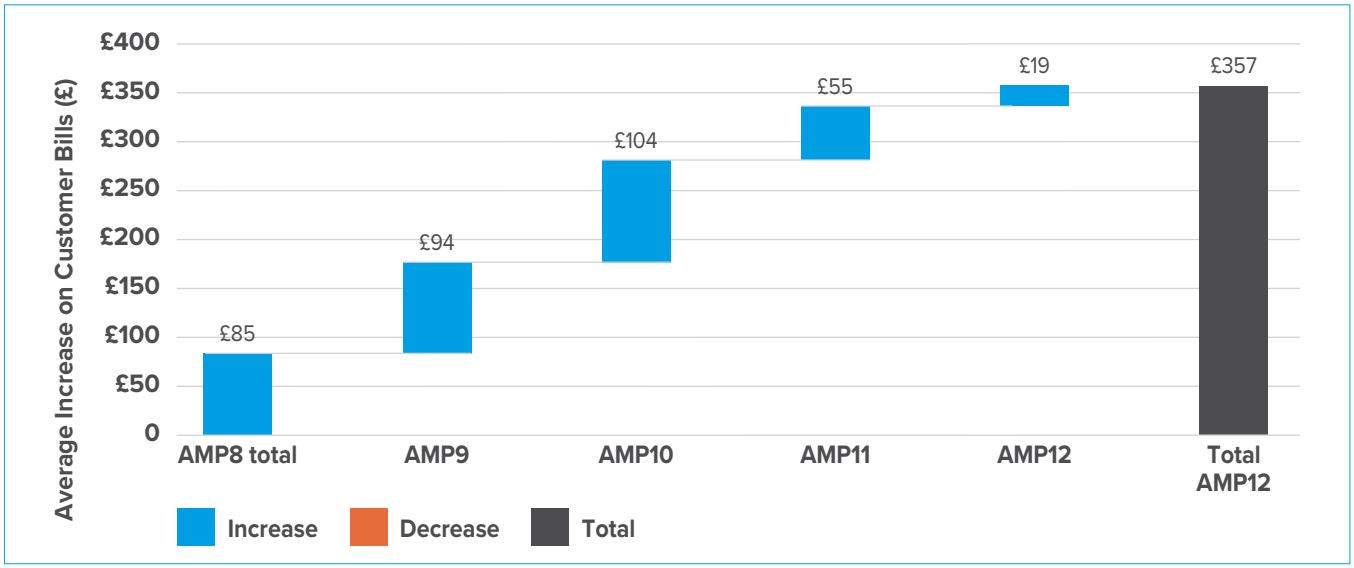


Figure 22: Water Enhancement Impact on Average Customer Bills to 2050 (22/23 prices)

The impact of our planned core Wastewater enhancement costs upon future bills can be seen in the chart below:

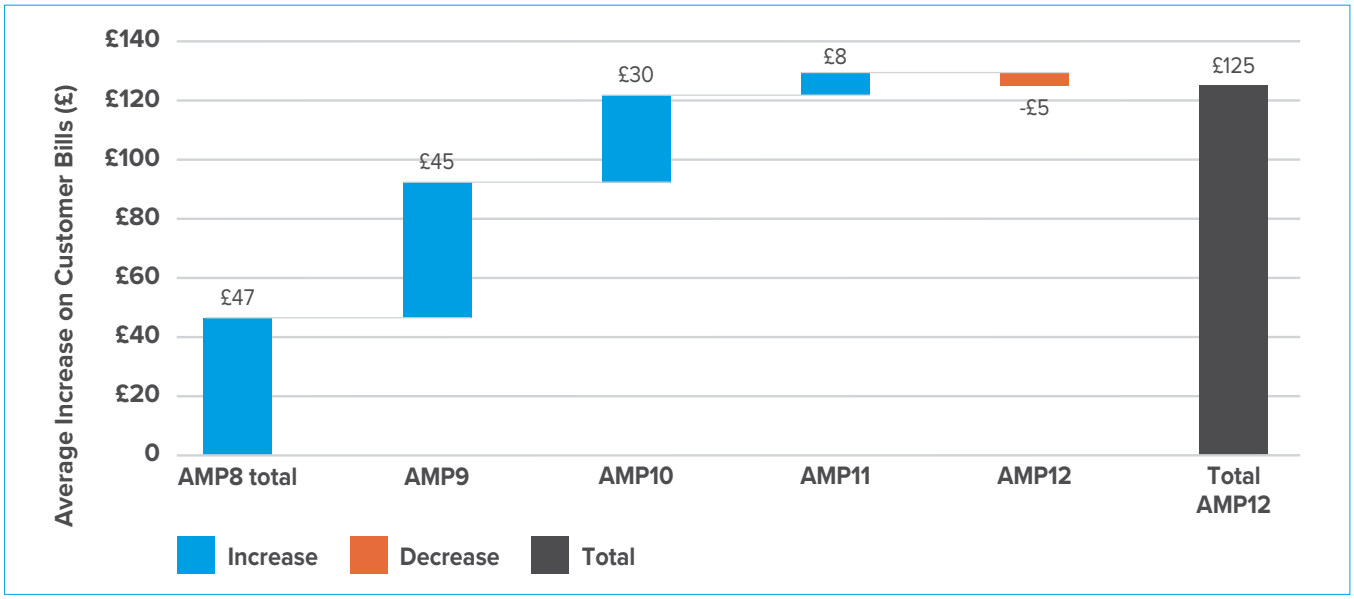


Figure 23: Wastewater Enhancement Impact on Average Customer Bills to 2050 (22/23 prices)

7.7 Environmental summary

The structure of our Long-term Delivery Strategy has been designed to reflect our primary strategic focus of continuing to maintain a reliable, high quality water supply to our customers and then to take the used wastewater away and dispose of it safely. However, within that focus we have tremendous opportunity to modify our traditional ways of working and adopt new methodologies that can mitigate the impact of our operations on our surrounding environment. In addition, we also have opportunities to potentially use our assets to make a positive improvement to our environment.

Protecting and improving the environment is one of our long-term priorities and in Section 1.1 the interlinkage between our long-term priorities and our strategic delivery themes was introduced to articulate how we intend to make our ambition happen

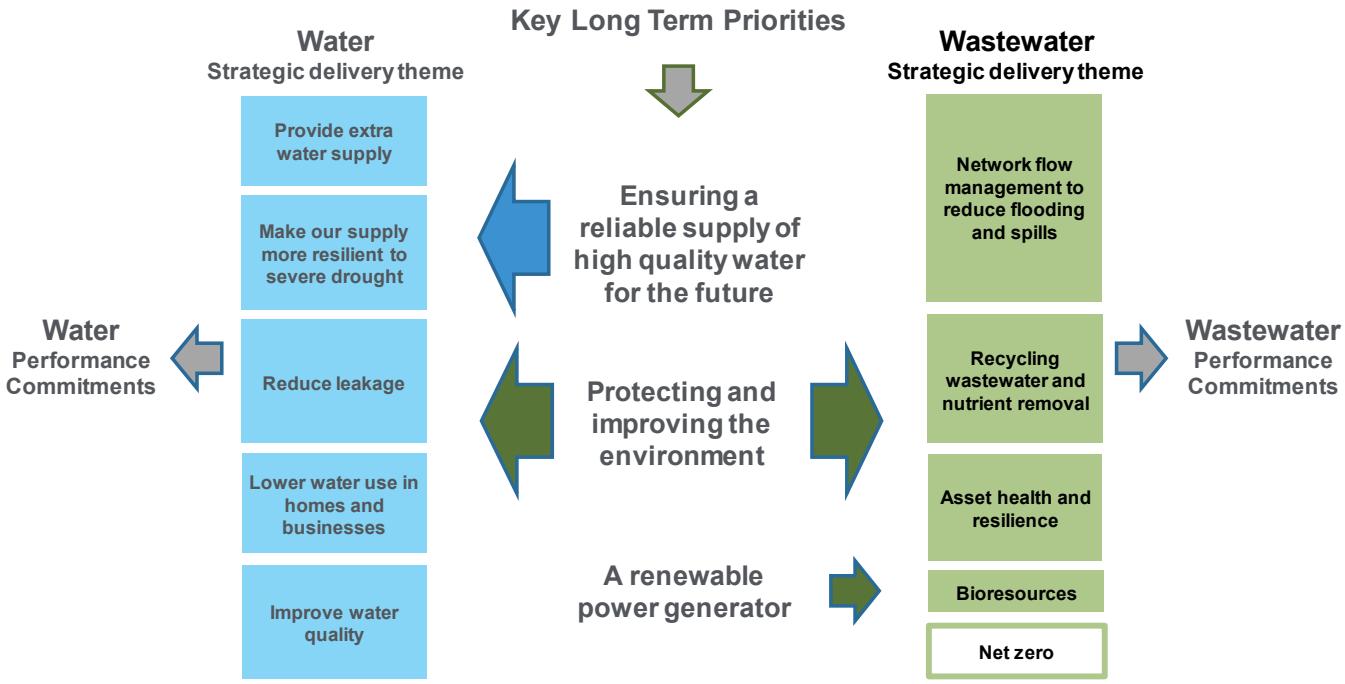


Figure 24: Strategic delivery of our Long-Term Priorities

As can be seen our long-term priority of protecting and improving the environment is at the heart of our plans. This section highlights those delivery activities that have specific relevance to our environmental ambition.

We have five strategic principles that we are utilising to help define options and long-term delivery plans:

1. **Partnership working.** The most cost-effective and sustainable solutions are where we collaborate and co-create across systems and in partnership
2. **Integrated catchment management.** The planning processes that underpin our Long-term Delivery Strategy are catchment based rather than point solutions. We are using our understanding of the whole catchment alongside nature-based options to deliver solutions for the ongoing supply of water and treatment of wastewater
3. **Low carbon and renewables.** Adopting and integrating procedures and technologies to reduce our carbon footprint
4. **Liveability.** Increasing awareness in decision-making that customers expect to use and enjoy blue and green spaces (such as coastal bathing waters and rivers for swimming) all year round
5. **Incorporating natural and social capital into decision-making.** Challenging established thinking to adopt pure financially driven "low cost" options and consider alternative solutions that have wider environmental net gain

From an environmental perspective, the key relevant enhancement activities that are planned mostly relate to our Wastewater operations. This reflects the importance given to the need for us to reduce the polluting aspects of our operations as a key strategic driver. However our environmental long-term priority also has significant strategic implications within our Water long-term plans.

Key environmental long-term enhancement activity within our delivery strategy includes:

1. **Net Zero.** We have a number of initiatives that when collectively considered form a business-wide carbon reduction programme. We anticipate gradual progress to be made on these initiatives over the 25-year

Long-term Delivery Strategy period as they are dependent upon a number of emerging and as of yet unproven technologies. These initiatives include:

- A phased transition to a low carbon fleet of cars, vans and larger vehicles [Ref: Section 16.3 Technology for further detail]
- Reducing nitrous oxide and methane production from water and wastewater treatment processes
- Building enhanced renewable energy production capability and capacity into our Bioresources operations

Bullets 2 and 3 above can be referenced within the main body of the Long-term Delivery Strategy under the **Recycling wastewater and nutrient removal** and **Bioresources** strategic delivery themes.

2. **Improving wild waters.** Significant investment is planned within our Long-term Delivery Strategy to curb the pollution from our activities and improve the wild waters of our environment. In addition significant investment is planned to support new, freshwater supply capacity if we are to improve wild waters in sensitive areas through the reduction of existing abstraction levels. Key relevant activities include:

   - Surface water separation, sustainable drainage system and storage tank build to mitigate the use of polluting storm overflows. Surface water separation and sustainable drainage system solutions are innovative and are, as of yet, not entirely proven in their application. In addition they are more expensive than the default solution option of increased storm tank capacity. This is an example of where we are applying our environmental principle of incorporating natural and social capital into decision making
   - New or enhanced wastewater treatment and pumping capability and enhanced asset maintenance programme
   - New alternate freshwater supply sources such as reservoirs, recycling, desalination plants, transfer pipeline build and tapping of new groundwater sources. A number of these projects are being conducted in partnership with other organisations e.g. Havant Thicket reservoir (Portsmouth Water) and the Thames to Southern strategic pipeline (Thames Water) demonstrating our environmental principle of partnership working to deliver effective solutions
   - Developing catchment partnerships with land users and environmental groups to improve water sources for the future particularly with regard to reducing groundwater nitrate levels

Bullets 1 and 2 above can be referenced within the main body of the Long-term Delivery Strategy under the Wastewater **Network flow management** and **Recycling wastewater and nutrient removal** strategic delivery themes.

Bullets 3 and 4 above can be referenced within the main body of the Long-term Delivery Strategy under the Water **Provide extra water supply** and **Make our supply more resilient to severe drought** strategic delivery themes.

3. **Improving blue and green spaces.** In addition to the enhancement activities relevant to improving wild waters our plans also include:

   - Monitoring Sites of Special Scientific Interest (SSSI)
   - Conducting SSSI and chalk river improvement schemes

Bullets 1 and 2 can be referenced within the main body of the Long-term Delivery Strategy under the **Recycling wastewater and nutrient removal** strategic theme.

4. **Increase biodiversity.** The 2021 Environment Act and 2023 DEFRA Environmental improvement plan have stipulated that new asset sites have to incorporate plans to improve the biodiversity of the site by 10%. In addition to incorporating this stipulation into our new asset designs we plan to conduct reviews into how we can potentially improve existing assets. Potential options include for example converting areas that were previously mowed into meadows to promote insect, butterfly and bird supporting habitats. Feasible solutions will then be implemented at our existing sites throughout the 25-year Long-term Delivery Strategy period.

5. **Reduce our consumption.** The population in the south-east of England is anticipated to grow by 11% - 22% between 2020 and 2050 (Source: Office of National Statistics and Local Authority Housing Plans). Meeting the needs of this anticipated population increase will be a challenge since river and groundwater sources within the south-east are approaching exhaustion. The challenge intensifies when we consider the need to reduce existing abstractions from sensitive local sources such as chalk streams and also our desire to improve our water supply drought resilience capability.

   New freshwater supply capability such as recycling and desalination plants are planned, but to sufficiently balance future freshwater demand against available supply requires a reduction in the overall per person consumption of water. To this end across the entire duration of the Long-term Delivery Strategy we will be implementing a demand management plan that will include e.g. smart metering, running public campaigns to encourage water efficiency and potentially introducing innovative tariffs, subject to customer acceptability.

   Reducing consumption can be referenced within the main body of the Long-term Delivery Strategy under the **Lower water use in homes and businesse**s strategic theme.

8. Adaptive pathways

8.1 How the enhancement programme may need to change to adapt to future changes in circumstances

Our adaptive pathways describe how our core pathway enhancement investment programme may change in response to future events. We have designed eight adaptive pathways, four relate exclusively to Wastewater, two relate exclusively to Water and, two pathways are applicable to both Wastewater and Water.

These pathways describe our strategic response to five variables namely:

- Regulation (with regard to the use of landbank as a disposal route for biosolids)
- Technology (concerning the use of water separation schemes)
- Demand
- Abstraction reduction
- Climate change

An adverse outcome within any of these variables may trigger a jump to an associated adaptive pathway.

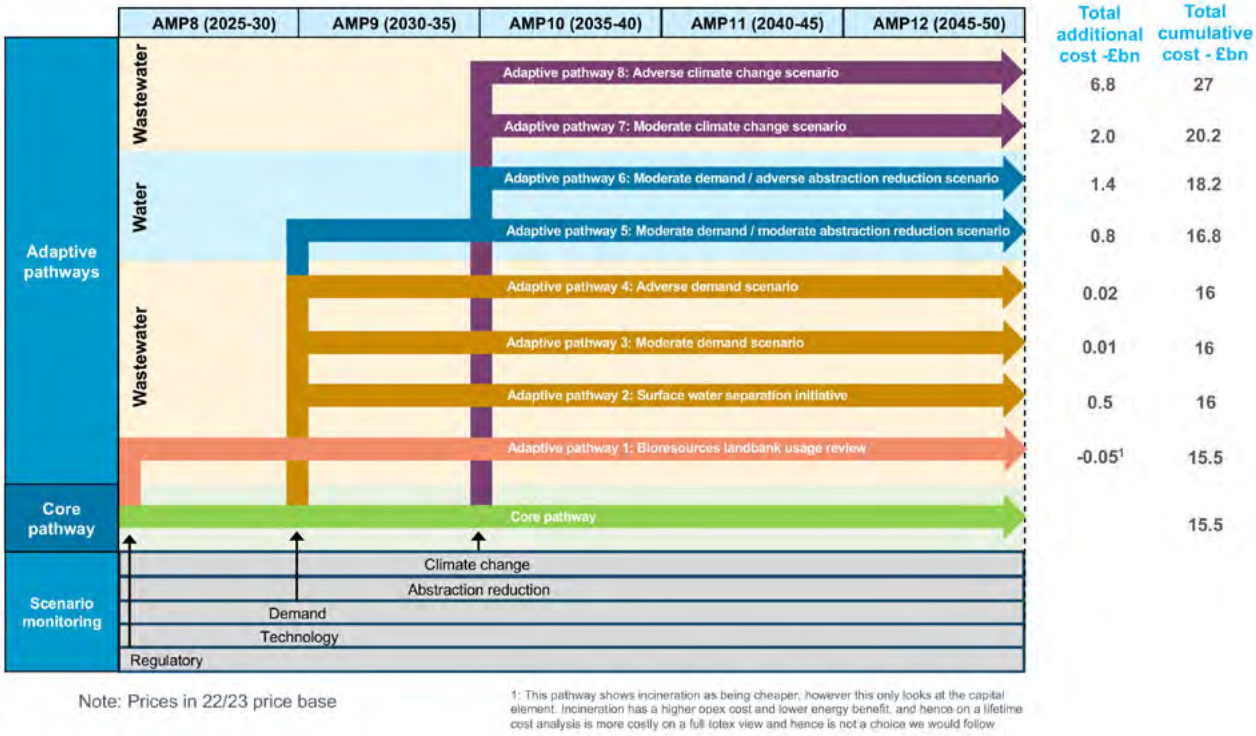


Figure 1: LTDS: Holistic adaptive pathway overview

Wastewater

There are six adaptive pathways that relate directly to Wastewater:

- Adaptive pathway 1: 2025 Bioresources landbank usage review. This pathway is directly applicable to the **Bioresources treatment and disposal** strategic theme
- Adaptive pathway 2: 2030 Surface water separation initiative. This pathway is directly applicable to the **Network flow management to reduce flooding and spills** strategic theme
- Adaptive pathway 3: 2030 Moderate demand increase scenario. This pathway is directly applicable to the **Treatment compliance and nutrient removal** strategic theme
- Adaptive pathway 4: 2030 Adverse demand increase scenario. This pathway is also directly applicable to the **Treatment compliance and nutrient removal** strategic theme
- Adaptive pathway 7: 2035 Moderate climate change scenario. This pathway is directly applicable to the **Network flow management to reduce flooding and spills** strategic theme
- Adaptive pathway 8: 2035 Adverse climate change scenario. This pathway is also applicable to the **Network flow management to reduce flooding and spills** strategic theme

Water

There are two pathways that relate directly to Water:

- Adaptive pathway 5: 2030 Moderate demand increase / low abstraction reduction scenario. This pathway is applicable to **all** Water strategic themes with the **exception** of **Improve water quality**
- Adaptive pathway 6: 2030 Moderate demand increase / high abstraction reduction scenario. This pathway is also applicable to all Water strategic themes with the **exception** of **Improve water quality**

Our WRMP has been developed in harmony with the WRSE and has adopted a flexible adaptive planning approach that encompasses nine adaptive pathways or "situations" that number from Situation One (highly adverse) to Situation Nine (highly benign). The Long-term Delivery Strategy has to present our strategy holistically across all our water and wastewater operations therefore it has not been pragmatic to adopt and apply the full Water nine pathway approach into the Long-term Delivery Strategy.

Three of the WRMP situations have therefore been applied and utilised for the Long-term Delivery Strategy to provide a high-level representation of the Water core pathway and the key adaptive path alternatives:

- Situation 6 of the WRMP (Moderate demand increase and low abstraction reduction scenario) maps to the core pathway of the LTDS
- Situation 5 of the WRMP (Moderate demand increase and moderate abstraction reduction scenario) maps to LTDS Adaptive pathway 5
- Situation 4 of the WRMP (Moderate demand increase and high abstraction reduction scenario) maps to LTDS Adaptive Pathway 6

The chart below illustrates the full range of water pathway options as presented within our WRMP

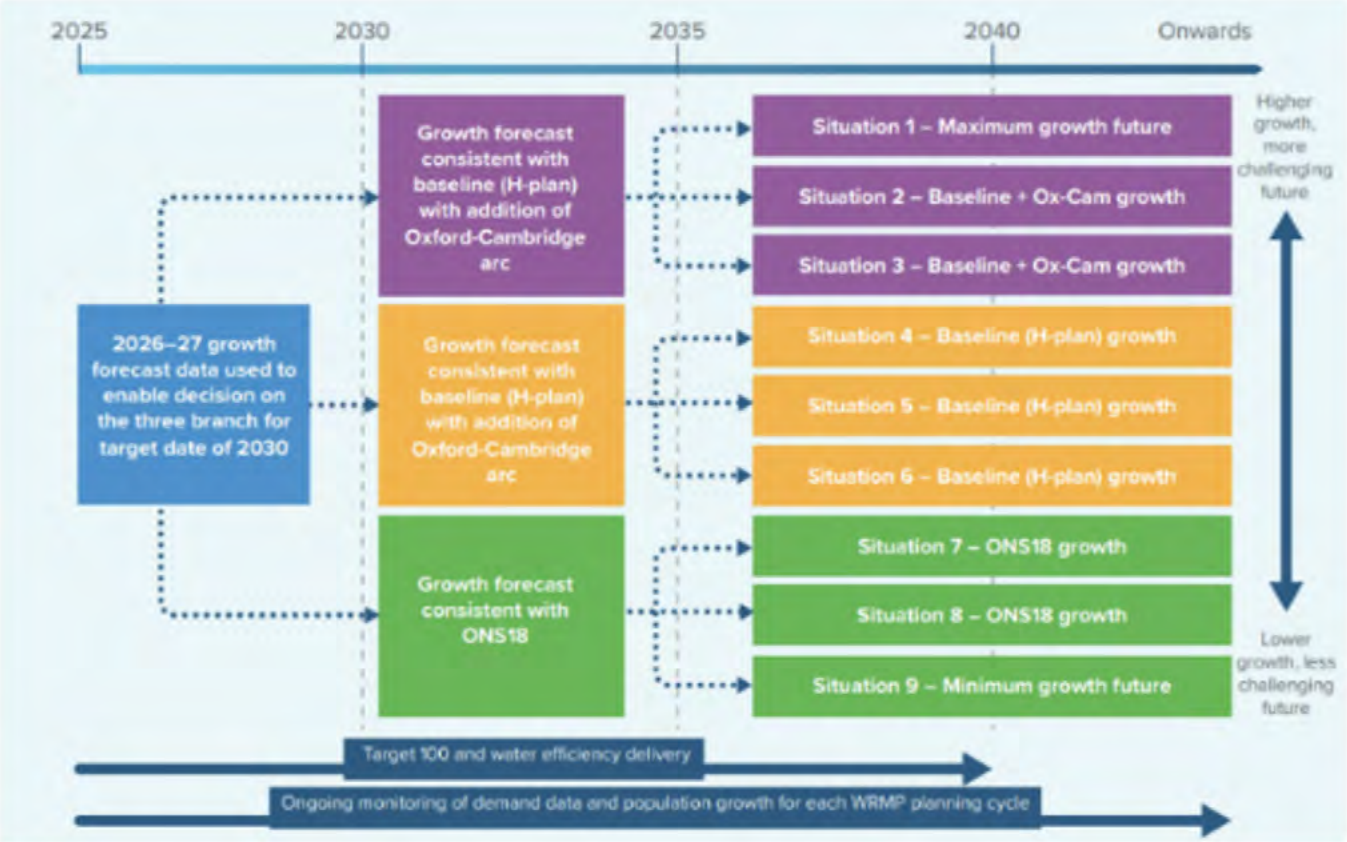


Figure 2: WRMP/WRSE Summary of adaptive plan metrics, monitoring and decision points

This means that every adaptive pathway option for Water has not been included within the Long-term Delivery Strategy. However the inclusion of three pathways (including core – Situation 6) instead of nine continues to allow a fair representation of the range of options available for Water within the wider business context.

It should be noted that the WRSE / WRMP situations vary according to three different common reference scenarios: demand growth, abstraction reduction and climate change. To aid clarity in the articulation of our Long-term Delivery Strategy, Water adaptive pathways 5 and 6 highlight the demand and abstraction reduction variables because they are anticipated to be of the greatest potential impact to our future supply / demand projections. Climate change is a considered factor in Water but has been de-emphasised in favour of the other two factors which have much greater impact.

Adaptive pathway activity above core

Each adaptive pathway detailed within the Long-term Delivery Strategy includes a set of enhancement activities that will be considered should an adverse outcome to any of the five modelled variables be realised.

The chart below summaries those key enhancement activities for each adaptive pathway:

Linkage to business area		Total additional cost £bn	Total cumulative cost £bn	Associated adaptive pathway activity (above core)
Wastewater (Network flow management)	Adaptive pathway 8	6.8	27	Increased and then significantly increased investment associated with additional wastewater storage tank and network flow capacity to absorb more frequent and more intense stormwater surges.
	Adaptive pathway 7	2.0	20.2	
Water (WRMP Situation 4)	Adaptive pathway 6	1.4	18.2	Further increased investment in water supply capacity, alternate sources and focus on demand management.
Water (WRMP Situation 5)	Adaptive pathway 5	0.8	16.8	Increased investment in water supply capacity, alternate sources and focus on demand management.
Wastewater (Recycling wastewater and nutrient removal)	Adaptive pathway 4	0.02	16	Further increased investment in wastewater treatment capacity.
	Adaptive pathway 3	0.01	16	Increased investment in wastewater treatment capacity.
Wastewater (Network flow management)	Adaptive pathway 2	0.5	16	Shift in focus from rainfall separation to additional storage options.
Bioresources	Adaptive pathway 1	-0.05[1]	15.5	Shift in focus to incineration as a primary disposal mechanism (cheaper than preferred "core" option).
	Core pathway		15.5	

Note: Prices in 22/23 price base

1: This pathway shows incineration as being cheaper, however this only looks at the capital element. Incineration has a higher opex cost and lower energy benefit, and hence on a lifetime cost analysis is more costly on a full totex view and hence is not a choice we would follow

Figure 3: LTDS: Additional adaptive pathway cost and activity above core

9. Adaptive pathway 1: Bioresources landbank usage review

Circumstances under which use of adaptive pathway may be appropriate to DEFRA and EA rules governing the use of Biosolids as a phosphate-based fertiliser for farming will be reviewed in the future with the next review in 2025. Our bioresources core pathway assumes that following this review the regulations surrounding farming-based disposal of wastewater biosolids will continue materially the same. However, the review could result in a completely adverse outcome in that a partial ban on farming as a disposal route is implemented. Should this adverse outcome be realised, a jump from the core to an adaptive pathway may be triggered.

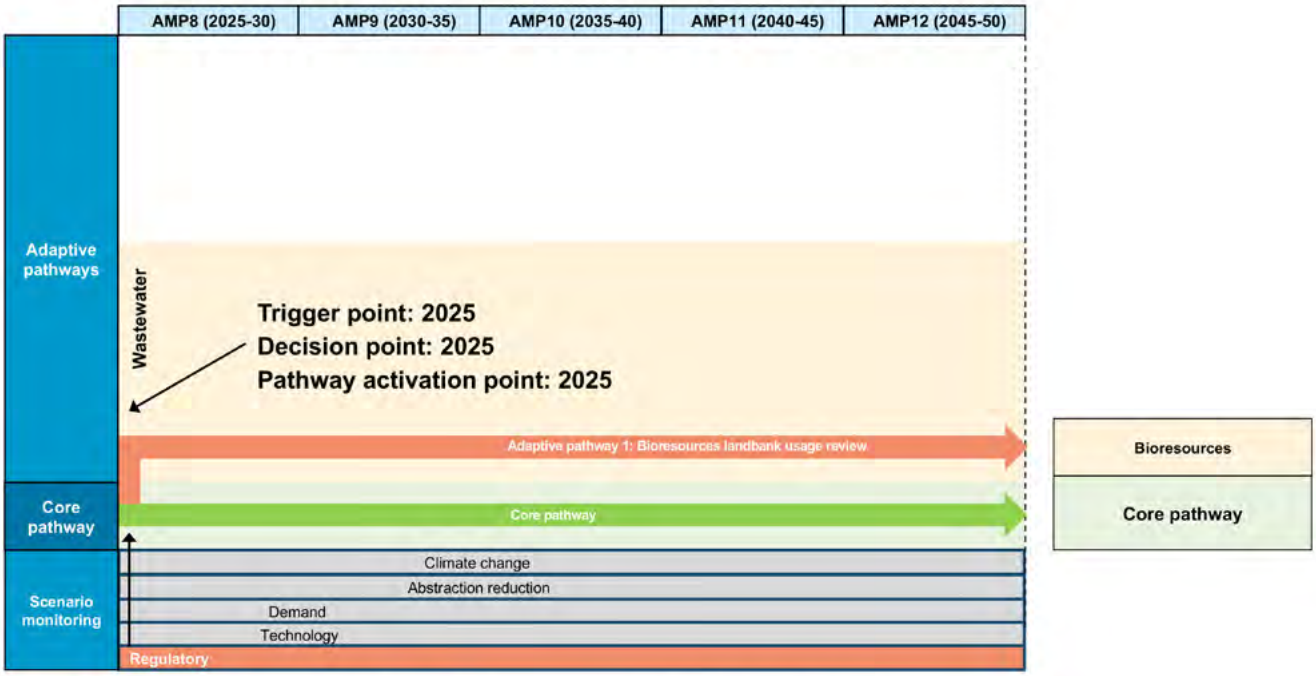


Figure 4: Wastewater: Adaptivity pathway 1 – Bioresources landbank usage review

9.1 Pathway timing, decision point and trigger point

Should the DEFRA and EA rules realise an adverse outcome then Adaptive pathway 1 deviates from the core pathway at this point.

The adaptive pathway trigger point is the timing of the review with the associated metric being the outcome of the review. The adaptive pathway decision point would follow immediately after.

9.2 Estimate of likelihood of utilising adaptive pathway

The outcome of the review cannot be anticipated at this time, making any likelihood estimate impossible.

9.3 How circumstances will be assessed and monitored

Relevant political and regulatory developments will be monitored in the lead up to the review and any opportunities to engage and provide factual feedback will be utilised. When the outcome of the review is published, the detail will be reviewed, assessed and any required actions taken accordingly.

9.4 Adaptive pathway narrative

The key result following an adverse outcome to the review will be an acceleration away from landbank usage and a shift in focus from constructing new advanced digestion sites to fast-tracking incineration as the primary mechanism for disposal. In addition, the proposed development of CHP technology would be reviewed in accordance with its place and usefulness alongside an incineration-focussed operation. Within the adaptive pathway, utilising biomethane optionality becomes unlikely.

In AMP8 investigations will continue as to whether advanced thermal conversion technology is still a viable alternative option, but the development emphasis would be reduced in comparison with the core pathway. Additional cake storage will also be considered to improve the resilience of the process.

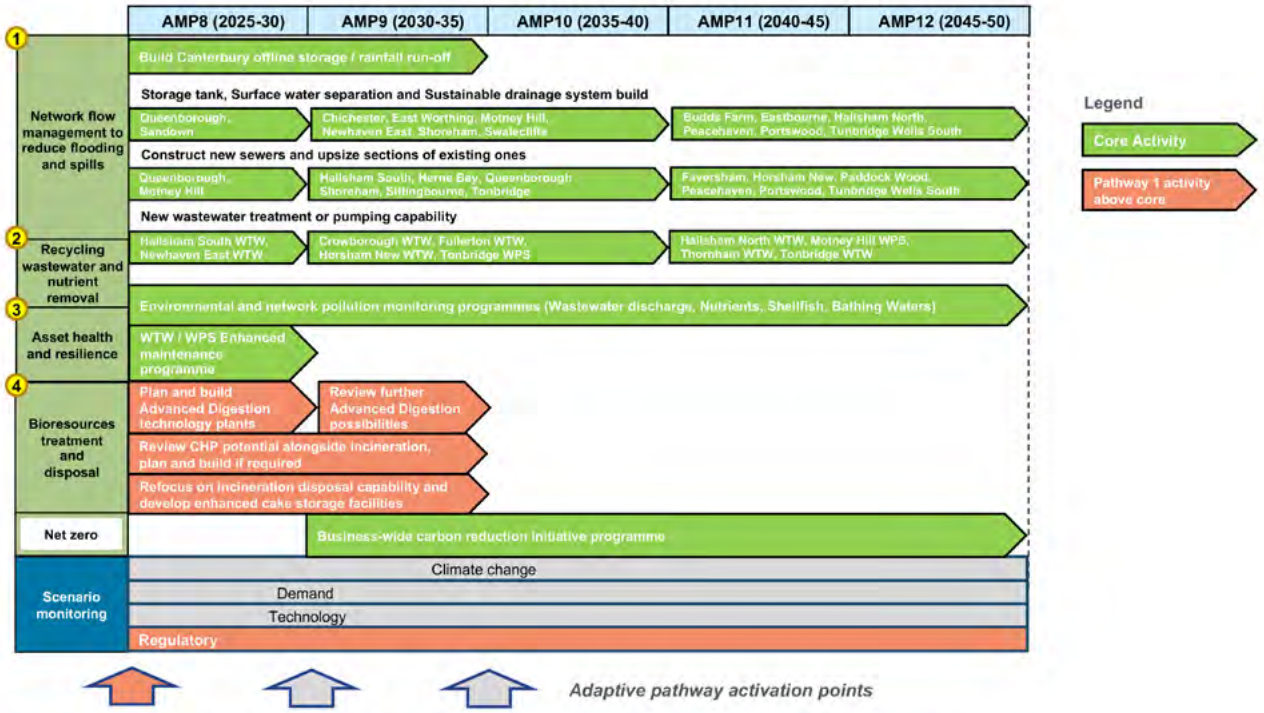


Figure 5: Wastewater: Adaptivity pathway 1 – Bioresources landbank usage review roadmap

9.5 Pathway investment profile and enhancement funding

Should Adaptive pathway 1 be activated the associated enhancement cost decease from the core pathway would be £49m across all AMPs.

Moving the strategic focus away from advanced digestion to incineration reduces enhancement costs by £49m. However, incineration has an anticipated higher OpEx cost than advanced digestion and is considered the less environmentally desirable option.

Enhancement cost (All AMPs) £m
-49

Note: Enhancement cost is below core pathway

Figure 6: Adaptive pathway 1: Additional enhancement cost to core (£m)

9.6 Bill impacts

The table below identifies the estimated impact of the enhancement spend from the pathway based on the PR24: Final guidance on Long-term Delivery Strategies bill calculation methodology.

£ (22/23 prices)	AMP8	AMP9	AMP10	AMP11	AMP12
Impact on average customer bills	47	94	123	127	123
Variance to core	0	3	2	-3	-2

Table 1: Adaptive pathway 1: Average customer bill impact from pathway enhancement

10. Adaptive pathway 2: Wastewater surface water separation initiative

10.1 Circumstance under which adaptive pathway may be appropriate

In AMP8, as part of the Core plan, the Pathfinder project is intended to investigate the feasibility of utilising innovative surface water separation techniques to reduce the volume of storm water entering the sewer network.

The core plan ambition is to achieve a 30% separation of storm flow. Should this prove unfeasible due to evidence from pathfinder projects, a jump from the core pathway to Adaptive pathway 2 will be triggered.

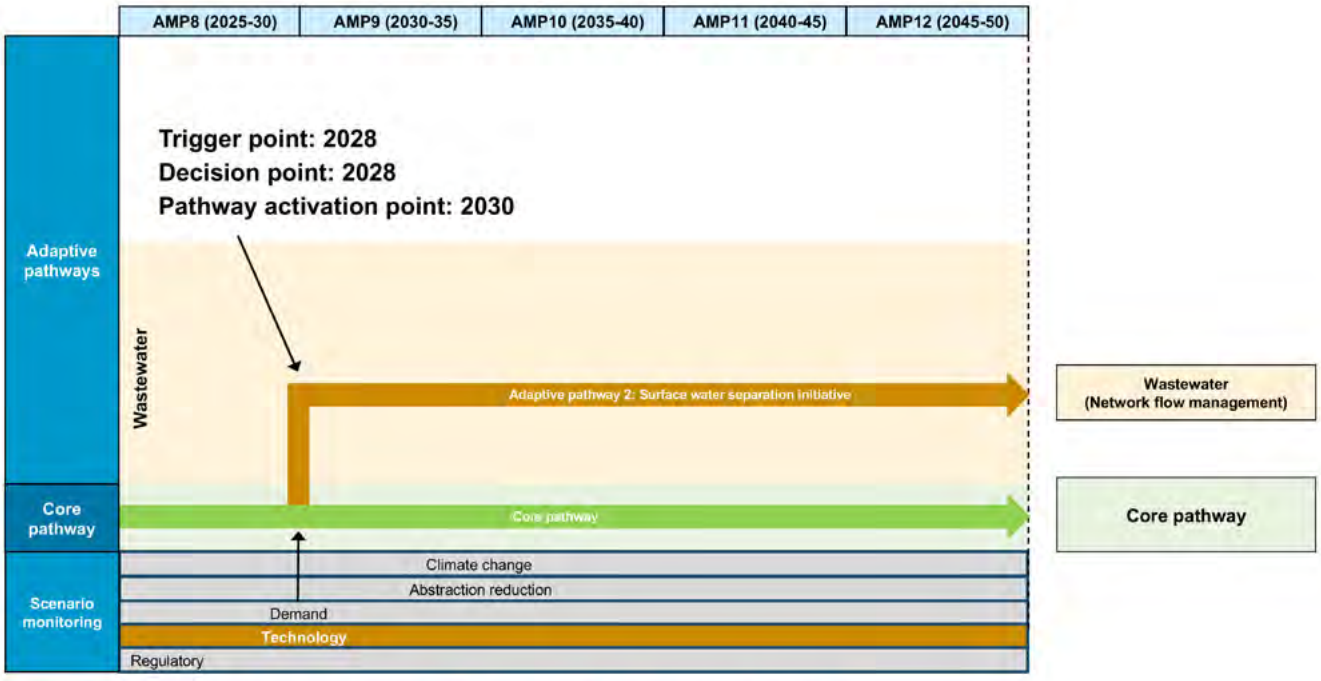


Figure 7: Wastewater: Adaptivity pathway 2 – Surface water separation initiative

10.2 Pathway timing, decision point and trigger point

As the Pathfinder project progresses, it is anticipated that the feasibility and effectiveness of the initiative will become apparent towards the end of AMP8. The project will be reviewed as part of the PR29 price review exercise and the trigger metric of 30% surface water separation will be assessed. A decision could be taken in 2028 as to whether to stay on the core pathway or jump to the Adaptive pathway. Should the decision be taken to jump to Adaptive pathway 2, the pathway will commence in 2030.

10.3 Estimate of likelihood of utilising adaptive pathway

The 30% surface water separation target is potentially conservative so the likelihood of the need for an adaptive pathway is considered low (but worth considering and planning for).

10.4 How circumstances will be assessed and monitored

Throughout AMP8, the development and implementation of surface water separation initiatives as part of Project Pathfinder will be assessed and monitored as to their effectiveness once they have been implemented. 2028 is considered ample time for sufficient projects to be implemented so as to assess the overall derived benefits and successfulness of the project.

10.5 Adaptive pathway narrative

If the adaptive pathway is triggered, it means that the preferred nature-based water separation solutions will not have proved as effective as hoped in reducing the level of storm rainfall from entering the sewer network. To achieve our ambition of reducing pollution from the discharge of effluent via storm overflows more conventional, traditional mechanisms will need to be relied upon to offset the flow deficit resulting from the under-performance of the surface water separation initiatives. This means increased enhancement funding for a programme of either new or increased capacity storage tanks, new or an increase in existing wastewater pumping capability, and the construction of new sewers or the upsizing of existing ones.

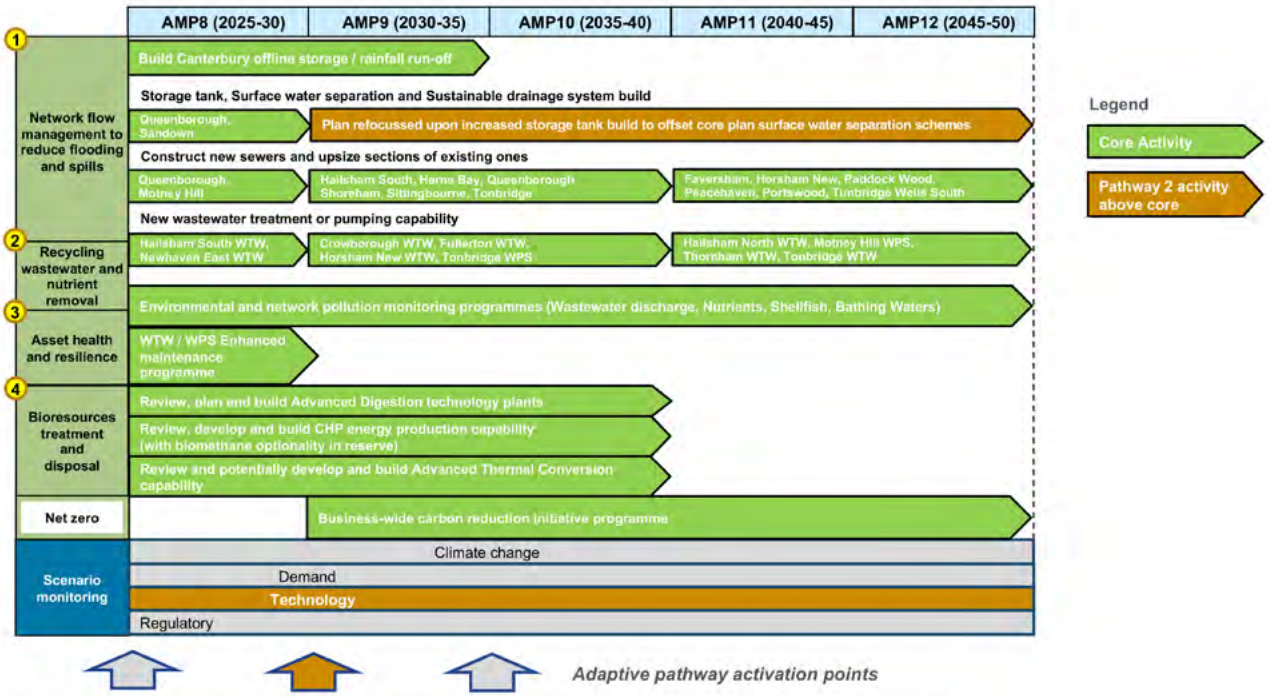
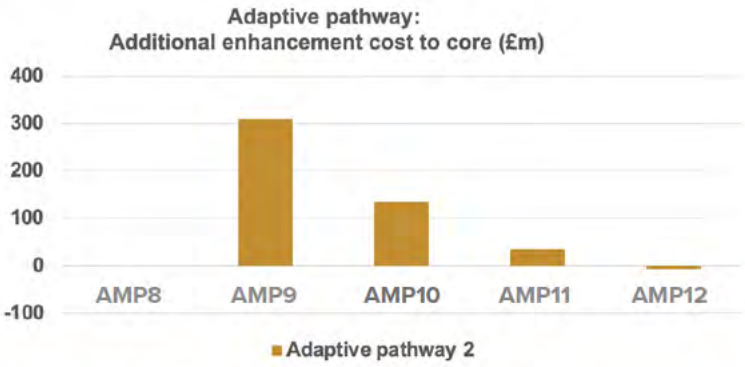


Figure 8: Wastewater: Adaptivity pathway 2 – Surface water separation initiative roadmap

10.6 Pathway investment profile and enhancement funding

Should Adaptive pathway 2 be activated the associated enhancement cost increase from the core pathway would be £472m across all AMPs.



Enhancement cost (All AMPs) £m
472

Note: Enhancement cost is above core pathway

Figure 9: Adaptive pathway: Additional enhancement cost to core (£m)

10.7 Bill impacts

The table below identifies the estimated impact of the enhancement spend from the pathway based on the PR24: Final guidance on Long-term Delivery Strategies bill calculation methodology.

£ (22/23 prices)	AMP8	AMP9	AMP10	AMP11	AMP12
Impact on average customer bills	47	99	133	142	134
Variance to core	0	7	12	12	9

Variance is pathway bill impact less core bill impact

Note: These values can be found in data tables LS7

Table 2: Adaptive pathway 2: Average customer bill impact from pathway enhancement

11. Adaptive pathways 3 and 4: Wastewater moderate and adverse demand increases

11.1 Circumstance under which adaptive pathways may be appropriate

Scenario testing has shown that the **Recycling wastewater and nutrient removal** strategic delivery theme is sensitive to variations in demand. The key impact of future demand variation is upon the level of increased wastewater treatment capacity we build into our plan.

Water demand growth modelling has utilised two key variables to analyse future uncertainty, household population growth and consumption. Population levels across the south-east are anticipated to grow over the 25-year Long-term Delivery Strategy period which if realised will result in an increase in solid matter entering the sewer network. At the same time, household and business water consumption is anticipated to decrease, which if realised will decrease the associated fluidal component of the dry weather wastewater flow.

The need for future Wastewater treatment capacity will therefore be primarily driven by the increase in solid matter related to the anticipated population growth. The fluidal consistency of the dry weather wastewater flow is considered less important however this will need to be monitored to ensure the accuracy of this assumption.

The core plan ambition is to pursue a low/no regret pathway which reduces pollution risk within a benign population growth environment. Should actual population growth be realised above the modelled benign level to a "moderate" level of growth, then a jump from the core pathway to Adaptive pathway 3 will be triggered. Should actual population growth be realised above the modelled benign level to an "adverse" level of growth, then a jump from the core pathway to Adaptive pathway 4 will be triggered.

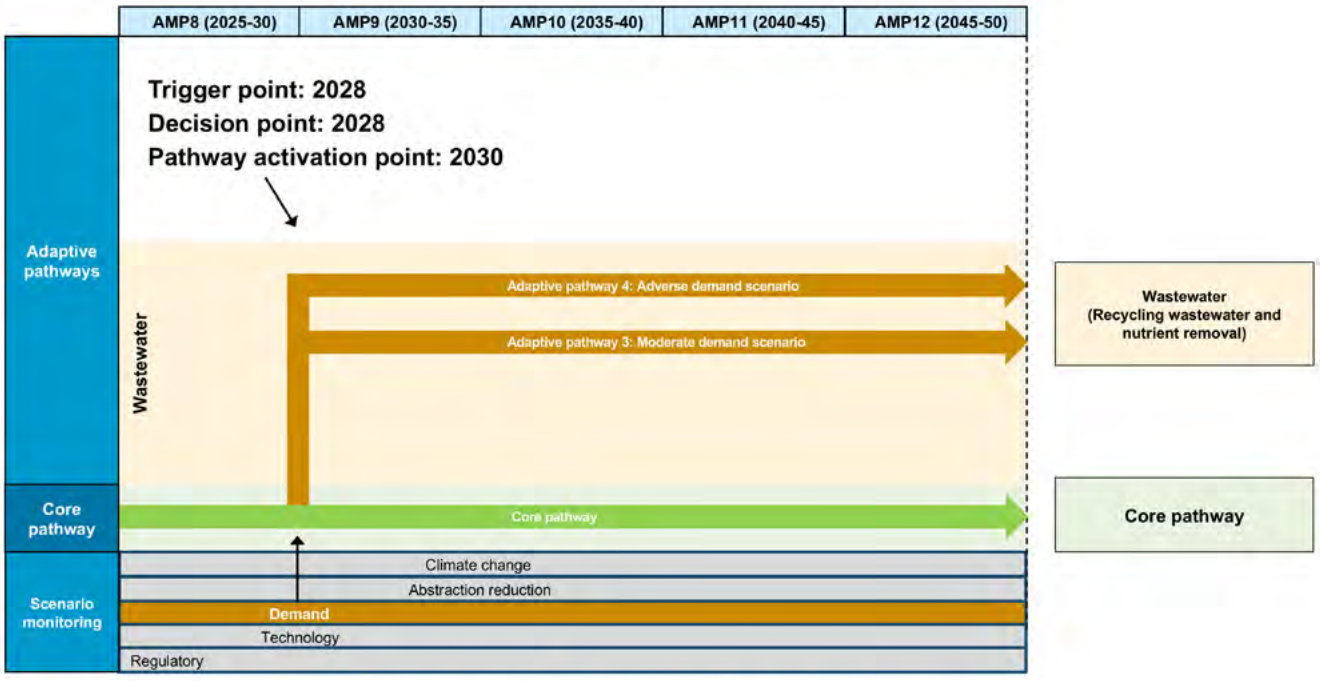


Figure 10: Wastewater: Adaptivity pathway 3 and 4 – Moderate and adverse demand scenarios

11.2 Pathway timing, decision point and trigger point

Scenario testing has resulted in the core pathway being positioned potentially slightly too adverse when considered in accordance with the consolidated demand (two variable test), yet slightly too benign when considered in accordance with the population growth test. It is therefore desirable to set a trigger point date sooner rather than later to address the risk of core pathway over or under investment.

AMP8 enhancement plans are focussed on infrastructure upgrades to ensure environmental permit compliance. As this task is completed towards the end of the AMP a natural decision and trigger point timing emerges for the consideration of actual consolidated demand developments.

At 2028 the population growth scenario test predicts the core pathway PE (Population Equivalent) level to be **5.43m**. Population Equivalent statistics scale up residential based population numbers to take into account commercial activity. The moderate scenario test figure which equates to the Wastewater moderate demand increase pathway has been modelled to be **5.46m**. The adverse scenario test figure which equates to the Wastewater adverse demand increase pathway has been modelled to be **5.49m**.

Actual population growth, consumption rates and dry weather flow rates will be reviewed together as part of the PR29 price review exercise. A decision will consequently be taken in 2028 as to whether to stay on the core pathway or jump to the moderate or adverse adaptive pathways. The primary driver of this decision will be the trigger metrics of **5.46m and 5.49m** respectively. Should the decision be taken to jump to Adaptive pathways 3 or 4, the pathways will commence in 2030.

11.3 Estimate of likelihood of utilising adaptive pathways

Current opinion is that actual demand growth increase will result between the benign and moderate scenarios, making the moderate demand pathway jump a significant possibility with the adverse pathway jump less so.

11.4 How circumstances will be assessed and monitored

Throughout AMP8 actual population growth, consumption and dry weather flow data will be monitored. This will provide supporting data to, and inform, the full review in 2028 of the adequacy of the core pathway against emerging actual demand growth and the potential for a jump to an adaptive pathway.

11.5 Adaptive pathway narrative

If either the moderate or adverse demand Wastewater pathways are triggered it will mean that additional enhancement spend will be allocated to increased wastewater treatment or pumping capability. Facilities designated for enhancement will be prioritised and chosen in accordance with the risk-based methodology utilised by the Wastewater team in accordance with DWMP operational processes.

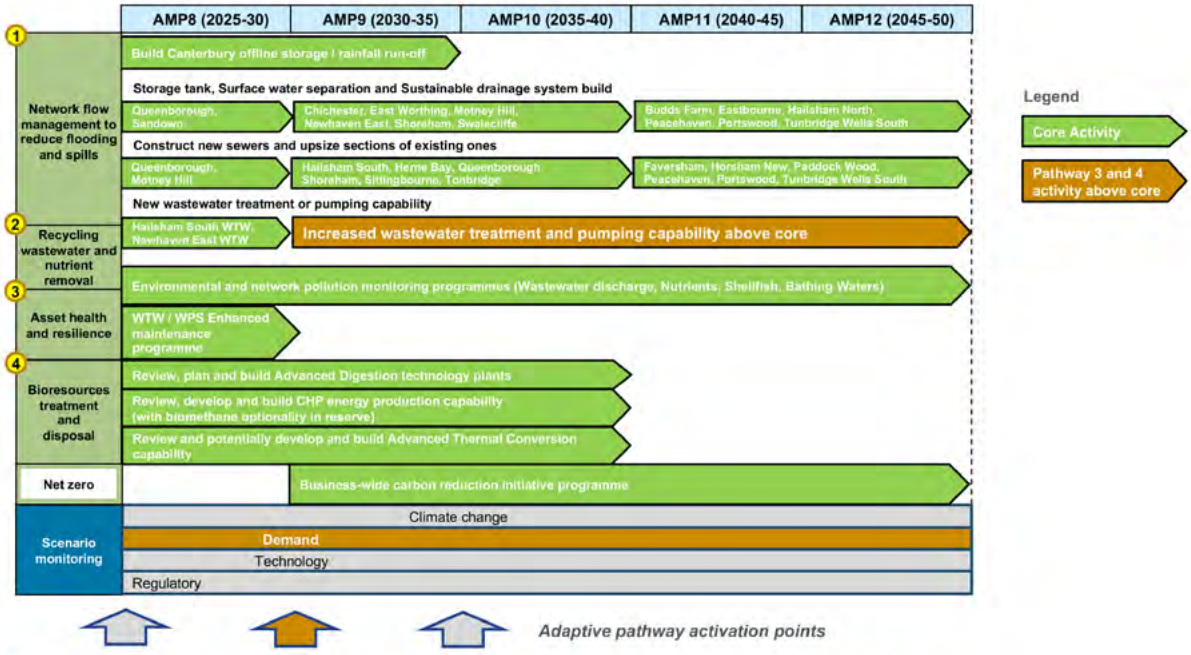
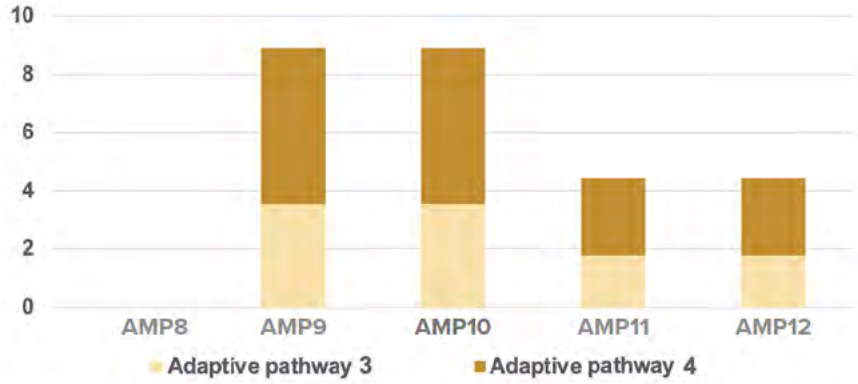


Figure 11: Wastewater: Adaptivity pathway 3 and 4 – Moderate and adverse demand roadmap

11.6 Pathway investment profile and enhancement funding

The Wastewater core pathway is sensitive to increases in demand however the cost impact is much less dramatic than the potential impact of adverse climate change scenarios.



	Enhancement cost (All AMPs) £m
Adaptive pathway 4 (Adverse)	16
Adaptive pathway 3 (Moderate)	11

Note: Enhancement cost is above core pathway

Figure 12: Adaptive pathways 3 and 4: Additional enhancement cost to core (£m)

The Wastewater moderate demand scenario pathway (Adaptive pathway 3) has a planned increase in enhancement expenditure of £11m. The associated adverse demand scenario pathway (Adaptive pathway 4) has a further enhancement expenditure increase of £16m.

11.7 Bill impacts

The table below identifies the estimated impact of the enhancement spend from the pathway based on the PR24: Final guidance on Long-term Delivery Strategies bill calculation methodology.

£ (22/23 prices)	AMP8	AMP9	AMP10	AMP11	AMP12
Adaptive pathway 3					
Impact on average customer bills	47	91	119	126	120
Variance to core	0	-1	-2	-4	-5
Adaptive pathway 4					
Impact on average customer bills	47	91	117	123	115
Variance to core	0	-1	-4	-7	-9

Variance is pathway bill impact less core bill impact

Note 1: These values can be found in data tables LS7

Note 2: Variance is negative as the scenario has more customers

Table 3: Adaptive pathways 3 and 4: AAverage customer bill impact from pathway enhancement

12. Adaptive pathways 5 and 6: Water moderate demand / medium and high abstraction reduction scenarios

12.1 Circumstance under which adaptive pathways may be appropriate

Population growth and potentially severe abstraction reductions are the key variables that will impact the provision of fresh water to our customers over the 25-year Long-term Delivery Strategy period. Scenario modelling has been utilised to anticipate future water demand and the Environment Agency has guided future expectations regarding regulatory abstraction reductions. Scenario testing has also been utilised to anticipate the impact of climate change on future freshwater supply. Climate change impact on future supply / demand balance projections are notable but are of lesser concern than the two primary uncertainties, demand growth and abstraction reduction.

Water demand growth modelling has utilised two key variables to analyse future uncertainty, Household population growth and consumption. Population levels across the south-east are anticipated to grow over the 25-year Long-term Delivery Strategy period whereas consumption is anticipated to decrease. A key unknown is the extent to which actual reduction in per person fresh-water consumption (when considering both residential and commercial equivalent use) can offset the actual realised demand increase from population growth.

Significant uncertainty currently surrounds both the quantity and location of potential future abstraction licence changes. We are currently investigating the sustainability of our sensitive source water abstractions through our WINEP programme and expect to conclude these investigations in 2027. This will allow us to work with the Environment Agency, Natural England and other stakeholders to make robust, evidence-based decisions concerning the specifics of future abstraction reductions.

Rising global temperatures have the potential to impact our water supply operations in three ways:

- Decrease in summer rainfall. We anticipate more prolonged periods of drought conditions during the summer due to reduced rainfall.
- Increase in winter rainfall. Low rainfall during the summer is anticipated to be offset by increased rainfall during the winter. Although this has the potential to adequately refill reservoirs and groundwater sources depleted from the summer months it introduces the need to build greater resilience into the system.

These drivers have helped shape our second water strategic theme: **Make our supply more resilient to severe drought**.

- Sea level rise. Our region has a long coastline with major population centres lying along the coast. Several of our borehole sources are relatively close to the shoreline and in conditions of extreme drought have the potential to become vulnerable to saltwater contamination.

The Long-term Delivery Strategy has three pathways that specifically relate to Water:

- LTDS Water core (which equates to our WRMP / WRSE Situation 6)
- LTDS Adaptive pathway 5 (which equates to our WRMP / WRSE Situation 5)
- LTDS Adaptive pathway 6 (which equates to our WRMP / WRSE Situation 4)

The three specific WRMP / WRSE situations were chosen for the Long-term Delivery Strategy as firstly, Situation 6 most closely represents our core strategy as stipulated in the Ofwat guidance [Ref: PR24 and beyond: Final guidance on Long-term Delivery Strategies]. Secondly, Situation 4 is considered within our WRMP as the “Most likely” future scenario and thirdly, Situation 5 was recommended as a key scenario by the WRSE. The three situations when considered collectively provide a reasonable range of pathways to represent our WRMP within our Long-term Delivery Strategy.

The positioning of the three situations utilised for our Long-term Delivery Strategy within the WRMP pathway structure can be ascertained in the table below:

	Applied scenario					
		Demand				
	WRMP Situation	2050 Population growth	2050 Consumption reduction	2050 Climate change	2050 Abstraction reduction	2050 Situation Total Supply / Demand deficit (Ml/d)	AMP 8-12 Total enhancement cost (£m)
	1	Housing plan + Ox-cam Max from 2035 (22% population increase)	Consumption decrease to 110 l/p/d	High	High	-537	8,657.7
LTDS Adaptive Pathway Six	4	Housing plan (16.9% population increase)	Consumption decrease to 110 l/p/d	High	High	-517	8,409.9
	2	Housing plan + Ox-cam (17.6% population increase)	Consumption decrease to 110 l/p/d	Medium	Medium	-478	7,255.6
LTDS Adaptive pathway Five	5	Housing plan (16.9% population increase)	Consumption decrease to 110 l/p/d	Medium	Medium	-475	7,139.8
	7	ONS 18 (5.1% population increase)	Consumption decrease to 110 l/p/d	High	High	-473	7,457.8
	8	ONS 18 (5.1% population increase)	Consumption decrease to 110 l/p/d	Medium	Medium	-432	6,917.6
	3	Housing plan + Ox-cam (17.6% population increase)	Consumption decrease to 110 l/p/d	Low	Low	-388	6,613.8
Core pathway	6	Housing plan (16.9% population increase)	Consumption decrease to 110 l/p/d	Low	Low	-385	6,443.3
	9	ONS 18 (5.1% population increase)	Consumption decrease to 110 l/p/d	Low	Low	-342	6,180.9

Increasing Supply / Demand deficit

Figure 13: LTDS Pathway representation of WRSE / WRMP situations

The Long-term Delivery Strategy Water core and both adaptive pathways are all based upon a population growth assumption of 16.9% and an assumption of decreased consumption from the current level of 127 l/p/d to below 110 l/p/d by 2050.

LTDS Adaptive pathway 5 builds in the consideration of a harsher “medium” level scenario abstraction reduction environment to that of the core pathway. In addition it builds in a harsher “medium” level climate change scenario to that of the core pathway. Should these circumstances be realised then the enhancement spend associated with Pathway 5 will be activated in AMP10.

LTDS Adaptive pathway 6 builds in the consideration of an adverse abstraction reduction scenario above that of Adaptive pathway 5 and the core pathway. In addition, LTDS Adaptive pathway 6 builds in an adverse climate change scenario above that of Adaptive pathway 5 and the core pathway. Should these circumstances be realised then the enhancement spend associated with Pathway 6 will be activated in AMP10.

12.2 Pathway timing, decision points and trigger points

The lead time in developing new freshwater supply capacity (e.g. in building a new reservoir or water recycling plant) is significant. Therefore the timing of adaptive pathway decision and trigger points has to take this into consideration as well as being reflective of when adequate data for trigger point metrics is likely to become available.

The Long-term Delivery Strategy reflects the **high-level strategic** adaptive pathway approach utilised for our WRMP which builds in two sets of decision and trigger points or "gateways" to authorise strategic enhancement activity over the core pathway that could be required to address the need for significantly higher new freshwater supply. The initial decision and trigger points rest in **2028** whereby demand will be reviewed to assess how actual consumption is developing in accordance with the various scenarios adopted as per the WRMP scenario testing. The trigger and decision point has been purposely chosen to integrate with the PR29 price review. Confirmation that actual demand is rising in accordance with anticipated projected increases as per the scenario testing will provide clarity as to the importance of crucial planning work to be conducted in AMP9 for future major water supply investment projects scheduled for AMP10 and beyond.

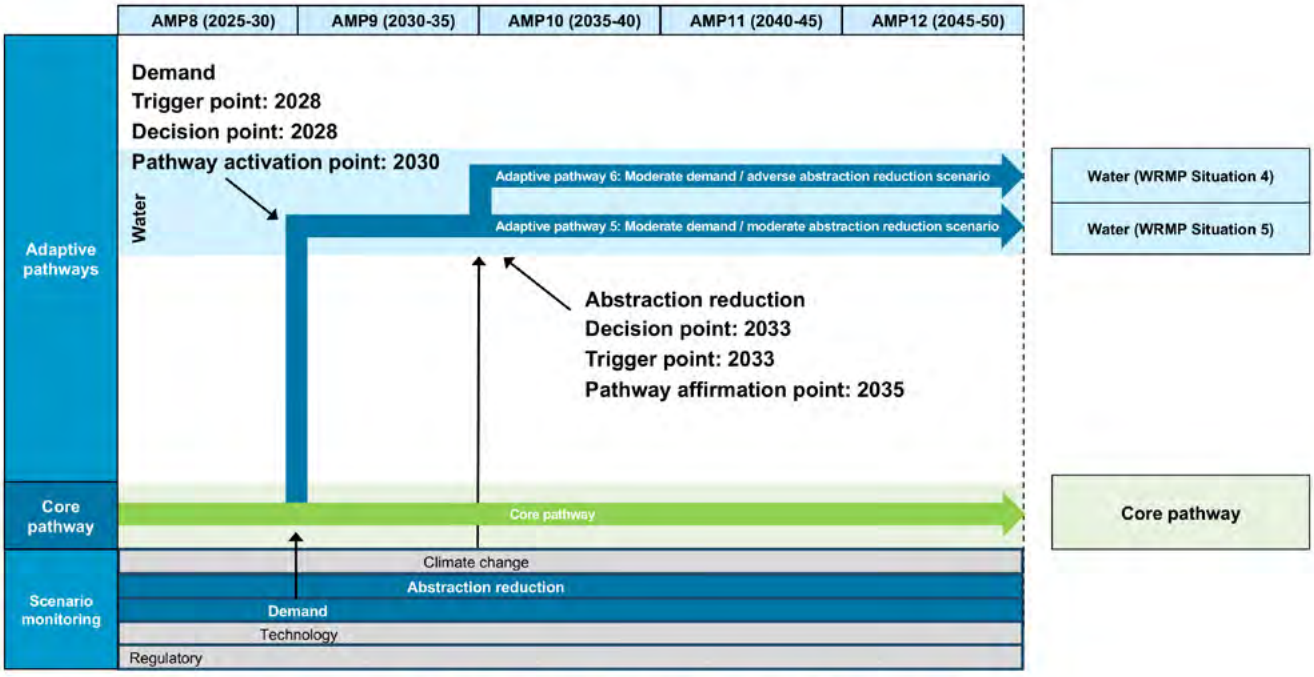


Figure 14: Water: Adaptive pathways 5 and 6 – Moderate demand / moderate and adverse abstraction reduction scenarios

A second gateway has been identified in **2033** with decision and trigger points scheduled at this time. In 2033, actual developments in abstraction regulations and climate change will be reviewed and assessed in accordance with the various scenarios. Depending upon the severity of the realised circumstances then significant construction spend associated with LTDS Adaptive pathways 5 or 6 in AMPs 10, 11 and 12 may be authorised. The two-stage gateway approach ensures that strategic decisions relating to significant new capacity costs are taken close to when they are needed and when there is greater certainty surrounding the size of the need.

The WRMP / WRSE pathways selected for Long-term Delivery Strategy purposes all utilise the same demand increase scenario and so the first gateway is not completely relevant if considered simply from a Long-term Delivery Strategy perspective. However, from a WRMP perspective the demand increase review at the end of AMP8 is significant because of the wider number of pathways and associated demand scenarios that have been modelled. The review will help clarify our planning parameters and provide insight as to the level of importance we need to give to the crucial planning work scheduled in AMP9 which will underpin any major adaptive pathway investment projects that become necessary in AMP10 and beyond.

Ultimately it may prove to be the case that in 2033 actual supply/demand conditions at this time differ to a wider or lesser extent from the conditions laid out in Adaptive pathways 5 and 6 of our Long-term Delivery Strategy. Depending upon the circumstances of the time there is always the potential to fine-tune our strategic decisions. This may involve tailoring our adaptive pathway enhancement plans to more adeptly suit particular conditions or issues that have evolved. Hence decisions in 2033 could result in the Water enhancement portfolio potentially being more akin to one of the six alternative possibility pathways or "situations" presented within our WRMP (and more widely across the region with the WRSE).

12.3 Estimate of likelihood of utilising adaptive pathways

The Long-term Delivery Strategy Adaptive pathway 6 (which equates to Situation 4 of the WRMP) is considered within the WRMP as the most likely outcome of the future demand, abstraction reduction and climate change scenarios. Firstly, this anticipates actual demand increase to be in the vicinity of the moderate population growth scenario, which would have the impact of increasing freshwater demand by **446 Ml/d**. Secondly, this anticipates actual abstraction reduction requirements to be in the vicinity of the high abstraction reduction scenario which would have the impact of decreasing the amount of freshwater we can abstract by **247 Ml/d**. Thirdly, this anticipates actual climate change impact to be in the vicinity of the high climate change scenario which would have the impact of decreasing the availability of supply by **55 Ml/d**.

12.4 How circumstances will be assessed and monitored

So far, the adaptive planning approach presented within our WRMP and adopted within our Long-term Delivery Strategy has been described on a *high-level strategic* basis. However, the high-level strategic trigger and decision points do not map well to the planning, development and construction lead times required for individual schemes / projects. The WRMP therefore utilises bespoke scheme-level decision point and **supply / demand trigger thresholds** which allow a clear determination as to when the development of an individual scheme / project becomes essential.

The illustration below from the August 2023 Draft WRMP Annex 11: Monitoring our Adaptive Plan provides an example of how an individual scheme / project adaptive plan assessment will work.

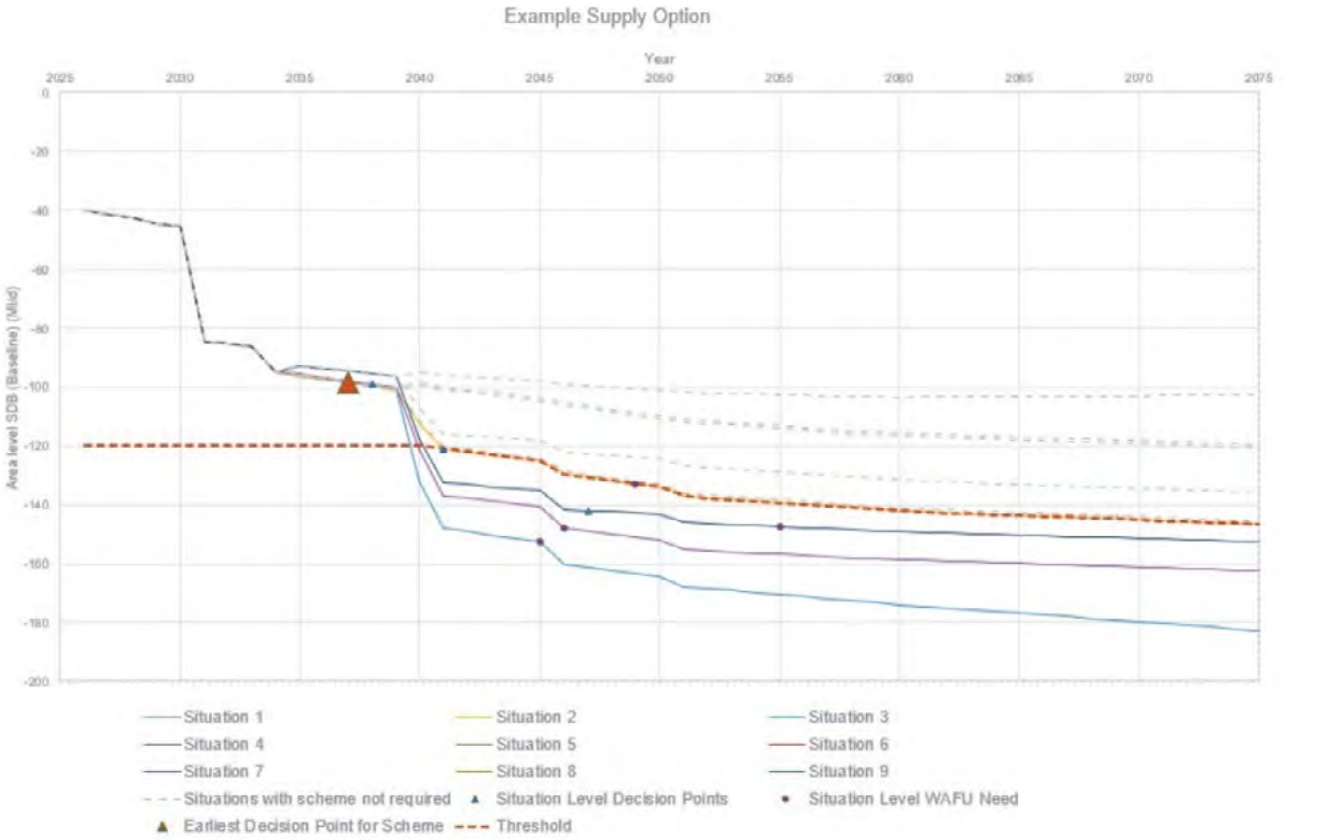


Figure 15: Example adaptive planning decision making trigger threshold plot

The illustration highlights those WRMP situations which are relevant to the individual scheme project and the associated supply / demand deficit for the area. In this example the decision point to proceed with the scheme towards the end of AMP10 (2035 – 2040) becomes clear. As actual data becomes available to assess the real supply / demand deficit, comparisons can be made against the projection with decisions taken sooner or later should the supply / demand threshold be breached outside of expectations.

Actual data will be tracked and reviewed as per the WRMP monitoring plan with a review of developments presented in our WRMP annual review. Further information can be found in our Draft WRMP Annex 11: Monitoring our Adaptive Plan – August 2023

12.5 Adaptive pathway narrative

On the assumption that actual demand is realised as per projections, AMP9 will not see a significant difference in enhancement spend between the core and adaptive Long-term Delivery Strategy pathways. Core Water pathway projects / schemes will continue and significant preliminary planning and investigative work will be conducted primarily in connection with:

- New Adur / Blackstone reservoir
- New desalination build

On confirmation in 2033 of either an overall medium abstraction reduction / climate change scenario or an adverse abstraction reduction / climate change scenario being realised then additional enhancement spend associated with Adaptive pathways 5 and 6 will be initiated.

If circumstances support Adaptive pathway 5, then the major project to be justified will be a new desalination plant at Sheppey. If circumstances support Adaptive pathway 6, then the development and construction of further projects will be initiated in AMP10 and beyond, in particular:

- New Adur / Blackstone reservoir
- De-salination build at Arun and Thanet
- New recycling plant at Hastings
- New groundwater source at Petworth

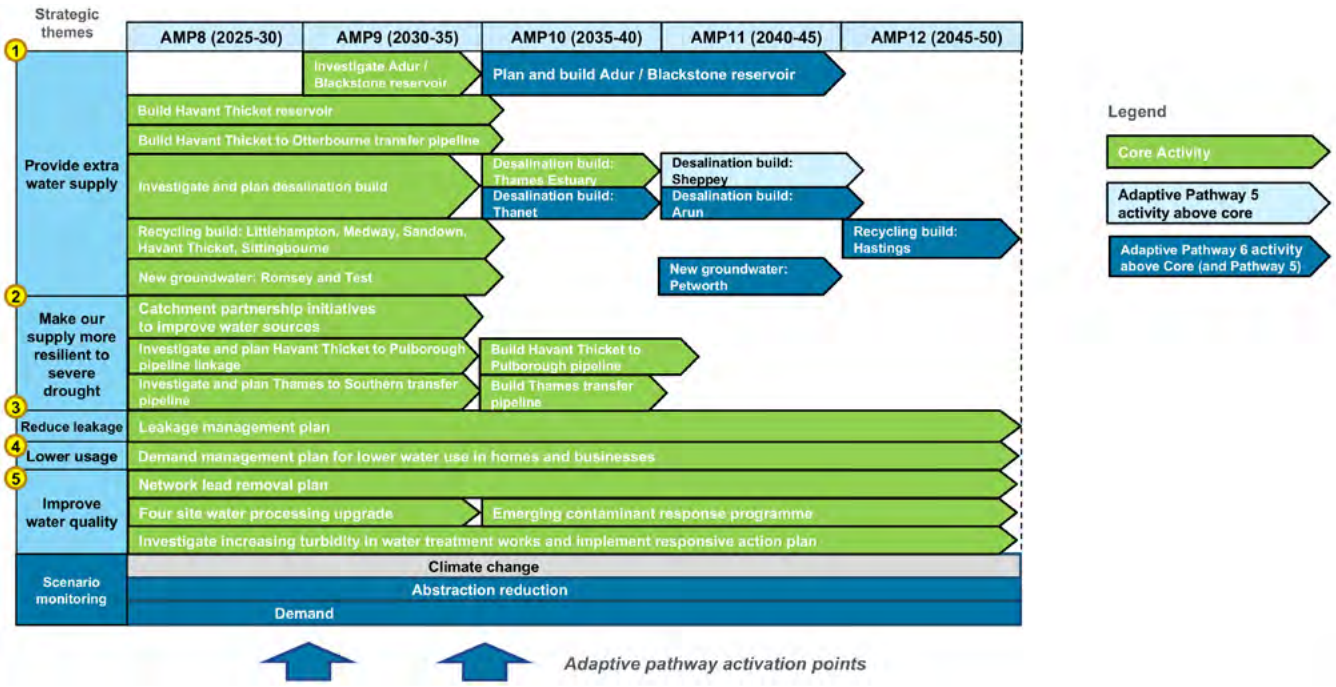


Figure 16 : Adaptive pathway 6 (WRMP Situation 4)
Moderate demand / adverse abstraction reduction roadmap

The role additional recycling and desalination capability plays in balancing supply / demand projections under the more adverse scenario of Adaptive pathway 6 can be seen in the chart below:

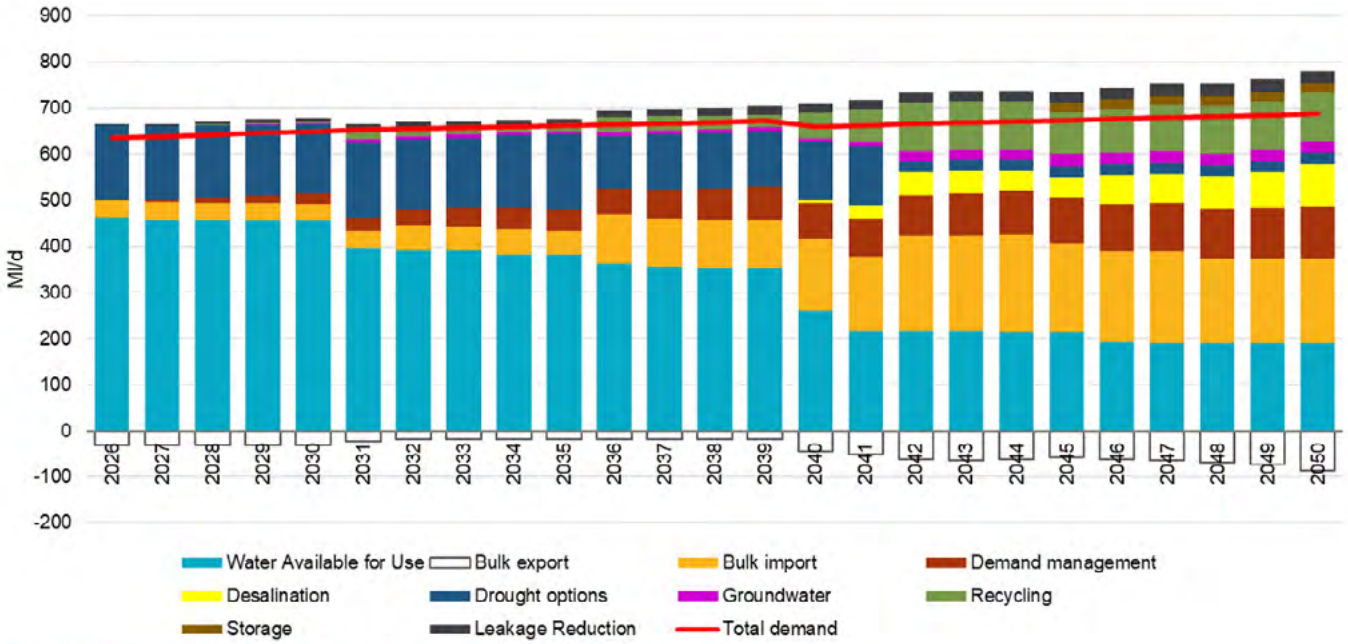
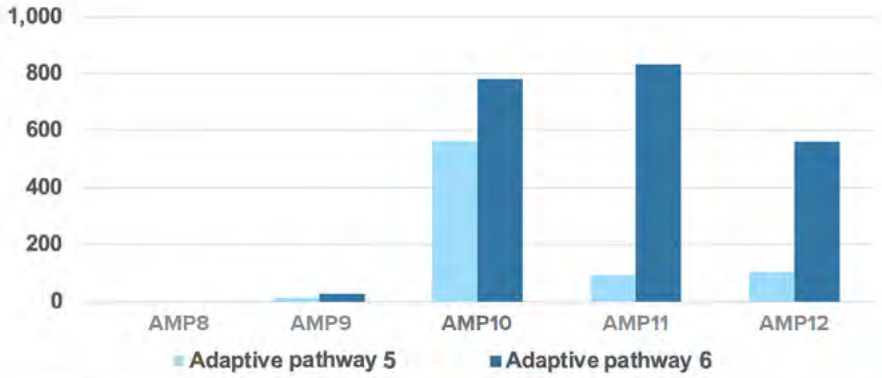


Figure 17: Adaptive pathway 6 (WRMP Situation 4) supply / demand balance

12.6 Pathway investment profile and enhancement funding

The Water core pathway is particularly sensitive to increases in demand and the anticipated regulatory-driven reduction in abstraction quotas. Consequently, Adaptive pathway 5 has a sizeable increase in enhancement expenditure over the core pathway of £774m. The low costs in AMP9 compared to later AMPs reflects the need for extensive planning and preparatory work before actual potential enhancement construction commences in AMP10.



	Enhancement cost (All AMPs) £m
Adaptive pathway 6 (Adverse)	2,203
Adaptive pathway 5 (Moderate)	774

Note: Enhancement cost is above core pathway

Figure 18: Adaptive pathways 5 and 6: Additional enhancement cost to core (£m)

Adaptive pathway 6 has a further sizeable increase in enhancement expenditure to £2.2bn (which includes the £774m enhancement cost planned for Adaptive pathway 5). This is primarily driven by the need to build increased supply capability to address an adverse abstraction reduction scenario.

12.7 Bill impacts

The table below identifies the estimated impact of the enhancement spend from the pathway based on the PR24: Final guidance on Long-term Delivery Strategies bill calculation methodology.

£ (22/23 prices)	AMP8	AMP9	AMP10	AMP11	AMP12
Adaptive pathway 5					
Impact on average customer bills	85	177	287	355	363
Variance to core	0	-3	4	17	6
Adaptive Pathway 6					
Impact on average customer bills	85	177	294	396	427
Variance to core	0	-2	11	58	70

Variance is pathway bill impact less core bill impact

Note: These values can be found in data tables LS7

Table 4: Adaptive pathways 5 and 6: Average customer bill impact from pathway enhancement

13. Adaptive pathways 7 and 8: Wastewater moderate and adverse climate change scenarios

13.1 Circumstance under which adaptive pathways may be appropriate

Scenario testing has shown that within our enhancement portfolio the **Wastewater network flow management to reduce flooding and spills** strategic delivery theme is sensitive to the potential impact of climate change.

This strategic theme is considered sensitive to climate change as it is assumed that as global temperatures rise, on the occurrence of a storm event there will be a potential associated increase in the magnitude of the rainfall flow into the sewer network. Should this potential be realised then additional capacity will need to be built into the sewer network in order for us to achieve our ambition of reducing storm overflow pollution.

Scenario testing has linked global temperature rises to storm flow modelling by equating UKCP18 projections for RCP 2.6 and RCP 8.5 to hydraulic upload factors. There is industry agreement that RCP 8.5 (which relates to an assumed approximate increase in temperature of 1.6°C between 2000 and 2050) equates to a storm flow hydraulic uplift of 20% (from 2025 to 2050). RCP 8.5 has been used as the default for sewer development plans as part of the DWMP. For Long-term Delivery Strategy purposes, RCP 8.5 (20% hydraulic model uplift) has been modelled as an adverse storm scenario.

Use of a hydraulic uplift factor to represent a benign RCP 2.6 scenario is more problematic as no industry agreement currently exists upon which to base a comparison. DWMP guidelines suggest a sensitivity analysis of +/- 30% be conducted upon the 20% default uplift factor. Applying a 30% lower sensitivity adjustment results in a hydraulic model uplift of 14%. This has been assumed to equate to RCP 2.6 and has been utilised as the basis for the Long-term Delivery Strategy core pathway.

Two climate change related adaptive pathways have been applied to the Long-term Delivery Strategy, a moderate pathway and an adverse pathway. In terms of storm event flow, should actual climate change circumstances be realised above the modelled "benign" RCP 2.6 climate change projections to that of the adverse RCP 8.5 level then a jump from the core pathway to the moderate climate change pathway (Adaptive pathway 7) will be triggered. A decision to jump to the adverse climate change pathway (Adaptive pathway 8) is more qualitative in nature. It will depend on the considered resilience level required of the sewer network within the more adverse climate change conditions.

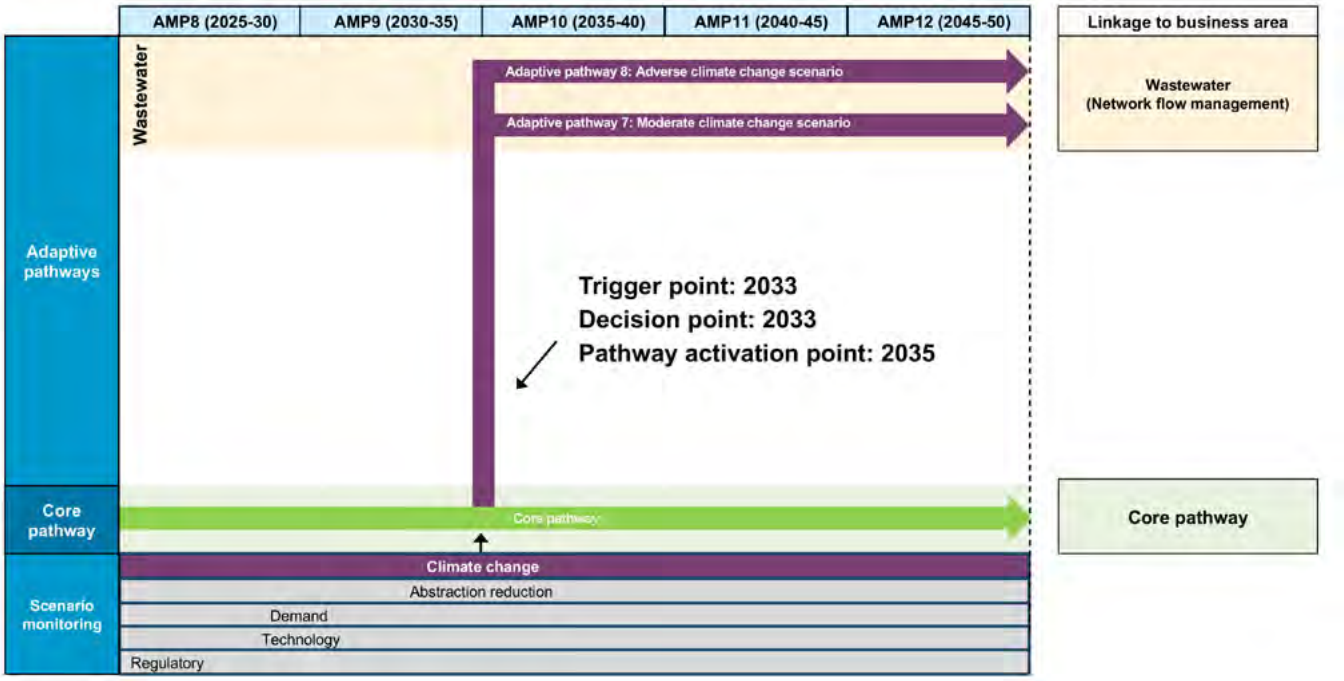


Figure 19: Adaptive pathways 7 and 8 – Moderate and adverse climate change scenarios

13.2 Pathway timing, decision point and trigger point

The potential of climate change impact is serious, but gradual in nature. The timing of decision and trigger points therefore needs to balance two factors. Firstly, the need for sufficient time for actual data to become available to demonstrate the requirement for additional enhancement spend and secondly, the need for a reasonable timeframe to deliver an operational response. Bearing these two factors in mind, decision and trigger points for a potential climate-change driven adaptive pathway jump have been set at **2033**. We consider that the available data in 2033 should provide sufficiently robust evidence upon which a decision can be taken as to whether to make an adaptive pathway jump. The timing will also be harmonious with the PR34 price review which will allow any additional adaptive plan enhancement spend to be embedded within the AMP10 plan. Should a decision be taken in 2033 to follow a moderate or adverse climate change pathway, then the pathway will activate in **2035**.

The key overriding metric that is relevant to all climate-change sensitive strategic themes will be the anticipated rise in global temperature which is intrinsic to the RCP 8.5 calculation.

Wastewater network flow management to reduce flooding and spills

The primary metric for increased climate-change related storm flow is the hydraulic uplift factor that relates to 2020 base levels. If this reaches or is above **6.4%** in **2033** then the moderate climate-change adaptive pathway will be triggered for this strategic theme. The decision to then jump further to the adverse adaptive pathway (Adaptive pathway 8) will not be metric related but will be qualitative in nature. It will depend upon the resilience needs of the network in consideration of the operating conditions associated with the adverse climate change environment.

13.3 Estimate of likelihood of utilising adaptive pathways

Current opinion is that actual climate change impact will result towards the adverse end of the scenario range (RCP 8.5) making a jump to the moderate pathway (Adaptive pathway 7) a significant possibility. The greater unknown is whether any additional resilience measures will be required for the water and wastewater network within the more adverse climate change environment. The resilience measure need will drive the decision as to whether to jump to the adverse adaptive pathway (Adaptive pathway 8).

13.4 How circumstances will be assessed and monitored

Throughout AMP8 and 9 climate change implications particularly temperature changes will be monitored as part of the annual BRAVA assessment monitoring plan for Wastewater and annually assessed for Water. Annual reviews on the Wastewater network hydraulic loading status, high tidal levels and turbidity impacts will be conducted. This will provide a developing repository of supporting data that will allow an informed full review at 2033 of the adequacy of the core pathway against developing climate change issues and the potential need for a jump to an adaptive pathway.

13.5 Adaptive pathway narrative

If either the moderate (Adaptive pathway 7) or adverse (Adaptive pathway 8) climate change pathways are triggered it will mean that additional enhancement spend will be allocated to increased storage tank build, sustainable drainage systems and surface water separation initiatives.

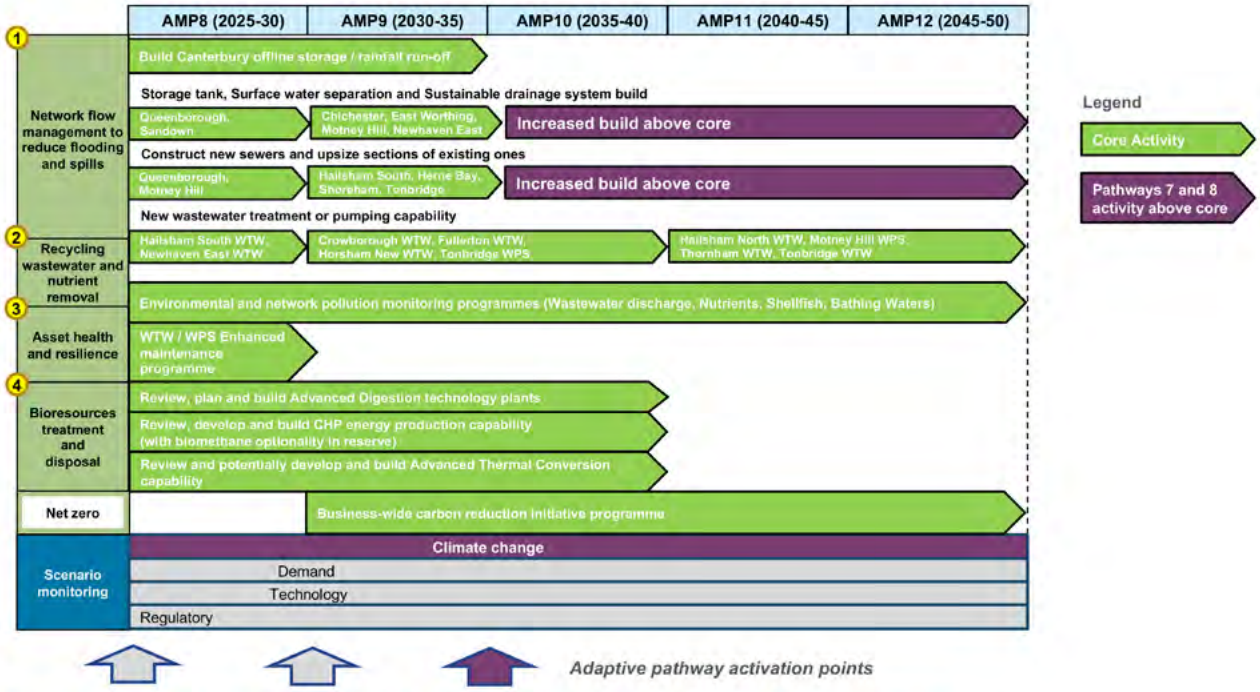
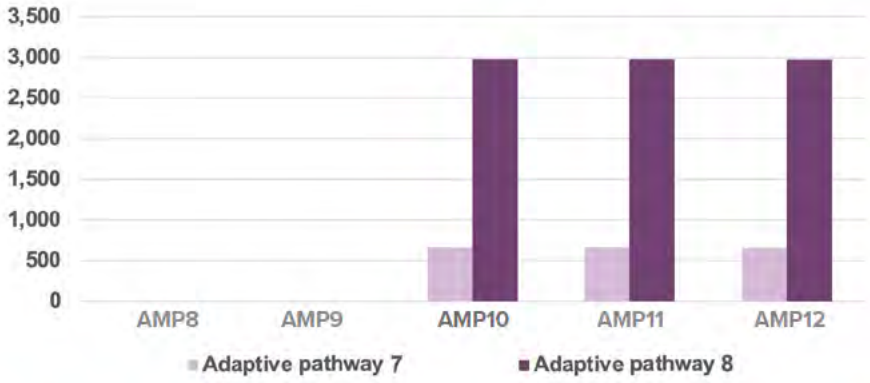


Figure 20: Adaptive pathways 7 and 8 – Moderate and adverse climate change roadmap

Facilities designated for enhancement will be prioritised and chosen in accordance with the risk-based methodology utilised by the Wastewater team in accordance with DWMP operational processes.

13.6 Pathway investment profile and enhancement funding

The moderate climate change adaptive pathway (Adaptive pathway 7) has a planned increase in enhancement expenditure of £2bn. The associated adverse climate change scenario (Adaptive pathway 8) has an enhancement spend of £8.9bn (which includes the £2bn planned for Adaptive pathway 7). The adverse adaptive pathway enhancement spend is substantial as it reflects a significant increase in resilience to the system. In addition, the basis upon which the scenario test modelling was conducted has not considered height contours when assessing properties at risk. This means that the resulting enhancement figures could be excessive for the actual resilience and adverse climate change need.



	Enhancement cost (All AMPs) £m
Adaptive pathway 8 (Adverse)	8,931
Adaptive pathway 7 (Moderate)	1,989

Note: Enhancement cost is above core pathway

Figure 21: Adaptive pathways 7 and 8: Additional enhancement cost to core (£m)

13.7 Bill impacts

The table below identifies the estimated impact of the enhancement spend from the pathway based on the PR24: Final guidance on Long-term Delivery Strategies bill calculation methodology.

£ (22/23 prices)	AMP8	AMP9	AMP10	AMP11	AMP12
Adaptive pathway 7					
Impact on average customer bills	47	92	134	162	171
Variance to core	0	0	12	32	47
Adaptive pathway 8					
Impact on average customer bills	47	100	256	322	333
Variance to core	0	8	134	192	208

Variance is pathway bill impact less core bill impact

Note: These values can be found in data tables LS7

Table 5: Adaptive pathways 7 and 8: Average customer bill impact from pathway enhacement

14. Monitoring the Long-term Delivery Strategy

We have developed a monitoring plan to track and identify which adaptive pathways we are likely to be following into the future. This complies with the requirements set out in Section 3.3.5 of Ofwat's (2022) Final Guidance on Long-term Delivery Strategies[4]. There are three key elements to our monitoring plan: (i) monitoring of adaptive pathways; (ii) monitoring of a number of Long-term Delivery Strategy considerations; and (iii) monitoring of policy and modelling. Our monitoring plan is in SRN12.1 Adaptive Monitoring Plan - Long Term Delivery Strategy Technical Annex Supporting Document

Monitoring of adaptive pathways

To ensure we adopt the appropriate pathways in our adaptive planning decision tree, the first key element of our monitoring plan informs us when to take each adaptive pathway. This includes clear dates for the decision and trigger points for each alternative pathway, underlying metrics and associated thresholds that inform the course of action to take (summarised in the table below). We will conduct an annual internal review of the adaptive pathway metrics as part of our internal corporate and risk assessments and will communicate the results to Board. This yearly update will ensure the data is collated and readily available for critical decision points in the Long-term Delivery Strategy planning cycle.

Driver	Metric	Decision point	Trigger point	Thresholds
Wastewater Regulation: Regulatory restrictions on landbank usage	Outcome of EA / DEFRA landbank usage review	2025 *	2025 *	EA / DEFRA decision to implement a partial ban on farming as a disposal route for our waste product will trigger a review which will likely lead to an adaptive pathway jump **(Adaptive pathway 1: Bioresources landbank usage review)**.
Wastewater Technology: Success of Surface water separation technology	30% separation of storm flow	2028	2028	If feasible separation of stormflow is found to be materially less than 30%, this will trigger a fundamental review in the next DWMP assessment, which should be site-specific. This could trigger an adaptive pathway jump **(Adaptive pathway 2: Surface water separation initiative)**.
Wastewater Demand: Increasing population	Actual demand relative to modelled scenarios	2028	2028	At 2028 core pathway population (PE) levels are projected to be **5.43m**. Should actual population levels prove to be above this then a DWMP assessment review will be conducted. Should the actual PE level be approaching **5.46m** then a jump to **Adaptive pathway 3: Moderate demand**

[4] PR24-and-beyond-Final-guidance-on-long-term-delivery-strategies_Pr24.pdf (ofwat.gov.uk).

Driver	Metric	Decision point	Trigger point	Thresholds
				could be triggered. Should the actual PE level be approaching **5.49m** then a jump to **Adaptive pathway 4: Adverse demand** could be triggered.
Water Demand: Increasing population & **Abstraction reduction:**	Actual demand relative to modelled scenarios	2028	2028	LTDS Water core and adaptive pathways anticipate a trend reflecting a **Housing plan modelled 16.9% population increase.** If actual population increase substantially differs then a joint WRMP / LTDS pathway review will be conducted.
	Environment Agency regulatory restrictions on abstraction	2033	2033	Should a "medium" scenario based on "Enhanced" regulation and environmental protection be realised then a WRMP review will be conducted that will likely lead to a jump to **Adaptive pathway 5: Moderate demand / moderate abstraction reduction**. Should a "high" scenario based on maximising environmental benefit be realised then a WRMP review will be conducted that will likely lead to a jump to **Adaptive pathway 6: Moderate demand / adverse abstraction reduction.** The potential jump to an adaptive pathway will also be influenced by climate change factors (See Section 15.1 Water scenario testing).
Wastewater Climate change: Increased intensity storm flow	Actual storm flow hydraulic uplift factor relative to base scenario	2033	2033	If the hydraulic uplift factor that relates to 2020 base levels approaches 6.4% then a DWMP review will be conducted that could lead to a jump to **Adaptive pathway 7: Moderate climate change**. At this point the resilience needs of the network will also be considered in light of the adverse climate change operating environment. This could trigger an alternate jump to **Adaptive pathway 8: Adverse climate change**.

Table 6: Summary of how we will monitor alternative pathways

* It is possible that the EA will continue to add more information on landbank usage from 2025 onwards, so 2025 is not a final date after which no further changes will occur. The trigger point will be whenever they make their final decision, which is uncertain.

Monitoring of Long-term Delivery Strategy considerations

It is important that we monitor metrics beyond those that directly inform decision and trigger points. The adaptive planning tree has considerations that should be monitored in case there are material developments that will impact our infrastructure investment requirements. To ensure confidence in these considerations related to climate change and technology drivers, the second key element of our monitoring plan sets out how we will monitor data related to coastal resilience, heat stress and technological developments (see table below). We will conduct a review of these metrics every five years.

Consideration	Metric
Rising sea levels	• Observed relative mean sea level • Observed relative mean high and low water and tidal range • Projections of future relative mean sea level rise • Projections of future mean high water spring levels • Observed land level change (isostatic adjustment)
Level and frequency of extreme water levels	• Observed extreme water levels • Projections of future extreme water levels • Freeboard (residual uncertainty) allowances
Increased heat stress upon assets driven by rising global temperatures	• Risk of overheating of electrical equipment • Risk of gas explosion at digestion plants and sludge holding tanks due to prolonged heating • Risk of microbial action leading to increased odour • Risk of hydrogen sulphide generation affecting structural integrity
Technological developments	• Customer demand efficiency tools (e.g., effectiveness of smart meters) • Process and fugitive emissions initiatives (e.g., nitrous oxide and greenhouse gas emissions) • Carbon sequestration (e.g., monitoring the potential of biochar for agricultural applications)

Table 7: Summary of how we will monitor LTDS considerations

Monitoring of policy and modelling

A broad review of policy and our modelling will be undertaken every five years. This will be aligned with strategic planning cycles, which are in turn closely linked to the price review cycle. We will also monitor any significant government policy changes, for example EA policies, that affect our planning and sit outside the strategic planning cycle. Using the basis of the five-year cycle of Long-term Delivery Strategy planning, we can ensure progress on the adaptive plan is monitored regularly and provide a framework for consultation and engagement with stakeholders, regulators, and other water companies.

We will engage with our stakeholders on how they wish to be informed on our monitoring plan outside of the strategic frameworks. For example, we would expect Ofwat to update their guidance on the Annual Performance Report to specify the detail and requirements for the monitoring plan. The decisions and triggers will also be reported through a number of routes to Ofwat and the EA.

Chapter 3

Rationale

15. Identification of core and alternate pathways

We have developed our core and alternate pathways from the strategic frameworks based on the process below.

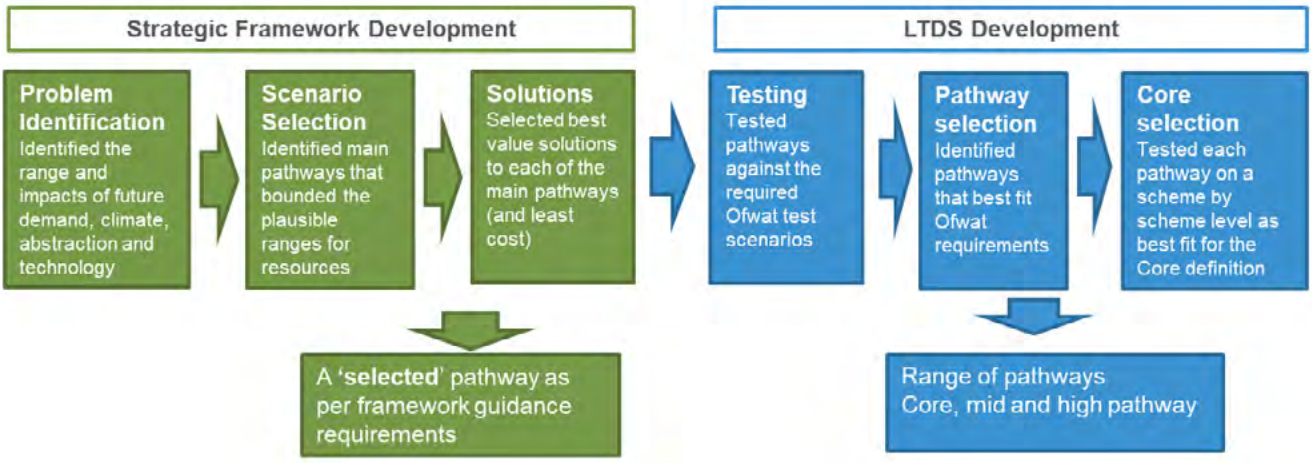


Figure 1: Core and alternate pathways from the strategic frameworks and LTDS development

The key stages were:

15.1 Strategic frameworks development

- **Problem identification.** The vulnerability assessment was carried out in the strategic frameworks to identify the critical drivers based on known risks and uncertain factors. This was compared with the existing and target levels of service in terms of the key outcomes
- **Scenario selection.** The range of the key drivers were modelled and representative scenarios (WRMP 'situations') were identified
- **Solutions development.** For each of the scenarios options development and appraisal was carried out in similar manners for both WRMP and DWMP based on framework guidance

15.2 LTDS development

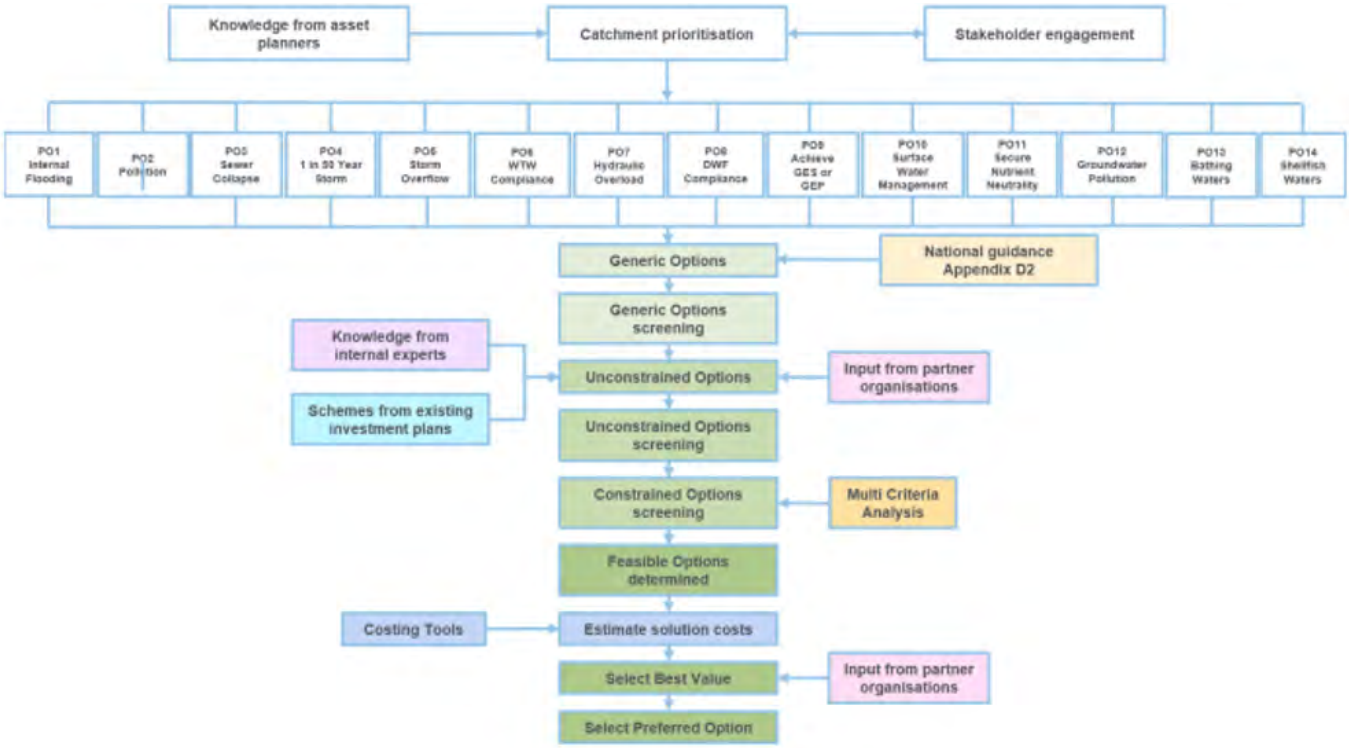
- **Ofwat scenario testing.** The framework scenarios were tested at a high level against the Ofwat reference scenarios. This allowed us to assess how the framework scenarios and solutions compared against the Ofwat reference scenarios
- **Pathway selection.** The initial core and alternate pathways were selected based on the ability to deliver a range of solutions over the plausible range of uncertainty
- **Core options testing.** The individual solutions (schemes) within each pathway were then tested against the low-regrets definition. The final core pathway and alternate pathways were selected based on this testing. Options for alternate pathways that required development funding to retain were included within the core pathway

15.3 Options development and appraisal

Our adaptive planning approach in our strategic frameworks sets out the challenges and the uncertainty, then undertakes an options appraisal exercise starting with unconstrained and then constrained options. This refines the list of options down to a short-list which is then assessed against best value metrics and compared to low-cost options. Our options selection process is based on a robust process that enables us to meet any future planning application enquiry. Our process for each project is developed in consultation with stakeholders and undertaken by qualified individuals. The process is iterative, and generally comprises of:

- Develop a list of options that considers government policy and aspirations
- Undertake problem characterisation and evaluate strategic needs and complexity
- Decide on a modelling method
- Identify and define data inputs to model(s)
- Undertake decision-making (options appraisal) modelling
- Carry out sensitivity tests
- Produce a final planning forecast

Details of the approach taken in our strategic frameworks is in each of the respective technical documents. Rejected options and the rational is described in the technical reports, option fact files can be found in Annex 13 to the dWRMP. The figure below shows the Options Development and Appraisal process from the DWMP



DWMP Options Development and Appraisal Process

Figure 2: Annex C – ODA from generic options to preferred options

Once an option is selected a second iteration of detailed assessment may be undertaken as follows:

- Site and route selection
- Consenting evaluation
- Multi-criteria decision analysis
- Assessment against legal and policy objectives
- Assessment against strategic objectives
- Interim business evaluation
- Future needs assessment
- Final business evaluation

This second process is used for our Strategic Resource Options which are in the regional plans, for example. our Southern Water Gate 2 Annex 5: Options Appraisal Process – Future Needs Update describes the process, the evidence and the results in full.

15.4 Best value process

As part of our options appraisal, the Best Value planning metrics we will use to decide between short list of options is identified. Our current best value metrics are based on:

- Strategic environmental assessment score
- Natural capital
- Biodiversity net gain
- Customer preferences
- Resilience metrics (adaptability, evolvability and reliability)
- Programme costs
- Carbon costs

Examples of the best value metric for the WRMP can be found in Technical Report Table 6.2 and DWMP technical summary on options development and appraisal. The results of the process are included with our technical reports, for example dWRMP Technical Report Section 7.

15.5 Customer and stakeholder engagement in option selection

As part of our strategic frameworks development, we consult as per best practice with customers and stakeholders on the proposed options. We have consulted extensively with customers and stakeholders over their understanding and appreciation of water scarcity and the possible solutions of demand and supply measures. An example of our one of the consultations we have undertaken is below.

WRMP We carried out a long-running process of consultation on Southern Water's Water Resources Management Plan (WRMP) 2024. Details of the consultations are in the [SRO enhancement case]. Our Statement of Response (Annex 6) for the revised dWRMP sets out our approach to the consultation and our response to it. The issues raised were grouped into 11 themes:

- The supply-demand balance challenge
- The options appraisal process
- The option selected
- The history and development of the Hampshire Water Transfer option
- The water treatment process in the option
- The costs of the option
- International precedents for using recycled water
- Releases of treated wastewater into the environment
- Impact on customer bills
- The consultation process itself
- The involvement of Portsmouth Water

In the annex we responded in detail to each of the themes raised. An overall summary was provided in our dWRMP Statement of response to feedback received from all consultees.

We have also consulted specifically on the Havant Thicket Transfer and Water Recycling Project via a non-statutory consultation preparing for the development consent order, and via stakeholder engagement carried out for Water for Life–Hampshire We have also consulted customers and stakeholders through our PR24 customer research programme and the consultation on our draft Long-term Priorities Statement carried out in 2022. This process has allowed us to incorporate feedback into the option selections.

15.6 Low regrets assessment of options

For our each of our enhancement business cases for PR24 we have carried out a low regrets analysis to ensure that the option meets the criteria and is justified based on the best available evidence. In addition, we have requested expenditure to carry out investigations and retain future options.

16. Scenario testing

The Long-term Delivery Strategy approach to scenario testing has been to primarily utilise the scenario testing undertaken for the WRMP and the DWMP and then leverage that testing for Long-term Delivery Strategy purposes. This has allowed us to apply a joined-up, consistent approach to our testing whilst ensuring the testing maps to the individual requirements of the differing strategic frameworks.

The primary focus of our scenario testing has been on the four common reference scenarios. We also considered one additional scenario, that being the potential impact of a partial ban on farming as a disposal route for our Bioresources waste product.

16.1 Water

The adaptive planning approach we have adopted for our WRMP specifically addresses uncertainty in the supply / demand balance arising from three of the drivers associated with the long term reference scenarios:

- Demand as a consequence of different population growth forecasts
- The forecast range of reductions in available supplies due to implementation of different levels of abstraction reduction environmental ambition
- The possible range of impacts from climate change on supply availability (deployable output)

To undertake testing of our LTDS strategy we examined the range of supply / demand balance impacts of each of these drivers over time compared to our baseline (2025) position. We could then recombine them to create a new suite of supply / demand balances that reflect different “benign” or “adverse” future conditions.

To undertake testing of our LTDS strategy we examined the range of supply / demand balance impacts of each of these drivers over time compared to our baseline (2025) position. We could then recombine them to create a new suite of supply / demand balances that reflect different “benign” or “adverse” future conditions.

For our WRMP we looked at a wider range of challenges than those projected in the Long-term Delivery Strategy common reference scenarios. This is to ensure we meet the water resource management plan guidance, for example, the guidance requires companies to also consider the potential of the OxCam growth corridor, even though it is not in the local plans. We also wanted to make sure that we considered the ONS-18 growth forecasts and other lower growth forecasts. This enables us to meet the key requirements of the water resource management plan guidance including considering stress testing the selection of those initial choices to higher and lower future challenges.

Therefore, the adaptive planning tree we have used to derive our WRMP and WRSE regional plan considers a broader set of challenges than the LTDS common reference scenarios to ensure the schemes / projects selected are robust to a wide range of future scenarios.

16.1.1 Demand

The WRMP24 Adaptive pathways for demand consist of three principal branches linked to different forecasts of population growth:

- **Local Authority Housing Plans.** A housing-led scenario, with population growth underpinned by each local authority’s Local Plan housing growth trajectory. Following the final year of data, projected housing growth in non-London areas returns to the average of ONS-14 and ONS-16 long-term annual growth average by 2050.
- **Local Authority Housing Plans with the Oxford Cambridge (OxCam) Growth Arc.** New Settlement 23,000 dwellings per annum scenario, with c.3,800 dwellings per annum above Housing Plan distributed between Cherwell (20%), Aylesbury Vale (20%), Central Bedfordshire (40%), South Cambridgeshire (20%).
- **Office of National Statistics (ONS).** 2018-based Principal sub-national population projection, using a five-year history (2013-2018) to derive local fertility and mortality assumptions, a long-term UK net international migration assumption of +190k and two-year history (2016-2018) of internal migration assumptions. This scenario has been rebased to the 2021 mid-year estimate.

In our WRMP and in the regional plan we consider all three scenarios. However, there are only two growth scenarios considered in the LTDS common reference scenario approach as the OxCam scenarios are not in any local plans yet.

Of these three demand scenarios the Local Authority Housing Plan which corresponds with the “**medium**” adaptive pathway for the demand in WRMP24 (situations 4-6) directly represents the “**High Demand**” LTDS (adverse) common reference scenario.

Similarly the ONS-2018 projections, which corresponds with the “**low**” adaptive pathway for demand in WRMP24 (situations 7-9) directly represents the “**Low Demand**” LTDS (benign) common reference scenario.

There is also a conflict between the common reference scenarios and the Water Resource Planning Guidelines (WRPG). Planning guidance requires that that the 2025 to 2030 period should be based on local authority housing plans and any preferred branch should also be based on housing plan estimates whereas the common reference scenarios requires us to consider ONS as well as housing plan in the period 2025 to 2030. The WRMP continues to be compliant with the WRPG in the first 5 years.

Therefore, if only one of these two growth scenarios can be considered WRSE recommends that companies should consider the Housing Plan growth scenario for their core scenario as this means it will be compliant with the Water Resource Planning Guidance and meet Governments aspiration to support growth.

Further information on demand scenario testing can be found at Annex 7 of our WRMP: Demand forecast.

16.1.2 Abstraction reduction

We want to ensure that our region's rivers and protected areas meet flow or other environmental targets. This will require us to work closely with other stakeholders to develop innovative solutions that balance the need for water supply with the need to protect the environment.

Around 70% of the water we supply comes from groundwater and most of that is associated with the chalk aquifer. We have an extensive programme of environmental investigations in place over the next 10 years to understand the impacts of our abstractions and to determine appropriate mitigations that will protect and enhance the environment. We have derived a number of scenarios that reflect different plausible levels of abstraction reduction.

These scenarios reflect the potential plausible levels of abstraction reduction we could be required to make, the emerging outcomes from our ongoing environmental investigations (e.g. through the WINEP programme) and local discussions with Natural England and the Environment Agency.

Three key scenarios were considered as part of our WRMP24 adaptive planning. Further information on these scenarios, particularly in connection with the history of their development can be found at Annex 9 of our WRMP: Protecting and enhancing the environment.

- A "**Low**" scenario assuming a "Business As Usual" (BAU) policy and regulatory regime with the same level of protection of natural flows, but the natural flows are adjusted for the impact of climate change on rivers and groundwater and the water bodies are assumed to alter to the impacts of climate. The scenario also includes emerging outcomes from our current, largely 'No Deterioration' WINEP studies and discussions with regulators, considering known and planned for likely changes to sources. It also incorporates further reductions, where reducing abstraction would require a significant investment to water bodies that were previously deemed uneconomic to recover through Restoring Sustainable Abstractions options appraisals.
- **A "Medium" Scenario based on "Enhanced" regulation and environmental protection**. This scenario provides greater environmental protection for Protected Areas and SSSI rivers and wetlands, principal salmon and chalk streams. The most sensitive flow requirements are applied including the Common Standards Monitoring Guidance (CSMG) that sets water quality and quantity targets for designated sites. The natural flows for rivers and groundwater balances are altered for climate change. This scenario increases the proportion of natural flow required to protect the environment. The flows and balance test will evolve over the timeframe due to climate impacts.
- A "**High**" Scenario This scenario represents the best-case outcome for maximizing environmental benefit, but is also a reasonable worst-case scenario in terms of future water supply deficit. This scenario was used as a stress test to understand the long-term implications of achieving sustainable abstractions where potential impacts on designated sites are apparent. It is based on the "Enhanced" scenario, which maintains and improves protected areas. However, this scenario goes further to seek maximum environmental benefit by assuming that some of our chalk sources which may impact designated sites are no longer viable for abstraction. Specifically, this scenario proposes a reasonable worst-case cessation of abstraction from all sources within the river Itchen catchment and our Pulborough source.

In addition, all of the above scenarios include the impact of potential licence capping to prevent deterioration as defined by the Water Framework Directive.

The benign scenario for the Environmental destination needs to be clarified across the regulators. Ofwat have defined this as: use the agreed BAU+ scenario to form a long-term view, but use local reviews to remove licence reductions with significant uncertainty, to form a plausible 'extreme low' scenario. We do have a BAU+ scenario but there isn't agreement on significant uncertain reductions. For the moment we have used our WRMP24 low scenario as our benign test and suggest that we seek agreement with the regulators that this is in line with their expectations.

Of these three environmental scenarios the "**Low**" adaptive pathway used in WRMP24 Situations 3, 6 and 9 best corresponds with the "**Low Abstraction reductions**" (benign) common reference scenario. In that it meets minimum legal requirements under current environmental policy and guidance and considers local refinement based on emerging outcomes from our WINEP investigations.

Our "**High**" environmental adaptive pathway used in WRMP24 Situations 1, 4 and 7 best corresponds with the with the "**High Abstraction reductions**" LTDS (adverse) common reference scenario since it largely reflects the Environment Agency's "Enhanced" scenario but with further refinement within sensitive catchments to capture the full effects of new environmental flow targets such as the Natural England's Common Standards Monitoring Guidelines.

16.1.3 Climate change

We used the 28 spatially coherent RCP 8.5 climate change projections from UKCP18 to assess the impacts and uncertainty of climate change on deployable output. These projections are based on the UKCP18 regional and global climate models. RCP 8.5 scenario represents an upper emissions scenario, and its **median** impact is broadly equivalent to the "**High Climate Change**" LTDS common reference scenario. The key difference is that our WRMP scenario reflects spatially coherent, rather than probabilistic impacts. This primarily reflected the need to consider coherent impacts across south-east England to allow consistent assessment of water resource availability across the WRSE region.

We have also considered the implications of a lower emissions scenario (RCP2.6) equivalent to the "Low Climate Change" common reference scenario. To do this, we (as part of WRSE) commissioned a study that explored and compared the uncertainty within the range of the 28 RCP 8.5 spatially coherent climate change projection as compared to the uncertainty of the RCP 2.6 projections.

The study mapped the forecasts of rainfall and potential evapotranspiration from the 28 RCP 8.5 scenarios onto the Ofwat LTDS framework through identification of the closest matching WRSE climate scenarios (i.e. the 28 RCM and GCM RCP 8.5) to the median RCP 2.6 impacts.

The analysis showed there was good agreement between the mapped scenarios across all metrics and river basins. The spatially coherent RCM/GCM scenarios naturally show a greater level of variation but on the whole and as shown in the figure below the 'best mapped' scenario corresponds well to the probabilistic median for both RCP 2.6 and RCP 8.5 emissions pathways.

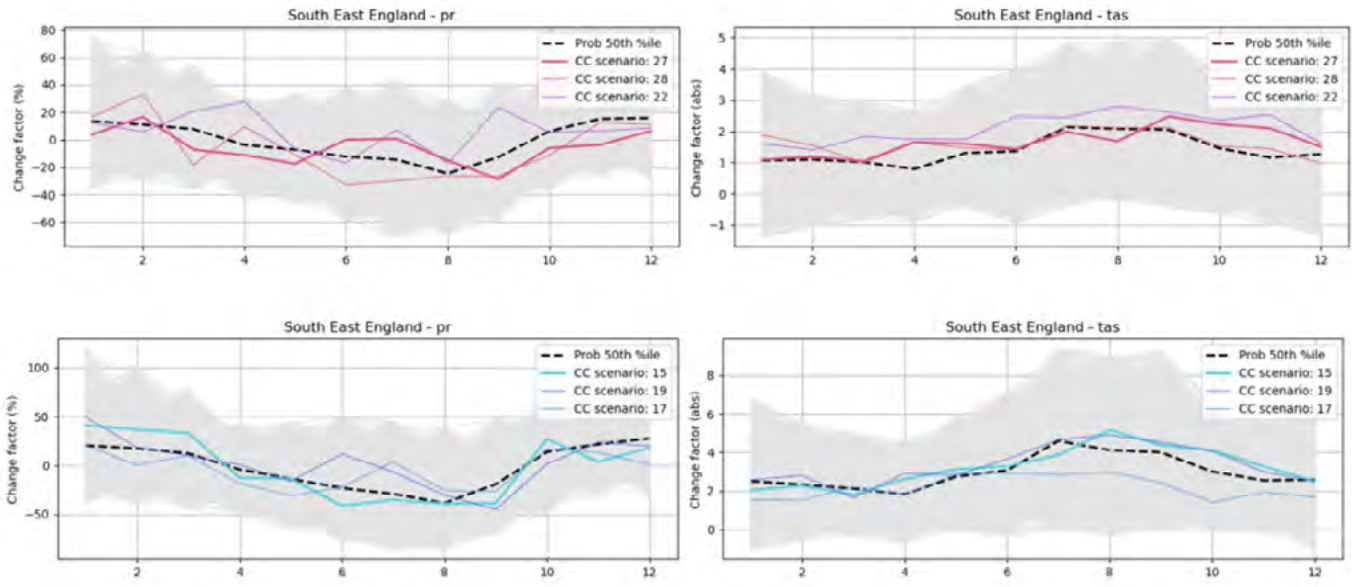


Figure 3: Comparison of monthly change factors for the probabilistic UKCP18 data (full range in grey) and mapped RCM / GCM spatially coherent scenarios for RCP2.6 (top) and RCP8.5. The most closely mapped scenarios are shown in bold

The RCP 8.5 and RCP 2.6 projections map, at a regional level, slightly better to climate change scenarios 15 and 27 respectively (of the 28 RCP8.5 scenarios). These are very close to the regional medium scenario. The climate change (i.e. Median RCP 8.5 and RCP 2.6) scenarios set out within the common reference scenarios have a narrower range of impacts than the high, medium, and low scenarios considered in the adaptive planning approach for our WRMP and the WRSE regional plan.

Given the non-linear relationship between meteorology and system response through deployable, a validation or sense check against the evidence of relative impacts on deployable output (supply) has been undertaken. The assessment shows that the RCP 2.6 scenarios fall within the range of scenarios already considered. Typically the scenarios more consistent with a higher emissions pathway (i.e. RCP 8.5) tend to shower more positive or smaller negative supply impacts when compared to the lower emissions pathway (RCP2.5) in zones with a high proportion of groundwater or baseflow fed rivers. This likely reflects the change in winter precipitation patterns with greater winter and spring rainfall leading to greater groundwater recharge and hence a benefit (or smaller negative impact) than the drier winters of the lower emissions pathway (RCP2.6).

Driver	LTDS Common Reference Scenario	WRMP24 Drive and Situations	Supply / Demand Balance Impact (Ml/d)			
			2025 (baseline position)	2030	2040	2050
Demand	High Demand	Medium (Local Authority Housing Plan) (Situations 4,5 & 6)	-382	-400	-421	-446
	Low Demand	Low (ONS-18) (Situations 7 & 8)	-378	-385	-394	-404
Abstraction Reductions	High Abstraction Reduction	"Medium" Scenario broadly consistent with the EA "Enhanced" scenario (Situations 2,5 & 8)	0	-47	-152	-189
	Low Abstraction Reduction	"Low" Scenario Legally compliant minimum with local refinement (Situations 3, 6 & 9)	0	-32	-84	-92
Climate Change	High Scenario	Medium UKCP18 RCP8.5 Median for Spatially Coherent Projections mapped to probabilistic data	-9	-13	-16	-19
	Low Scenario	UKCP18 RCP2.6 projections Not used in WRMP but for scenario testing RCP8.5 projections have been mapped to closest equivalent to RCP2.6 Median	-14	-20	-25	-30

Table 1: Ofwat common reference scenario impact on WRMP supply/demand balance

16.1.4 Supply / demand calculation

To undertake testing against the common reference scenarios we considered the supply / demand balance impacts of each of the above pathways relative to the 2025 baseline position. The underlying baseline supply / demand balance impacts were readily available for each pathway having already been used to determine the overall adaptiveplanning suite of pathways for WRMP24.

A summary of the key supply / demand balance impacts relative to each LTDS common reference scenario is summarised below.

To undertake the testing we then compared these supply / demand balance impacts in different combinations:

- A benign scenario with all drivers set to the "Low" common reference scenario
- A series of adverse scenarios where each driver was stressed to the "High" adverse impact in isolation, with all others held at "Low" impact

When applying the testing, we set the stress testing for the LTDS scenarios to reflect the WRMP24 adaptive pathway branching in 2030 for demand and 2035 for abstraction reduction and climate change. This approach is illustrated in the table below. The table highlights the supply / demand deficit impact of the adaptive pathway scenarios (which lags the adaptive pathway activation points by 5 years).

LTDS Pathway	2025-29	2030-34	2035-39	2040-44	2045-50
All Benign	Low Demand	Low Demand	Low Demand	Low Demand	Low Demand
	Low Abstraction Reduction	Low Abstraction Reduction	Low Abstraction Reduction	Low Abstraction Reduction	Low Abstraction Reduction
	Low Climate Change	Low Climate Change	Low Climate Change	Low Climate Change	Low Climate Change
Adverse Demand	Low Demand	Low Demand	High Demand	High Demand	High Demand
	Low Abstraction Reduction	Low Abstraction Reduction	Low Abstraction Reduction	Low Abstraction Reduction	Low Abstraction Reduction
	Low Climate Change	Low Climate Change	Low Climate Change	Low Climate Change	Low Climate Change
Adverse Environment	Low Demand	Low Demand	Low Demand	Low Demand	Low Demand
	Low Abstraction Reduction	Low Abstraction Reduction	Low Abstraction Reduction	High Abstraction Reduction	High Abstraction Reduction
	Low Climate Change	Low Climate Change	Low Climate Change	Low Climate Change	Low Climate Change
Adverse Climate Change	Low Demand	Low Demand	Low Demand	Low Demand	Low Demand
	Low Abstraction Reduction	Low Abstraction Reduction	Low Abstraction Reduction	Low Abstraction Reduction	Low Abstraction Reduction
	Low Climate Change	Low Climate Change	Low Climate Change	High Climate Change	High Climate Change

Table 2: Supply / demand deficit impact of the adaptive pathways scenarios

The Figure overleaf illustrates the supply-demand balance outcome of each of these tests against the range of outcomesfrom the 9 different adaptive planning situations used in WRMP24.

The comparison indicates that:

- The **All-benign** scenario most closely maps to WRMP Situations 9, 3 and 6. Of these, situation 6 maps to our LTDS core pathway
- The **High / Adverse climate change** scenario most closely maps to WRMP Situations 9, 3 and 6. Of these, situation 6 maps to our LTDS core pathway
- The **High / Adverse demand** scenario most closely maps to WRMP Situations 3 and 6. Of these, situation 6 maps to our LTDS core pathway
- The **High / Adverse environment** scenario most closely maps to WRMP Situations 2 and 5. Of these, situation 5 maps to our LTDS Adaptive pathway 5

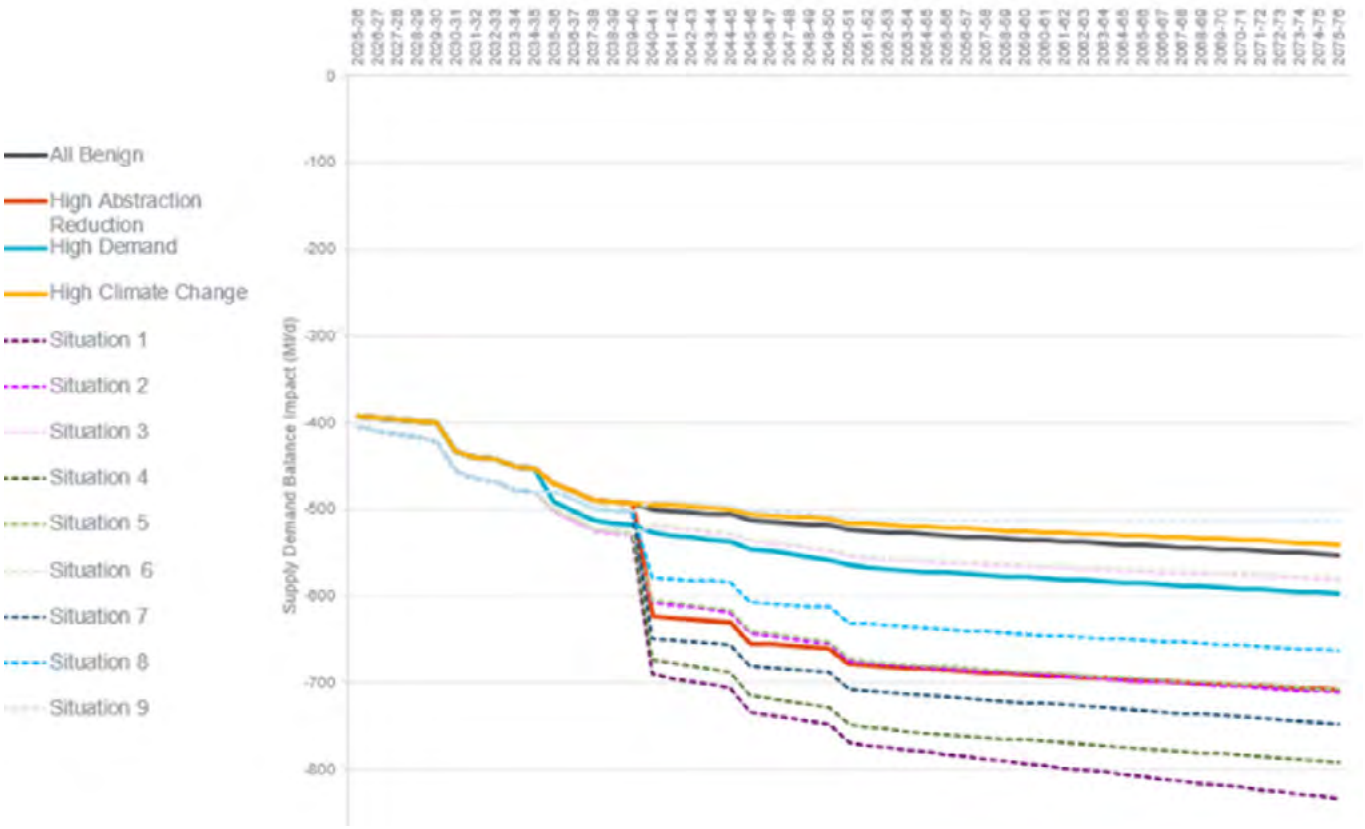


Figure 4: All WRMP 24 Situations vs common reference scenarios

16.1.5 WRMP / WRSE scenario test positioning for LTDS

In addition to the testing against the specific adaptive branches of our WRMP we have also worked with WRSE to consider testing against the common reference scenarios at a regional level.

Recognising that our WRMP and the WRSE regional plan sets out a broader range of challenges than the LTDS common reference scenarios we have constructed several different LTDS tree configurations and WRSE have explored these through two stages.

Stage one explores those LTDS scenarios set out through the mapping below. These are single state runs. The key point to note with these scenarios is that there will not be any transitioning of growth, climate change or abstraction reduction.

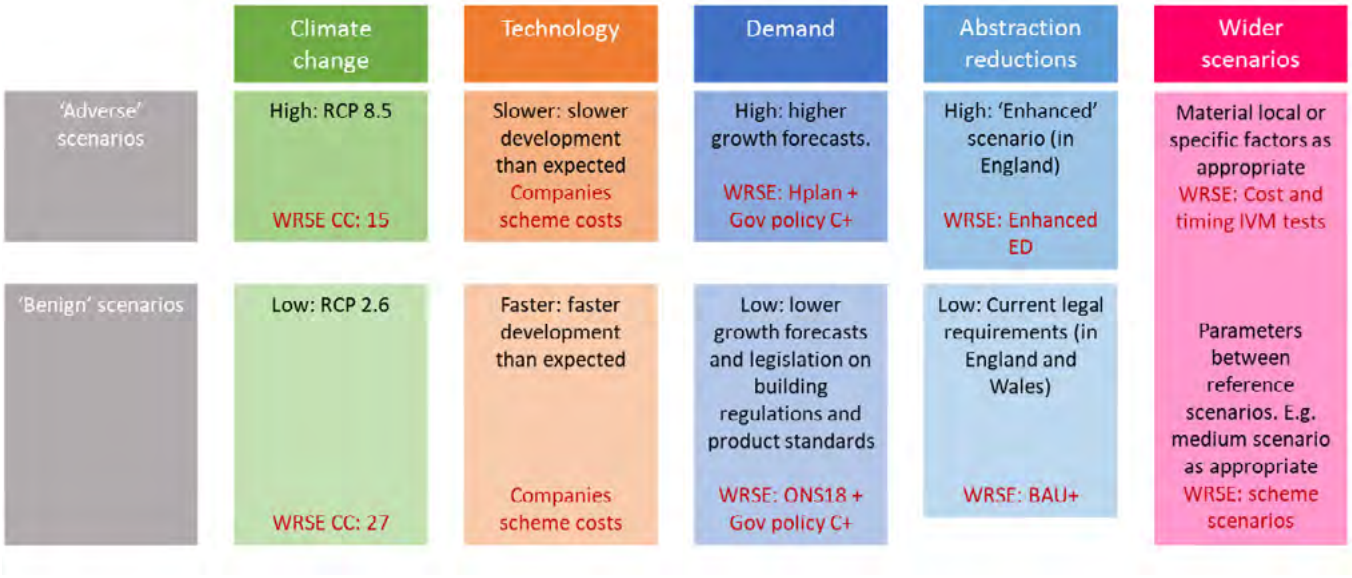


Figure 5: Ofwat scenarios and the choice of our adverse and benign pathways

In the second stage WRSE explored additional single state runs but these are configured to align with the Water resources management plan adaptive tree, which compounds different scenarios together i.e. each adaptive branch that transitions on growth after the first five years of the plan and environmental destination and climate change after the first ten years of the plan. In total there are 122 different situation trees that have been explored at a regional level.

The table below on the next page summarises the key features of each of the WRSE / WRMP scenario tests as compared to the LTDS common reference scenario tests.

Two pathways are needed to be selected for the regional plan – a preferred pathway for the WRMP and a core pathway for the LTDS. The regional preferred pathway should remain as Situation 4 as this complies with the WRPG.

Examining the regional level LTDS testing indicates that three of the scenarios fall within 50 Ml/d of each other, these are in ascending order of deficit:

- Local Authority Housing Plan (Hplan) growth; RCP 2.6 Climate Change; Medium Environmental Destination
- ONS-18 growth; RCP 2.6 Climate Change; High Environmental Destination
- ONS-18 growth; RCP 8.5 Climate Change; High Environmental Destination

From the WRSE and WRMP 24 Adaptive planning pathway perspective situations 5 or 7 are very close to these three regional LTDS scenarios. Situation 5 follows a compliant pathway in terms of housing growth (WRPG compatible and LTDS compatible) and a benign approach in terms of Environmental destination and climate change. Situation 7 follow a non-compliant pathway for growth and adverse path for climate change and adverse for environmental destination.

Since the LTDS testing approach requires not more than one factor (population growth, climate change or abstraction reduction) to be in an adverse state it would appear logical to let Situation 5 represent the core regional long term delivery strategy. Therefore, in conclusion WRSE recommended that the central pathway run that companies consider be Housing plan; Median climate change (RCP8.5) and High Abstraction Reduction (Situation 5).

Scenario	Test	Metric	LTDS metric	Comparison WRMP vs. LTDS	Commentary
Demand (Consumption)	Single test applied to all situations	Consumption decrease to 110 l/p/d	Benign 91 l/p/d Adverse 110 l/p/d	⇔	Single WRSE test is on the high end of the LTDS scenario test range, but is a reasonable figure. The LTDS scenario range is potentially too challenging.
Demand (Population)	Adverse	Housing plan + Ox-cam Max from 2035 (22% population increase)	21.4% (2020-50)	↑	WRSE adverse test is notably more adverse than its LTDS counterpart.
	High	Housing plan + Ox-cam (17.6% population increase)	21.4% (2020-50)	↑	WRSE metric is slightly more adverse when applied to the LTDS scenario range as an adverse test.
	Medium	Housing plan (16.9% population increase)	c.16% (2020-50)	↑	WRSE mod-range test is slightly more adverse than its LTDS counterpart. Equivalent to LTDS adverse
	Low	ONS 18 (5.1% population increase)	10.7% (2020-50)	⇔	WRSE metric is comparable to LTDS when base year adjustment is considered.
Climate change	High	High (RCP 8.5)	RCP 8.5	↑	WRSE climate change tests are based on a low, medium and high set of tests within the RCP8.5 range. WRSE adverse test is more adverse than its LTDS counterpart.
	Medium	Medium (RCP 8.5)	c. RCP 4.5	↑	WRSE climate change tests are based upon a low, medium and high set of tests within the RCP 8.5 range. WRSE mid-range test equates to an LTDS adverse test.
	Low	Low (RCP 8.5)	RCP 2.6	↑	WRSE climate change tests are based upon a low, medium and high set of tests within the RCP 8.5 range. WRSE benign test will be notably more adverse than its LTDS counterpart.
Abstraction reduction	High	High (-247Ml/d)	EA 'enhanced' scenario	⇔	WRSE adverse test approximates to LTDS scenario as an adverse test.
	Medium	Medium (-189Ml/d)	-	⇔	WRSE mid-range test approximates to LTDS scenario as a mid-range test.
	Low	Low (-92Ml/d)	Current legal requirements	⇔	WRSE benign test approximates to LTDS scenario as a benign test.

Table 3: WRSE / WRMP scenario test evaluation for LTDS

Note 1: Demand population growth WRMP and LTDS test comparisons are approximate due to differing base year data usage.

Note 2: Climate change supply / demand deficit figures do not correspond directly to those presented in the table in Secion 16.1.4 due to variations in the use of spatially coherent and probailistic impact data.

16.1.6 Summary

The figure below illustrates the results of our common reference testing against the full range of WRMP adaptive “situations” and illustrates our LTDS core pathway (WRMP situation 6) and alternative adaptive pathways, (WRMP situations 4 and 5). These proposed pathways are generally consistent with the outcomes of the common reference scenario testing and the results of the regional testing by WRSE.

As presented in Section 12.1 Circumstances under which adapted pathways will be followed, we decided to select WRMP Situation 6 as our core pathway. Considered against the wider range of scenarios explored by the WRMP the selected LTDS core and adaptive pathways cover a reasonable spread of the uncertainty comprising potential future supply / demand balance challenges.

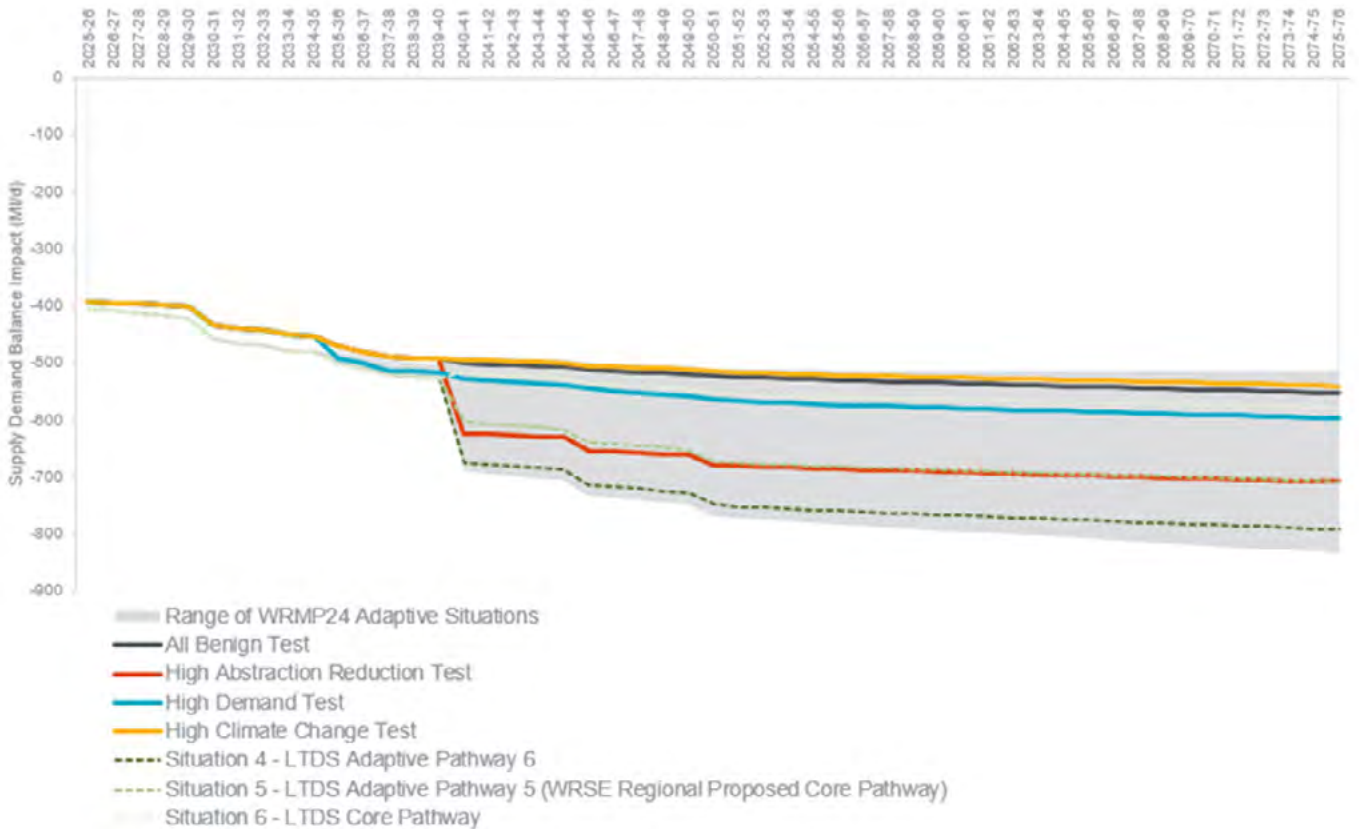


Figure 6: Uncertainty within our WRMP 24 Situations compared to our LTDS common reference scenario testing and our proposed adaptive pathways

Further information on supply / demand balances and WRMP / WRSE scenario testing can be found at Annex 10 of our WRMP: Baseline supply / demand balance situations and at Annex 11: Monitoring our Adaptive plan.

16.2 Wastewater

16.2.1 Demand

Wastewater demand growth modelling has utilised two key variables to analyse future uncertainty: household population growth and consumption.

Wastewater

Three demand scenario tests were sourced from the DWMP. A benign change in demand, a mid-range change in demand and an adverse, extreme change in demand.

Population Growth (2020 - 50)	DWMP	LTDS	Comparison DWMP vs. LTDS
Adverse	15.2% (+30% growth rate)	21.4% (Housing plan)	
Moderate	11.7% (Central Rate) [Sage v16]	------	
Benign	8.2% (-30% growth rate)	10.7% (ONS)	

Table 4: DWMP and LTDS reference scenario comparison for population growth

For comparison purposes, the DWMP population growth adverse scenario is lower than the LTDS extreme adverse scenario upper testing boundary (within upper bound) and the DWMP population growth benign scenario is lower than the LTDS extreme benign scenario lower testing boundary (outside lower bound).

However, when reviewing the application of DWMP consumption scenarios to the Long-term Delivery Strategy parameters, the result is the opposite. The DWMP consumption change adverse scenario is higher than the LTDS extreme adverse scenario parameter (outside upper bound). The DWMP consumption change benign scenario is also higher than the LTDS benign scenario (within lower bound, but also higher than the upper bound).

Consumption Change (2020 - 50)	DWMP	LTDS	Comparison DWMP vs. LTDS
Adverse	No change of consumption from 2020 (127 l/p/d)	Decrease to 110 l/p/d	
Moderate	Central rate of consumption (125 l/p/d) [Sage v16]	------	
Benign	Decrease to 118 l/p/d (Water UK Paper '19)	Decrease to 91 l/p/d	

Table 5: DWMP and LTDS reference scenario comparison for PCC

The default scenario test for demand is to calculate consolidated demand utilising Population x Consumption. On application of this default approach it could be considered that the DWMP Wastewater tests are potentially too adverse when applied to the LTDS framework. This is illustrated in the chart below whereby the LTDS parameters are highlighted by the shaded area.

Figure 7: Demand - LTDS and DWMP wastewater scenario testing

This appearance is driven by the weighting of the LTDS benign consumption scenario test parameter set at 91 l/p/d which is potentially unrealistically benign.

From a Wastewater perspective the initial demand scenario testing delivers two messages. Firstly, that with population growth a consequential increase will result in the volume of solid matter entering the sewer network. Secondly that household and business water consumption is anticipated to decrease, which if realised could decrease the associated fluidal component of dry weather wastewater flow. However, this fluidal change could in turn be offset by plans to balance reduced freshwater consumption with locally collected rainwater so that the volume of wastewater entering the sewer network from residential or commercial activity does not change materially. This also has the consequential potential to offset any increased risk of dry weather flow sewer blockages from the anticipated reduction in freshwater consumption.

The key Wastewater sensitivity within the enhancement portfolio to increasing levels of demand is the need for greater wastewater treatment capacity (which is considered within the **Recycling wastewater and nutrient removal** strategic delivery theme). In this application, the consumption component of the demand scenario test is anticipated to have a minor impact on the need for enhanced treatment capacity as the key driver is the level of solid in the waste, not the accompanying fluid level. Population growth therefore becomes the primary scenario test variable when considering the impact of demand upon the Wastewater portfolio. Use of Population Equivalent (PE) data allows us to scale up residential based population numbers to take into account commercial activity.

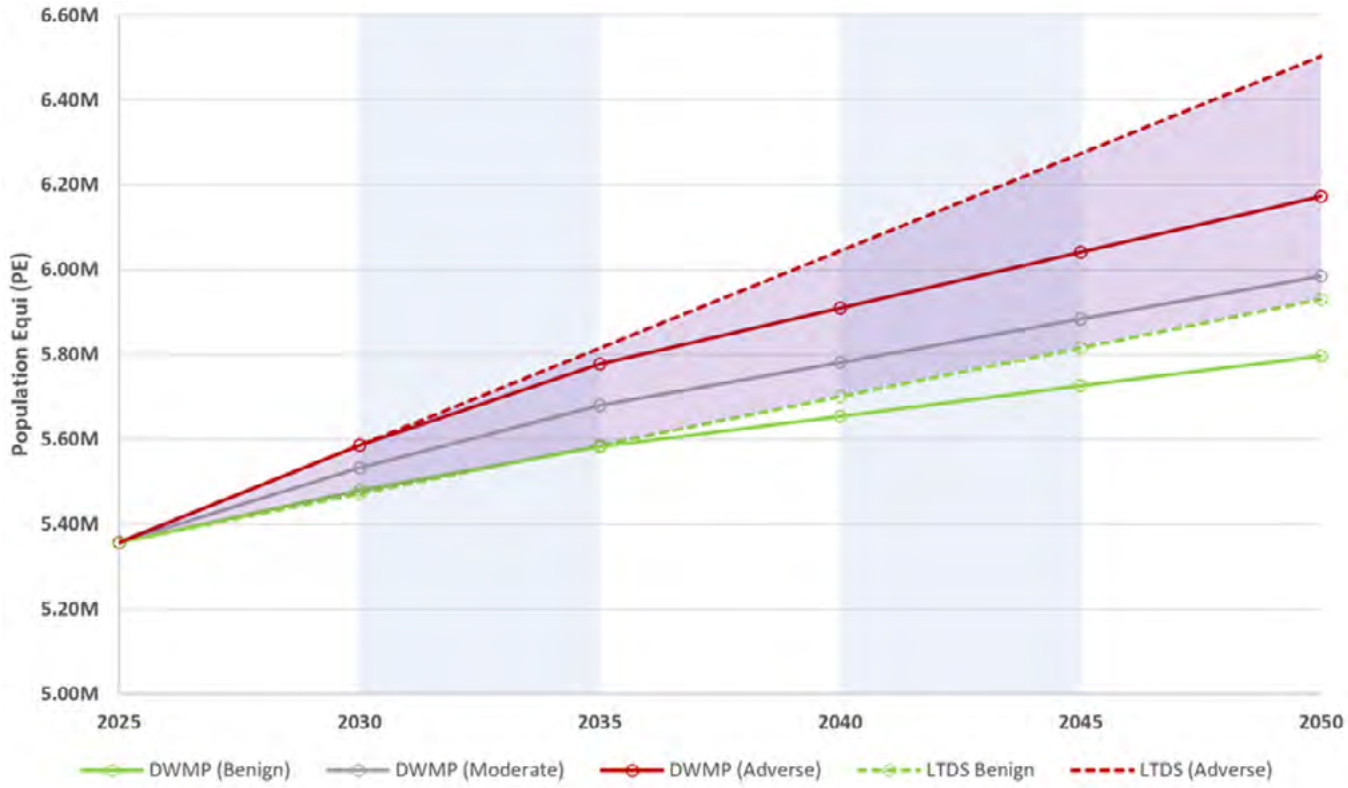


Figure 8: Population - LTDS and DWMP wastewater scenario testing

Although the DWMP population growth test could be considered as slightly too benign for Long-Term Delivery Strategy purposes, the correlation between the two is reasonable, particularly up to 2040. The three population growth tests have therefore been applied and equated to the Long-term Delivery Strategy core pathway and to two adaptive pathways. Adaptive pathways are required because without them there is a risk that enhancement spend on Wastewater treatment works as outlined within the core pathway will be insufficient to address a rise in population beyond that anticipated by the benign scenario. Insufficient treatment capacity puts our associated ambition of reducing pollution risk in jeopardy.

With the Long-term Delivery Strategy positioned on a potentially slightly more benign than desirable basis it is important to set a trigger point date for a potential adaptive pathway jump sooner rather than later.

The trigger point for a demand-driven adaptive pathway jump has been set at 2028. At **2028** the population growth benign scenario test predicts the core pathway PE (Population Equivalent) level to be **5.43m**. The moderate scenario test figure which equates to the Wastewater moderate demand increase pathway has been modelled to be **5.46m**. The adverse scenario test figure which equates to the Wastewater adverse demand increase pathway has been modelled to be **5.49m**.

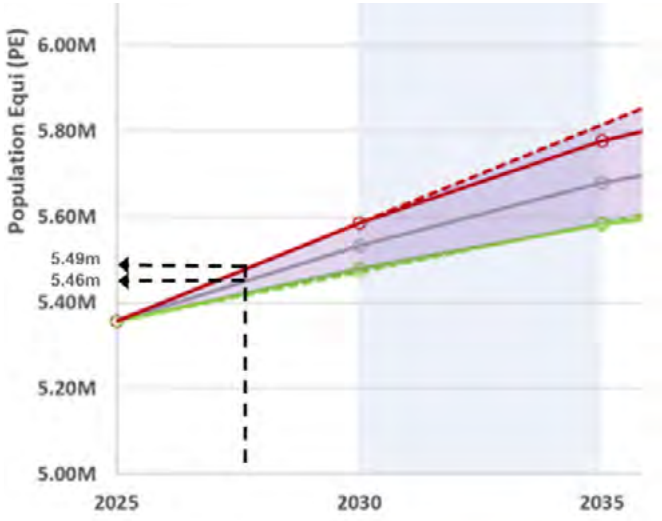


Figure 9: Population - LTDS and DWMP wastewater scenario testing

In addition to population growth as the primary metric, freshwater consumption rates and dry weather flow fluid dynamics will also be reviewed so as to deepen our understanding of the evolving dynamic of freshwater consumption reduction on the sewer network.
A decision will consequently be taken in 2028 as to whether to stay on the core pathway or jump to the moderate or adverse adaptive pathways. The primary driver of this decision will be the trigger metrics of **5.46m and 5.49m** respectively.

16.2.2 Climate change – storm flow

Climate change scenario testing is based upon the premise that the global average temperature is rising and that it is going to continue to rise in the future. The basis for our scenario testing has been the UK Climate Projections (UKCP18) analysis and the associated Representative Concentration Pathways (RCPs) which have been adopted by the Intergovernmental Panel on Climate Change (IPCC). The RCPs model the ranges of anticipated temperature rise. RCP 2.6 equates to a benign scenario, RCP 4.5 equates to a mid-range scenario whereas RCP 8.5 equates to an adverse scenario.

With regard to storm flow, the assumption is that as global temperatures rise, in the event of a storm there will be an associated increase in the magnitude of the rainfall flow into the sewer network.

In accordance with DWMP guidelines, the DWMP applies a hydraulic uplift factor to simulate the potential of increased storm flow. This has been set at a default of 20% above the 2020 storm flow baseline level. There is industry agreement that a 20% hydraulic uplift equates to the RCP 8.5 upper bound utilised for the LTDS scenario testing. DWMP guidelines suggest a sensitivity analysis of +/- 30% be conducted upon the 20% default uplift factor. Applying a 30% lower

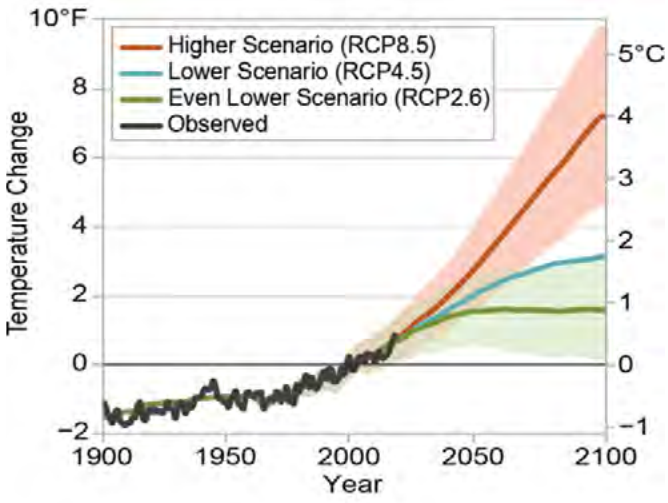


Figure 10: Global average temperature change

sensitivity adjustment results in a hydraulic model uplift of 14%. This has been assumed to approximately equate to RCP 2.6 because no models currently exist to provide an exact comparison. Two storm flow scenarios have therefore been applied to the Long-term Delivery Strategy: a 14% hydraulic uplift (estimated to equate to RCP 2.6) and a 20% hydraulic uplift (equating to RCP 8.5).

	Benign	Adverse
RCP	2.6 (Approx 1 °C increase at 2050)	8.5 (Approx 1.6 °C increase at 2050)
Hydraulic modelling uplift	14%	20%

Table 6: Impact of sea level rises on hydraulic uplift

The key Wastewater sensitivity within the enhancement portfolio to increased levels of storm flow is the need for greater sustainable drainage systems, surface water separation, and storage tank capability and capacity (which is considered within the Wastewater **Network flow management to reduce flooding and spills** strategic delivery theme).

The 14% benign scenario has been applied and considered as the basis for the Long-term Delivery Strategy core pathway with the 20% adverse scenario applicable as an adaptive pathway. An adaptive pathway is required because without it there is a risk that enhancement spend on storm flow management capability as outlined within the core pathway will be insufficient to address an increase in per-storm event rainfall flow into the sewer network. This puts out associated ambition of reducing pollution from storm overflows in jeopardy.

The potential of climate change impact is serious, but gradual in nature. The timing of decision and trigger points therefore needs to balance two factors. Firstly, the need for sufficient time for actual data to become available to demonstrate the requirement for additional enhancement spend and secondly, the need for a reasonable timeframe to deliver an operational response. Bearing these two factors in mind, the trigger point for a potential storm flow adaptive pathway jump has therefore been set at 2033. We consider that the available data in 2033 should provide sufficiently robust evidence upon which a decision can be taken as to whether to make an adaptive pathway jump.

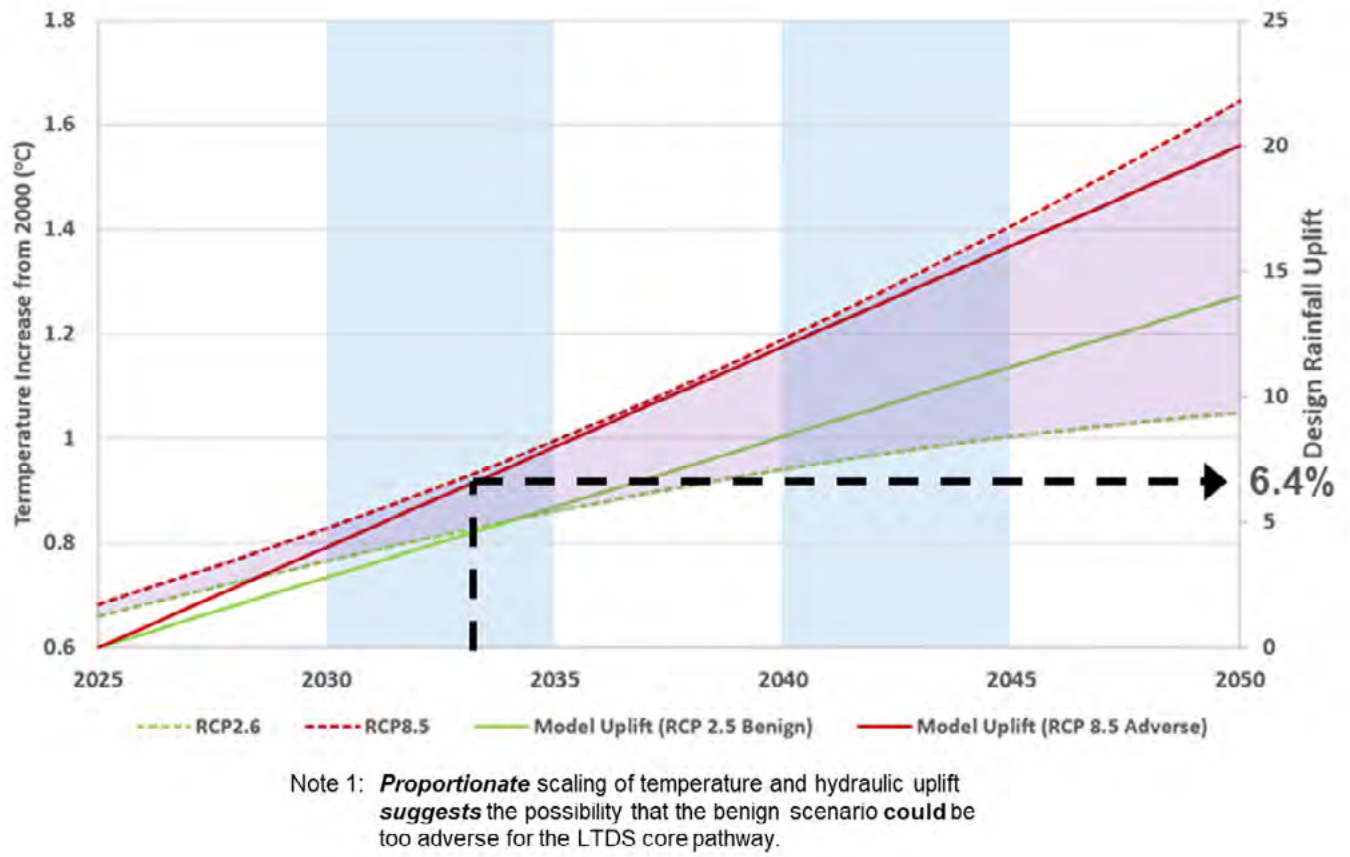


Figure 11: Uplift factor compared with RCP 2.6/8.5

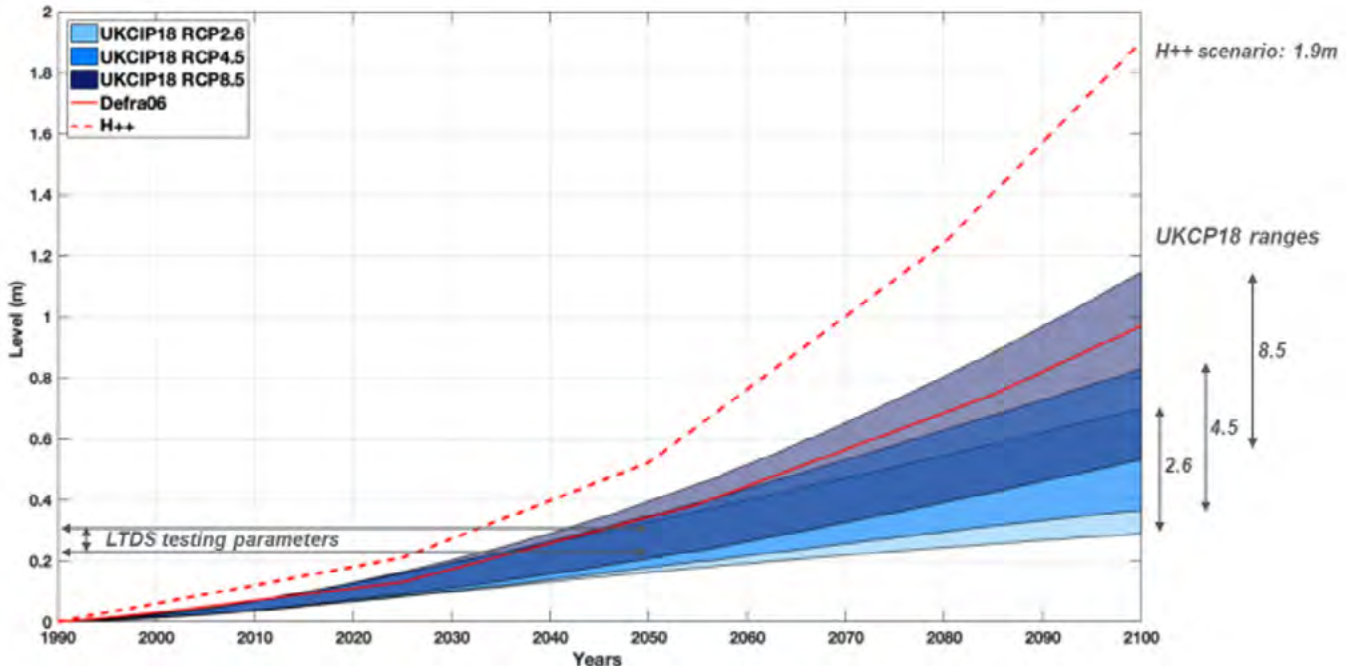
The primary metric for increased climate-change related storm flow is the hydraulic uplift factor that relates to 2020 base levels. If this reaches or is above 6.4% in 2033 then an adaptive pathway will be triggered for this strategic theme (corresponding with and incorporated within Adaptive pathway 7). The decision to potentially jump to an even more adverse adaptive pathway (Adaptive pathway 8) will not be metric related but will be qualitative in nature. The decision to jump to Adaptive pathway 8 will depend upon the considered resilience level required of the sewer network within the more adverse climate change conditions.

16.2.3 Climate change – sea level rise

With regard to scenario testing the risk of tidal flooding through sea level rise, the assumption is that as global temperatures rise, sea levels will also rise. Our Long-term Delivery Strategy modelling has been based upon the Environment Agency's flood models, specifically those that extend to the coast. In addition, we have utilised sea level analysis performed on the Thames Estuary by the University of Southampton.

Tidal levels vary across our operating area due to differences in the shape of the coastline, water depths and the gradient of the sea. To create a tidal baseline for our modelling, individual 1 in 200-year maximum tidal levels were extracted from 23 locations around our operational coastline. Using these as a basis, a mesh of tidal level values was then created to represent 1 in 200-year tidal heights across our region.

As can be seen from the chart below which utilises the Environmental Agency modelling as applied to the Thames Estuary, the Long-term Delivery Strategy testing parameters are modest when compared to the EA's overall framework. This is because the models estimate that the primary impact of rising sea levels will not be felt until the latter half of the 21st century.



UKCP18, Defra 06 and H++ MSL projections considered in this study. The shaded regions represent the 5th to 95th percentile range for the UKCP18 projections.

Figure 12: Thames Esturary – mean sea level projections

Two scenario tests were adopted for the Long-term Delivery Strategy. A 2050 RCP 2.6 50th percentile test to simulate a benign scenario for the core pathway and a 2065 RCP 8.5 "Upper end" range test to simulate an adverse scenario. Although the test adopted for our adverse scenario is more severe than the recommended Long-term Delivery Strategy upper boundary it is helpful to have a more severe test. This is because the immediate impact of rising sea levels is limited. The real adverse potential of rising sea levels is likely to impact in the second half of the 21st century. The slightly more severe test allows us to consider that potential when considering strategic remedial coastal defence work across our region.

In accordance with our benign scenario test, 18 assets were modelled at risk. This included 7 wastewater pumping stations and a number of outfalls, overflows, storm tanks and surface water pumping stations. The location of the modelled assets at risk in accordance with the benign scenario can be found in the map on the next page.

Source: Thames Estuary 2100: 10-year review. Technical monitoring report. University of Southampton, August 2021.

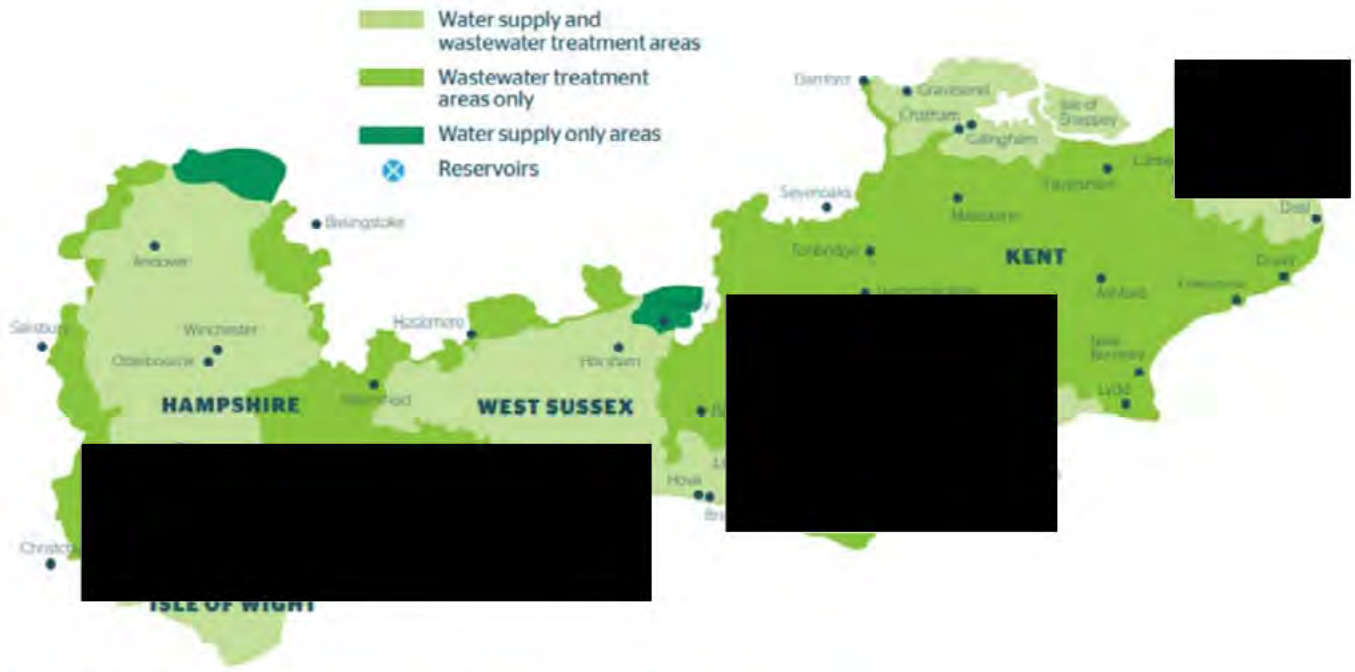
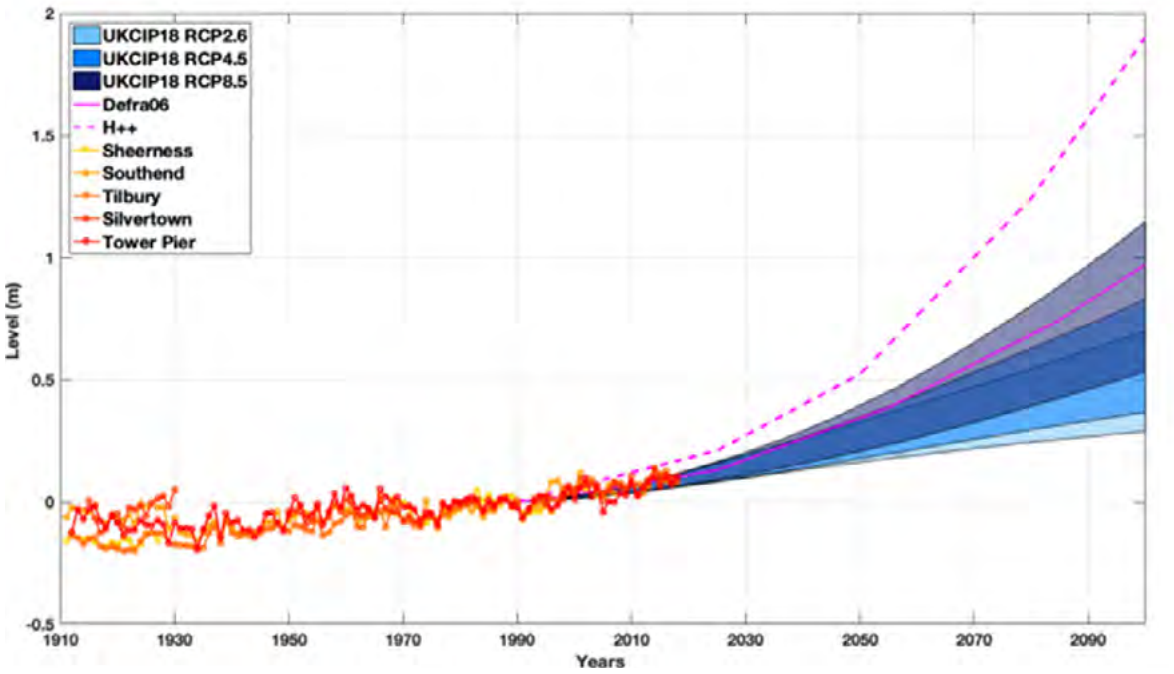


Figure 13: Sea level rise: Locations of modelled assets at risk (benign scenario)

In accordance with our adverse scenario test, 112 assets were modelled at risk. This included 4 wastewater treatment works, 46 wastewater pumping stations and again, a number of outfalls, overflows, storm tanks and surface water pumping stations. This list includes the assets identified in the benign scenario test.

The key sensitivity of our business to the potential of rising sea levels is that the operational capability of a number of our assets on the coast could be put at risk. This is considered within the Wastewater Asset health and resilience strategic delivery theme. We have a number of relevant enhancement activities planned within our core pathway to address coastal resilience. In AMP8 our strategy is to invest to protect three sites from the immediate impact of coastal erosion. Four more have been identified for protective work in AMP9. We plan to revisit our initial scenario testing on rising sea levels in AMP8 so that we can refine and enhance our modelling and improve our understanding of the impact of future sea level rises.

One potential option for us in the future monitoring of sea levels around our region is to utilise the Environment Agency's Thames Estuary monitoring plan developed by the University of Southampton (see chart below). The Thames Estuary plan leverages the Environment Agency flood models in the same manner as our own modelling. Actual sea level rises are being tracked utilising a mean sea level metric which is an aggregate mean of observations from eight recording sites (including Dover). Although tidal levels do vary across our operating area there is potential to integrate this existing monitoring into our future monitoring plans.



Time-series of MSL at Sheerness, Southend, Tilbury, Silvertown and Tower Pier superimposed with MSL projections for the period 1890 to 2100. All the time-series are offset relative to the baseline period of 1981-2000.

Figure 14: Thames Esturary mean sea leve: Actual vs. projection

16.3 Technology

Surface water separation and sustainable drainage systems

The key technological development that the core pathway is sensitive to is the planned utilisation of surface water separation and sustainable drainage solutions which are a major contributory factor towards our ambition of reducing storm overflow pollution. These solutions are more expensive than the default option of adding more overflow storage tank capacity. Despite this they have been considered due to the need to prioritise nature-based solutions which have the potential to be more environmentally harmonious and sustainable long-term. Our proposed technological and methodological approach is innovative and as such there are no guarantees that it will be as effective as anticipated in reducing the rate storm rainfall enters the sewer network. The core pathway ambition is to achieve a 30% separation of storm flow. Should this not be realised our ambition to reduce storm overflow pollution will be placed in jeopardy.

Should the 30% separation target not be realised then a jump from the core pathway to Adaptive pathway 2 will be triggered which will initiate the release of further enhancement spend to fund a programme of either new or increased capacity storage tanks to make up for any shortfall. The associated trigger point for Adaptive pathway 2 is 2028.

New wastewater approach

Our core plan incorporates new technology to increase the efficiency of how we manage our sewer network in particular with regard to the monitoring of sewer blockages and pollution. We are currently in the process of installing 22,000 sewer monitors in AMP7 reflecting an associated investment of £11m. A further £3m of enhancement investment is planned in AMP8 to conclude the current phase of development. The investment should primarily allow us to be more pro-active in our approach to blockage incidents and reduce our response times. In addition, automated water quality monitoring is being developed notably at Tankerton Beach where bathing water quality trials are being performed as part of the Pathfinder project. Throughout the current phase of technological development, analysis and review will be undertaken as to the effectiveness of these initiatives. Lessons learnt, along with the adoption of future technological upgrades will shape the next development phase in AMP9 and onwards as we move towards the utilisation of ever-more intelligent sewer management systems.

Smart water supply network

We're planning on developing our smart water supply network to deliver improved efficiency in our leakage detection and response times by integrating a number of components:

Source: Thames Estuary 2100: 10-year review. Technical monitoring report. University of Southampton, August 2021.

- **Digital Twin modelling.** Modelling network behaviour in near real-time will move leakage management to a more data centric approach, improving leak detection efficiency and reducing leak run times. In AMP8 we plan to develop this technological approach due to the significant increase in data that will result from the roll out of smart meters. In addition, it is estimated that by deploying, on average, 6 pressure sensors per District Metered Area (DMA), leakage detection targeting and burst event response could be significantly improved from current levels generating both leakage savings and efficiencies.
- **Situational Awareness.** This tool is currently being developed in AMP7 to increase awareness and response rates to network events, such as bursts, water quality and pump failures. There is an opportunity to further develop this capability by linking with the digital twin modelling to enable proactive maintenance and response to situations before they become events. We have estimated that, implemented across the whole network, these two solutions could result in leakage benefits of between 4.2 Ml/d and 12.6 Ml/d across the LTDS 25-year planning horizon.
- **Fibre Optic Networks.** This is a pioneering technology that uses either new or "dark" (unused capacity within the existing fibre optic network) to detect leakage. This technology is not yet proven but is considered to be worth exploring over AMP8 and AMP9 to both prove the viability and cost effectiveness of the technology and quantify the additional benefits that may be generated over and above those included in the digital twin/situational awareness capability.

Data to the digital network will be fed from a mixture of network sensors such as pressure and acoustic loggers, water quality sensors and an increasing volume of smart meter data as the roll-out programme is accelerated in AMP8.

Satellite and drone technology has been trialled in AMP7 to test its usefulness in detecting leaks on rural networks, especially trunk mains. Trunk mains leakage is a small component of overall leakage and therefore benefit for leakage reduction is considered minimal. Satellite and drone technology has not been taken up in our WRMP.

Further information and context on our smart water supply network plans can be found at: Draft WRMP 2024: Annex 17: Leakage strategy

Smart meter penetration

Implementing our smart water meter programme is a key component of our strategy to deliver our ambition in:

- Lowering water usage in homes and businesses
- Reducing leakage

In AMP7 we have been piloting schemes in Southampton, Andover, Midhurst and Brighton to test the assumption that we can reduce water consumption by 3% - 5% over a year by giving customers data on how much water they use. Our ambition is to reduce consumption to 110 l/p/d by 2050 and we are planning for smart meters to help deliver 25% of that saving. To enable this, we are planning to implement a wide-spread penetration of smart meters to customers in AMP8 [Ref: Draft WRMP 2024 Annex 16: Smart metering]. This penetration is intended to be as far as reasonably practicable. The scope excludes those customers in flats where the building is metered, businesses in shared premises and customers who refuse or where we are unable to obtain access. Delivery of this programme in AMP8 would put us well ahead of the scenario testing parameters (2035 to 2045) outlined in the Ofwat guidance notes [Ref: PR24 and beyond: Final guidance on Long-term Delivery Strategies]. We are also considering, subject to customer acceptability, introducing innovative tariffs, that incentivise water efficiency. We believe however that this cannot be done without clear, accurate metering and so we consider smart meters an essential step before exploring the further strategic development of our tariff structure.

In addition to lowering water usage we are intending to utilise the near real-time data from smart meters to help us to better identify and fix leaks in our network. Smart meter data should improve response times and narrow the search area for leak location improving the speed of repair.

Low-emission HGVs, fleet and carbon-free baseload electricity

Our strategic approach towards low-emission HGVs and fleet is to review the costs and benefits of the differing technological possibilities as they evolve and adopt them as and when it becomes pragmatic to do so.

Immediate purchases of new HGV vehicles are likely to favour diesel as the default engine of choice. In the near future (AMP7 / AMP8) there is the potential to adopt HVO (Hydrotreated Vegetable Oil) fuel which has the benefit in that it can either be implemented by purchasing new vehicles or by converting existing diesel ones. Alternative technologies such as EV (Electric Vehicle) or LNG (Liquid Natural Gas) are not yet pragmatic options. Any adoption of these technologies is not considered viable until AMP9 at the very earliest, as further technological development is required to make them practical for HGV application (in particular LPG which currently has a notable explosion risk when refuelling).

The adoption of EVs for fleet purposes is currently being determined in accordance with the usage intent of the individual vehicle. Up-front costs for EVs are much higher than for Internal Combustion Engines

(ICEs), but the running costs are much less. Introducing EVs as part of the fleet mix for high mileage usage therefore has significant potential. Pilot projects are planned in AMP7 and AMP8 to investigate this potential. Lessons learnt, along with the continued future development of enhanced EV technology, particularly with regard to battery enhancements will shape further fleet EV adoption plans in AMP9 and beyond.

The United Kingdom has committed to a decarbonised grid by 2035. The majority of our electricity is purchased from the national grid and we will continue to do so as per the United Kingdom electricity operating framework.

Open access to datasets

Progress towards open datasets is being driven by the need to fully understand the associated pragmatic and realisable benefits and value. The idea of synchronised, single, quality data sources is clearly appealing, but the way in which they would work and how their value would be leveraged remains unknown. We plan to explore the potential of open access to datasets by developing partnership schemes whereby the value of joint sharing solutions can be ascertained.

Low-carbon construction materials

We continue to adopt and follow strict guidelines and best market practice as to the usage of the materials we use in our operations. As low carbon materials become industry-approved we will adopt their usage in accordance with recommended industry best practice.

We are actively engaging with our partners in the development and utilisation of a carbon assessment tool. The tool will aid us in the implementation of a consistent approach to our intent of improving carbon decision making by allowing us to adjust designs so that they optimise a net zero carbon impact.

Risk of technology failure and threats from cyber crime

We continue to maintain and upgrade our systems in accordance with industry regulations and best practice. New IT technology is only approved after the cyber risk has been reviewed and the associated risks considered minimal. We believe our plan to continue adhering to industry-led best practice reduces risk and will help maintain our operational resilience both in AMP8 and into the future.

16.4 Additional scenarios

One additional scenario has been considered in addition to the four common reference scenarios.

Bioresources – Partial ban on farming as a waste product disposal route

In 2025 DEFRA and EA rules governing the use of biosolids as a phosphate-based fertiliser for farming will be reviewed. Our bioresources core pathway assumes that following this review the regulations surrounding farming-based disposal of wastewater biosolids will continue materially the same. However, the review could result in a completely adverse outcome in that a partial ban on farming as a disposal route is implemented. Should this adverse outcome be realised our core pathway strategy will become unfeasible.

This scenario has been considered and an alternate strategy devised, as described in Adaptive pathway 1. Should the 2025 DEFRA and EA rules review result in an adverse outcome then a jump from the core pathway to Adaptive pathway 1 will be triggered. The adaptive pathway trigger point is the timing of the review with the associated metric being the outcome of the review.

17. Long-term strategy comparison

17.1 Consistency with existing long-term plans

Our LTDS has been developed in parallel with our DWMP (published in May 2023), our WRMP24, where the Statement of Response was published in August 2023 and the revised draft WRMP was provided to regulators, and WINEP.

These three plans have provided the majority of the inputs to our LTDS, and the LTDS adaptive pathways have been developed in collaboration with the teams developing each plan, and in the case of water with the six south east water companies via WRSE. The long-term targets in the LTDS have been set consistently with those in the dWRMP and DWMP. PCs that align with the dWRMP include leakage, PCC, business demand, unplanned outage and mains repairs. PCs that align with the DWMP include pollution incidents, storm overflows, internal sewer flooding, sewer collapses, bathing water quality, and discharge permit compliance.

17.2 Consistency with previous long-term plans

We did not choose to develop a Strategic Direction Statement at PR19, meaning that the most recent available was that developed for PR09. The PR09 statement was found not to have fully anticipated a number of key trends that now shape the sector, including the increased public perception of the importance of chalk streams, the move to being resilient in a 1:500 drought and the transformed public view that no level of discharge via CSOs is socially acceptable, regardless of weather conditions or the original design. At PR19 we did publish a forward-looking horizon scanning document, Water Futures South-East.

To respond to the changed circumstances we updated (but did not republish) Water Futures South-East identifying which trends had continued or increased and what was new between PR19 and PR24. The results are described in our draft Long-Term Priorities published in 2022 and summarised in section 4 of this Annex. Our long-term priorities and the way they have been translated into this LTDS have been informed by this comprehensive update of the trends and challenges we face.

17.3 Comparison with PR19 performance commitments

We are now in the third cycle of WRMP planning and this helps to ensure continuity of the approach to managing water resources in the long term. The DWMP is new but the concepts behind it, including the use of adaptive planning, are similar to the WRMP so we expect the drainage and wastewater plan to mature in future cycles and to provide the same continuity.
The table below shows a comparison of the PCs at PR19 and those we are setting now, where there is comparability. Wherever possible we have continued or extended the PR19 target, though there are examples of where we have needed to take a more achievable view. The cost forecasts and bill impacts in the long-term show that we must prioritise spending on the areas that are most important to our customers.

PC	PR19 2045	PR24 2050	Comment
Leakage Ml/d	58.5	48.4	We continue to target leakage reduction as a key component of our response to manging supply and demand in a water stressed region
PCC l/p/d	90	105.6	COVID and recent weather conditions have caused demand to increase. We have set our PCC measure at stretching but realistic level, recognising that we are partly dependent on the success of Government activities to promote and require water efficiency
Unplanned outage	2%	2%	Continuation of the PR19 target
Pollution incidents	0	0	Continuation of the PR19 target
Discharge permit compliance	100%	100%	Continuation of the PR19 target
External sewer flooding	1000	1000	Continuation of the PR19 target
Water supply interruptions (mins)	1:00	02:00	We have acknowledged the need for greater operational resilience in our water network and have set a more achievable target
Compliance risk index	0	1	Customers do not set this measure as a priority and while we continue to invest heavily in treatment works upgrades, nitrate treatment and disinfection, we have set a more realistic target

Table 6: Comparison of PR19 and PR24 Long-term performance commitment forecasts

17.4 Lessons learned

The move to resilience in a 1:500 drought combined with the likelihood of ever-increasing pressure to reduce abstractions from chalk sources demonstrate that in our region we will need to continue to invest in alternative sources such as water recycling and desalination. These technologies are perceived as both relatively expensive and less preferred than other options by customers, such as more storage and reducing leakage. Demand side measures will not be sufficient to address our supply / demand deficits in dry weather, and we will need to work with our regulators, customers and stakeholders to ensure that new sources are both affordable and acceptable.

The emergence of the CSO, flooding and pollution issues as being unacceptable at any level was not sufficiently anticipated. We will need to ensure we are able to adapt quickly to changing public perceptions and industry pressures and extend adaptive responses from water resource management to all parts of our business.

18. Customer affordability and fairness

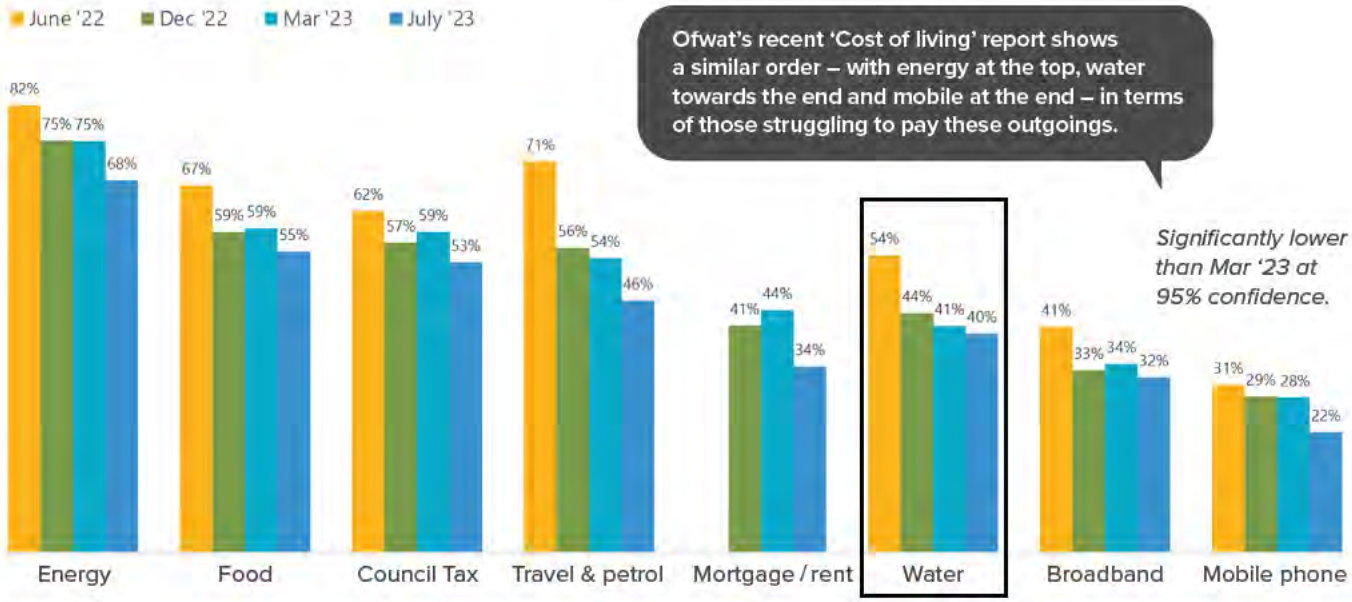
The importance of bill affordability is nuanced. Current bills today are felt to be relatively affordable compared to other utilities and household bills. However, the cost-of-living crisis means customer are feeling the squeeze. In the most recent data sources and with proposed increases to bills, future affordability has risen as a key priority in testing of the plan. We also see the relative importance significantly increase for bill payers, who ultimately will be funding the investment from 2025-2050.

"This is the big one now, overtaking the pandemic; families are hit hard and will have to make some major changes to their lives."
Households customer panel

Current Situation:

Our research shows that around 25% of our customers struggle with being able to comfortably afford their outgoings[5], and 7% really struggle. Analysis of demographic data shows that around 30% are in the lower social grades, with the Isle of Wight and North Kent having around 34% in the lower income levels compared to more rural areas of North and Central Hampshire and North Sussex having between 22-27%. In national research by Ofwat we see that up to 57% can sometimes struggle to pay household bills[6] over the last year.

Around 40% of our customers are concerned around future water bills. The greatest concern from customers on future bills is for energy, food, council tax and travel / petrol. Concern peaked in June 2022 and has slowly been decreasing since the height of the cost-of-living crisis.



And thinking more generally, how concerned are you about being able to afford the following household bills and expenses over the next 12 months.
Base: Southern Water customers, Wave 1 (1009), Wave 2 (1013), Wave 3 (1010) Wave 4 (1001).

Figure 15: Concerns with future affordability: T2B concern

We have heard from customers that whilst water bills might be relatively affordable today, middle income families are feeling the 'squeeze' with income not keeping up with rising costs. Any increase in prices then mean customers must trade-off in other areas of their lives. For those that are struggling today any increase to bills is a real concern. They need help and support through schemes (e.g. social tariff) and payment flexibility to aid budgeting. Even customers who do not struggle with their bills and our future customers want to ensure the most vulnerable are supported. Businesses reference their need for stability of bills to help them plan and budget.

Future Investment:

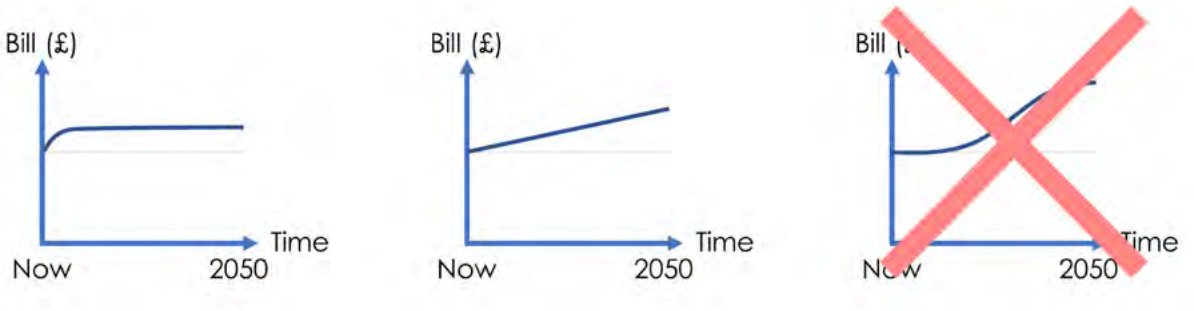
Our customers have told us the environment is central to everything we do and whilst bills need to be affordable, this shouldn't be at nature's expense. They are prepared to invest now for future generations, and we must support those that need it most. Our customers have consistently told us they want their bills to be as 'smooth' as possible, balancing keeping bills low for those struggling with cost of living today and improving the environment.

Customers expect a blend of solutions that think about best value for the long term and show credible

[5] Water Futures Quant – Wave 4 July 2023.
[6] Ofwat Cost of Living Research March 2023.

progress in the short term. They want us to make decisions that are based on best value. They often refer to investing properly now rather than an issue getting worse and having to pay more in the long run. They want us to use our expertise to go over and above, with the greatest focus on environmental benefits.

When talking about long term investment, through many different research projects, customers have consistently told us that they do not want to delay investment to place the cost on future generations.



Instead, customers prefer a smoother increase. Some customers (e.g. larger businesses) prefer a jump in the short term they call a 'reset' while others(e.g. lower income) would rather keep bills as low for as long as possible to help with the current crisis.

Reaction to price options:

When we look at specific pricing options we see higher bill impacts begin to raise a number of challenging questions and an initial defining of the limits as to what is deemed to be affordable. Over the Spring of 2023 we hosted several workshops to test a number of bill scenarios with customers.

- Customers were shocked when asked to consider a scenario that increased bills to £733 (pre-inflation) in 2030. Even more so when inflation was taken into account (and applied incrementally)
- There was less initial concern but when we reached year 2027-2028 onwards this scenario bill increase felt unaffordable for many of our customers, adding to the worry of what already feels like an uncertain future
- Many claimed they simply feel they could not afford an increase such as this
- Different scenarios with a predicted bill impact (rising to £677 pre-inflation) of the Proposed Plan was seen as affordable for most customers
- Affordability perceptions are not just about having the financial means to afford the predicted bill impact, but also often a belief that water is a relatively cheap commodity with research having opened customers' eyes to how much goes on behind the scenes
- The wider context of all household outgoings increasing in recent years also makes the predicted bill impact less of a shock, and for some can help justify it
- However, there are some who will find it harder to afford the predicted bill increase
- These customers are more likely to be lower income, vulnerable and larger (family) households who are feeling squeezed in all directions by the current cost of living crisis
- But there is also a small amount of principled objection to the Proposed Plan from some customers in this response
- For those with genuine affordability issues, it is essential that we work hard to identify them and promote awareness of the support available e.g. Social Tariff, as well as help with how to adopt measured behaviour change to keep bills manageable

In order to mitigate this level of increase, customers felt that Southern Water should:

1. Fund a larger proportion from profits rather than customer bills
2. Give additional support to customers over and above those on low incomes e.g. including those on middle incomes
3. Bring in new tariffs that take into account property size and / or better reward water efficiency

Our research into future tariff options highlighted that those with health vulnerabilities often have a need to use more water, they feel it is unfair to be penalized for this to stay healthy and clean.

Long-term Delivery Strategy: Ambition vs. Affordability

Our Long-term Delivery Strategy needs to balance customer and stakeholder feedback that wants us to be ambitious and deliver our Long-term priorities. However the investment required to achieve that ambition will be substantial and will cause bills to notably rise. Customer affordability will therefore undoubtedly continue to be an issue throughout the Long-term Delivery Strategy period as we look to fund our joint ambition.

19. Enhancement funding preparatory work

As presented In Section 12. Adaptive pathways 5 and 6: Water moderate demand / moderate and high abstraction reduction scenarios we have two key high-level strategic decision points for our Water business.

The first, is a demand-based gateway at the end of AMP8, with the second a predominantly abstraction reduction-based gateway (along with a consideration of climate change) at the end of AMP9.

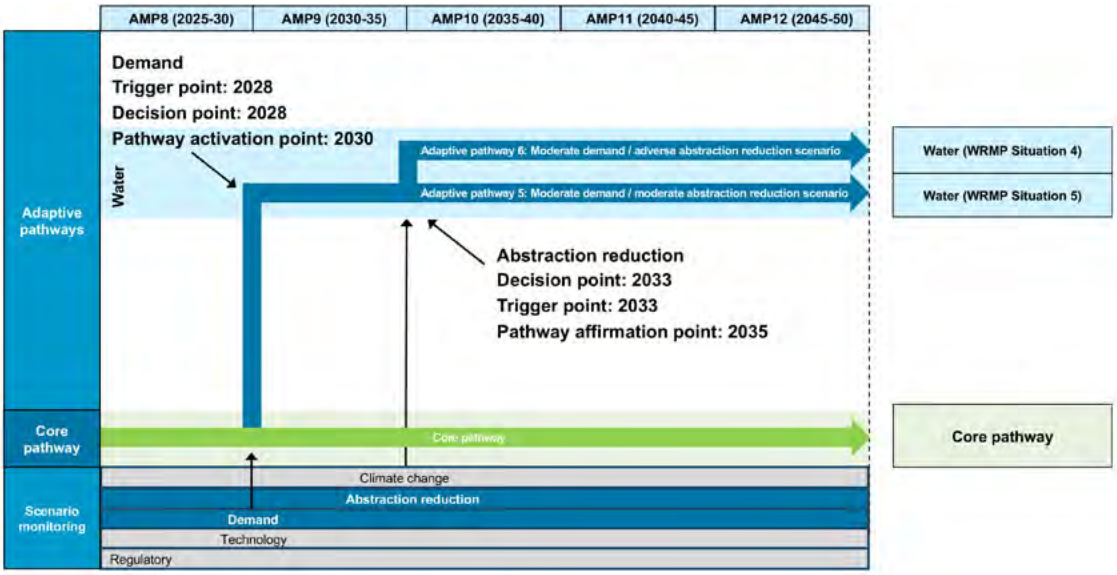


Figure 16: Water: Adaptive pathway 5 and 6 – Moderate demand / moderate and adverse reaction scenarios

Six key strategic Water schemes / projects lie beyond AMP9 in Adaptive pathways 5 and 6 which can be identified below.

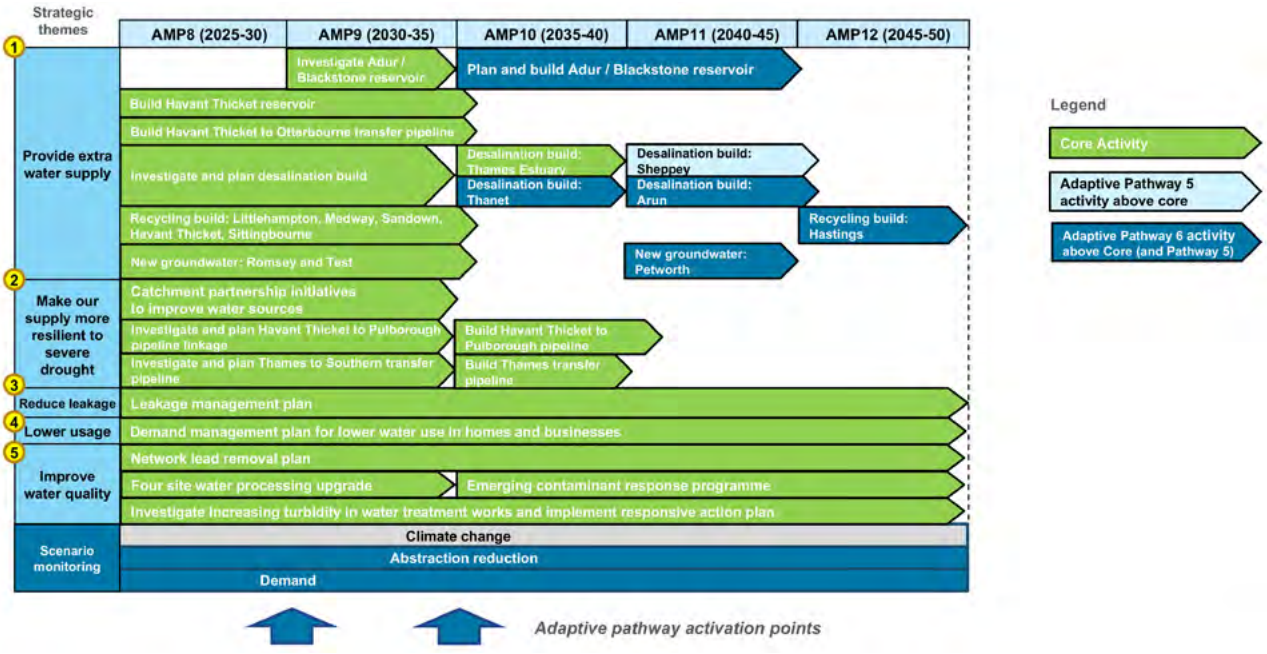


Figure 17: Water: Adaptive pathway 6 (WRMP Situation 4) Moderate demand / adverse abstraction redution roadmap

The key projects include:

- New Adur / Blackstone reservoir
- De-salination build at Thanet, Sheppey and Arun
- New recycling plant at Hastings
- New groundwater source at Petworth

Due to the lead time required for key infrastructure projects it is anticipated that some or all of the above projects will require planning time in AMP9. This is likely to be particularly in connection with e.g.

- Confirming the local need
- Confirming the proposal is the best option
- Confirming the site location
- Obtaining planning permission
- Assessing and confirming the build scope of the project
- Short-listing and appointing contractors for the various aspects of the project

This will need to be achieved before any construction work is initiated.

The urgency of the relevant planning work for these projects can be clarified at the end of AMP8 when assessments can be made as to how regional and localised water demand is developing. However, the major gateway lies at the end of AMP9 when confirmation is available as to the extent and location of required abstraction reductions.

The undertaking of this planning work in AMP9 will allow us to be in an advanced state of preparedness should the planned additional enhancement build on the above identified projects be required - without going too far so as to commit to actual construction. This allows us to protect the potential customer need and if we decide to go ahead with these projects beyond AMP9, in taking the decision closer to the time we will be able to ensure the customer need is required and can be met in a timely manner. This provides value for money in delivering the enhancement at the correct time to meet the customer need.

The Long-term Delivery Strategy for Wastewater encompasses a much greater number of smaller projects so does not have a particular need for a time of required enhancement funding preparatory work in the same way that our Water business has, as highlighted in AMP9.

Chapter 4

Foundations

20. Uncertainties and assumptions

Detailed in this section are the additional uncertainties and assumptions that we have considered in the preparation of our Long-term Delivery Strategy. We have not re-stated here the underlying assumptions and uncertainties connected with the demand, climate change, abstraction reduction, technology and regulatory factors that have shaped our core and adaptive pathways. The uncertainties presented here are generalist in nature and so can be considered as relevant across all our pathways. When reviewing our uncertainties and assumptions we found that they were intrinsically linked so have presented them together in this combined section.

What we think will be stable over the period

Our key assumptions about our wider political, social and economic environment are that over the 25-year period:

- The country will enjoy political and social stability
- Our region will not be subject to a widespread cataclysmic event such as an engulfing war, earthquake, meteor strike or other such event that would cause widespread and simultaneous destruction of assets
- We may face future challenges such as a further pandemic but economic and political structures will be broadly resilient to these
- The economy will recover from current conditions and show growth and increased productivity, much of which will derive from innovation
- The UK will continue to be an attractive place for investors, including for example international sovereign wealth funds, international asset managers and UK pension fund investors

Where we think the greatest uncertainties lie

We have identified seven key uncertainties outside those specific factors which have contributed towards the design of our adaptive pathway approach. We have assessed the anticipated magnitude and likelihood of the risk of the uncertainty and have detailed our associated assumption and potential response. The seven key uncertainties include:

1. Availability of skills, materials and capacity of the supply chain to support the Long-term Delivery Strategy investment programme
2. Availability of capital
3. Long-term construction material inflation outstrips general inflation
4. Long-term general level of inflation outstrips wage increases
5. Water industry renationalisation
6. Ability to build new infrastructure
7. Localised war, terrorism or cyber-attack risk

Key uncertainty 1: Availability of skills, materials and capacity of the supply chain to support the Long-term Delivery Strategy investment programme

Issues	• Our long-term ambition and investment programme is of substantial size • The rest of the water industry is likely to be pursuing major investment programmes at the same time • Other major national and international infrastructure projects will also be competing for skills and materials • In such circumstances, will we be able to successfully support in terms of skills, materials and supply chain capacity the asset investment development on the scale envisaged?
Impact risk	• High
Probability	• High
Assumptions	• Our supply chain will be able to deliver the materials that we require • We will be able to invest in our own talent and attract the right technical and operational skills to see projects through
Response	• We must ensure strong relationships with suppliers and aim to build loyalty and strong contractual relationships in the supply chain over the period • The company must invest in and nurture its own skills, particularly technical, project management, engineering and procurement skills

Key uncertainty 2: Availability of capital

Issues	• With geopolitics driving the development of two distinct trading blocs (Western G7 vs. BRICS 11) will key sources of infrastructure capital e.g. China and Middle Eastern sovereign wealth funds continue to be a source of major capital investment in the future? • If so, will future water industry investment be more limited to G7 sources e.g. Western asset managers such as Macquarie or Legal and General? • Will the industry as a whole, and Southern Water in particular, continue to be an attractive place to invest? • Will we be able offer a rate of return proportionate to the future capital demands of investors?
Impact risk	• Medium
Probability	• Medium
Assumptions	• Water industry financial regulatory framework continues to promote investor confidence • Wider environmental regulation remains proportionate and commercially viable solutions can be negotiated and agreed • Investors maintain confidence in the governance and management of the company • Potential future unforeseen events do not irreparably damage public, political, regulatory and investor confidence in the water industry
Response	• We will demonstrate progress on our strategy and work with government, regulators and investors to ensure our industry and business continues to be attractive to investors

Key uncertainty 3: Long-term construction material inflation outstrips general inflation

Issues	• Will the future cost of construction materials outpace general inflation? • On the assumption that Ofwat will be keen to manage future bill increases in line with general inflation the potential exists for a deficit to open up between future income and construction costs • This has the potential to put the future finance-ability of our enhancement programme in jeopardy • This scenario has the potential to facilitate the need either for further capital injections or to the delaying or shelving of critical projects
Impact risk	• Medium
Probability	• Medium
Assumptions	• Gap between construction material inflation and general inflation will not be excessive
Response	• Will require strong contractual relationships with sub-contractors, tight budget management and realistic contingencies • Discussion with Ofwat should a significant income / cost gap begin to become apparent

Key uncertainty 4: Long-term general level of inflation outstrips wage increases

Issues	• If long-term general inflation remains high and wages do not increase at the same rate then our customer base will become poorer over time • This has the potential to put pressure on future bill increases as affordability could become an increasing political issue • This could put Ofwat under pressure to restrict bill increases at a time when bill increases are required to fund our long-term ambition • The potential therefore exists for a deficit to open up between future income and our enhancement ambition
Impact risk	• Medium
Probability	• Medium
Assumptions	• Household income will rise broadly in line with inflation over the longer term • Potential for the less well off of the customer base to be hit the hardest should inflation remain high • Public opinion continues to accept the need for bill increases to ensure the delivery of enhancement programmes, particularly those relating to the environment
Response	• Careful monitoring of economic trends • Managing vulnerable customers through initiatives such as social tariffs • Managing regulator relationships to continue to make the case for necessary price increases to secure asset enhancement programmes and required investment

Key uncertainty 5: Water industry renationalisation

Issues	• Could a future government seek to renationalise the water industry?
Impact risk	• Low
Probability	• Low
Assumptions	• Broad assumption is that current regulatory and ownership structures will remain the same for the foreseeable future • Should renationalisation happen, our assumption is that there might be short term disruption, but that there would be less impact over the longer term
Response	• Should renationalisation happen, we would seek to make the best possible response in any given circumstances and in the interests of the environment, customers and stakeholders • Transfer of assets/capital requirements to public sector could lead to disruption but is unlikely to alter substantively the demands on the industry and what it has to do to satisfy those demands. We would endeavour to continue delivering our Long-term Delivery strategy under the new operational arrangements

Key uncertainty 6: Ability to build new infrastructure

Issues	• Our Long-term Delivery Strategy requires us to build a number of key pieces of infrastructure such as potentially two new reservoirs, transfer pipelines, recycling plants and desalination plants • All will likely require a mixture of planning permission, public consultation, legal and judicial consideration and review • The South-East of England is densely populated. Sizeable, new infrastructure assets such as desalination plants will undoubtedly have an impact upon communities local to where they are likely to be built. Local and political opinion can quickly rally against such projects • Will we be able to secure the necessary permissions for the major projects we plan to build?
Impact risk	• High
Probability	• High
Assumptions	• We have a convincing case that can influence and secure public consent • We have the expertise and resource to secure the required planning and other regulatory consents
Response	• The process of securing consent will require major focus, commitment, engagement, legal expertise and communication skills • Strong, sustained public engagement will be a necessity

Key uncertainty 7: Localised war, terrorism or cyber-attack risk

Issues	• A number of our water and wastewater assets are considered as critical national infrastructure and could potentially be subject to attack • War risk is generally rated low, although the current war in Ukraine and its impact on different sectors, not least energy, show how an unexpected crisis can arise
Impact risk	• High / medium
Probability	• Low / medium
Assumptions	• Assumption is that these events will not happen in a way that would materially affect the plan
Response	• Continuous monitoring of the environment and agility to respond rapidly to changing circumstances • Physical security to be upgraded at sites deemed to be of critical national infrastructure • Cyber defence capabilities to be upgraded in accordance with industry profile and evolving threat landscape

Progress on our Long-term Delivery Strategy along with the ongoing assessment of evolving uncertainties and our associated assumptions form part of the annual review process for our WRMP and DWMP. In addition, our Board, Audit and ESG committees will continue to review the risks associated with our political, regulatory, economic and legal environment on an ongoing basis.

21. Base expenditure improvements

21.1 Summary of base expenditure improvements

In developing our strategy and achieving our ambition we have considered the performance we could deliver from our base allowances. We have combined a mix of approaches in forecasting what base buys after 2030 depending on the framework guidance on how to develop the solutions and options for the problem characterisation. These were generated by a combination of historic performance and using risk assessment methodologies. The slightly different approaches are identified below:

Final methodology approach. For some PCs we have continued with our approach for PR24 delivery. This has been used mainly for outcomes that fall outside of the frameworks that have specified approaches.

A bow-tie analysis was the starting point for the assessment of actions against cause to event and event to consequence is effective, and that factors that could cause failures are recognized.

WRMP framework. Our WRMP used the following approach:

- Problem Characterisation, to assess the risks following the UK Water Industry Research (UKWIR) guidance (UKWIR, 2016a and UKWIR, 2016b) for risk-based planning
- Options development and appraisal, that started with unconstrained list and then refined through to solutions to best value

DWMP framework. Our DWMP uses a risk-based approach to our planning objectives.

This approach followed the national guidance and consisted of:

- Risk Categorisation into 3 bands, not significant, moderately significant and very significant risk
- Problem Characterisation, to explore the causes of the risks and those with the highest levels of concern
- Options development and appraisal, that started with unconstrained list and then refined through to solutions to best value

We have grouped the outcomes into three sets below based on our forecasts of delivery as follows:

- Improvements from base expenditure will continue over 25 years
- Flat delivery from base expenditure with no improvement of deterioration
- Base expenditure is unable to maintain the outcomes against the worsening environment

Continuing Improvements from base expenditure

Over the next 25 years we consider that only one outcome will continue to see improvement from base performance. This is only part of the story as our WRMP identifies 2 enhancement activities, mains replacement and advanced pressure management, that will further reduce the number of repairs needed.

Performance commitment	Unit	2029–30	2034–35	2039–40	2044–45	2049–50
Mains repairs	Number per 1,000 km of mains	158.1	169.2	163.4	158.2	152.8

Table 1: Outcomes where Base delivers improved performance over 25 years

Note: These values can be found in data tables LS2

Maintained performance from base expenditure

Most of our outcomes we can maintain from base expenditure. This has been evaluated with consideration to the deterioration of the external environment including demand and climate change offset by efficiencies and technology. This performance is below our ambition and the required environmental and government targets and will need enhancement investment to achieve these goals.

Performance commitment	Unit	2029–30	2034–35	2039–40	2044–45	2049–50
Compliance risk index (CRI)	Nr	4.06	4.06	4.06	4.06	4.06
Water supply interruptions	hh:mm:ss	00:08:31	00:08:31	00:08:31	00:08:31	00:08:31
External sewer flooding	No. of incidents	3,160	3,160	3,160	3,160	3,160
Biodiversity	BDUs	0	0	0	0	0
Operational GHG	Kt CO2e	220	224	229	235	241
Leakage	Ml/d	78.6	77.9	77.9	77.9	77.9
Pollution incidents	No. of incidents	63	50	50	50	50
Discharge permit compliance	% treatment works compliant	71.2%	71.2%	71.2%	71.2%	71.2%
Bathing water quality	%	88.7%	86.2%	86.7%	86.7%	86.7%
River water quality	% reduction	34.6%	34.6%	34.6%	34.6%	34.6%
Storm overflows	average spills per overflow	21	21	21	21	21
Unplanned outage	% of peak capacity	3:31	3.31	3.31	3.31	3.31
Sewer collapses	No. of sewer collapses	230	230	230	230	230

Table 2: Outcomes where base expenditure maintains performance over 25 years

Note: These values can be found in data tables LS2

Maintained performance from base expenditure

We have identified that for some outcomes base expenditure would be unable to maintain performance due to the deterioration of the external environment including demand and climate change which would not be offset by efficiencies and technology. In addition, all of these outcomes have ambition targets beyond the base performance and require enhancement expenditure to meet these goals.

Performance commitment	Unit	2029–30	2034–35	2039—40	2044–45	2049–50
Water quality contacts	Customer contacts per 1,000 population	0.92	0.92	0.94	1.00	1.04
Internal sewer flooding	No. of incidents	244	244	249	254	259
Per Capita Consumption	l/h/d	128.9	128.4	137.4	137.3	137.2
Business Demand	Ml/d	109.9	111.0	111.9	112.6	114.0

Table 3: Outcomes where base expenditure is unable to maintain

Note: These values can be found in data tables LS2

Chapter 5

Board assurance

22. Board assurance

This Board Assurance Statement on our Long-term Delivery Strategies (LTDS) should be read in conjunction with our broader Board Assurance Statement which covers all other areas of the plan:

We, the Board of Southern Water (SWS), have carefully considered the requirements of the PR24 LTDS Board assurance process and are pleased to provide the following Board statements.

We have challenged the business and satisfied ourselves that the Long-term Delivery Strategy is high-quality. We commissioned a range of technical and strategic assurance that was conducted to support the development of the PR24 Plan and our LTDS. Our engagement on our Long-term Strategy and priorities culminated in a full Board session on the topic in November 2022. The approach to LTDS is based on adaptive planning principles and we have developed it in line with specific Ofwat guidance. The LTDS has also been informed and guided by input from our customers – material that has been shared with the Board at regular intervals throughout the development of the PR24 plan.

Central to the LTDS has been the development of both our WRMP and the DWMP. The Board has been engaged and approved key submissions on the DWMP and the WRMP both of which meet our statutory and regulatory obligations (the WRMP is subject to regulatory uncertainty as described in the Data and Assurance chapter), as reflected in the assurance we have had on both submissions. As discussed in our broader Board Assurance Statement, the Board understand the uncertainty around the WRMP and supports the on-going dialogue on the matter with our regulators.

22.1 Shared long-term vision and ambition

As a Board we have been involved in shaping the long-term ambition, reflected in the LTDS, a process that started in late 2021. We have been engaged on a number of occasions culminating in a session in November 2021, where we discussed and identified our key priorities for the ambition into the future. These have been reflected in the LTDS. These developed into a set of long-term priorities that set our overall ambition for the future which was included as part of consultations in the summer of 2022. As a Board we are confident that these ambitions have been reflected in our long-term strategies.

In November 2022, the Board received feedback from our stakeholders and customers, allowing us to reflect and adapt our plans based on this input. As a Board we have also been heavily engaged in key regulatory submissions that feed into our LTDS including our WRMP, DWMP, WINEP and DWI submissions. In each case the Board has reviewed relevant assurance to support Board approval of each submission.

22.2 Best high-quality strategy

The Board has been able to consider the LTDS plan, including the strategic frameworks, and ascertain the quality and how the plans and strategies address our future challenges and the significant levels of uncertainty. In addition, our LTDS and wider plan have had significant scrutiny from our stakeholders and customers. This feedback has been shared with the Board throughout the PR24 planning process.

The Board has had visibility of the outputs of consultations and assurance and submission relating to several regulatory submission including the WRMP and WINEP. We are also aware that the WRMP has been subject to specific scrutiny since June 2022, and is subject to regulatory uncertainty as set out in the Data and Assurance Chapter, and we were part of the process that approved the improved response to these regulatory challenges.

22.3 Based on adaptive planning principles

The Board has been engaged on the strategic frameworks that comprise our LTDS. Of these the WRMP and DWMP both apply adaptive planning principles. This has allowed us to better understand how future decisions, using evidence-based thresholds and triggers, allow us to move between pathways should challenges materialise. These approaches have been aligned to national planning guidance.

22.4 Informed by customer engagement

As a Board we have spent considerable time reviewing and commenting upon the extensive customer engagement on our future plans and ambitions. This has included reviewing the results of this engagement and the resulting adjustments to the LTDS. In particular we looked at customer feedback on our performance commitments and the balance of priorities over the short and long term. One clear example is our approach to Net Zero where customers appreciate the importance of this but want us to prioritise other areas that matter to them. As a Board we reflected on this and supported deferring significant investment in decarbonisation to future AMPs when proven technology is available.

22.5 Long-term affordability and fairness

Affordability has been a large challenge in our Business Plan and our LTDS as we have endeavoured to balance the investment, we are required to make against the impact on customer bills. The Board has been engaged in the discussions on affordability and how these impacts lower income sections of our customers. This has been continued through to our LTDS and in early 2023 discussions on the future investment requirements and customer bills were discussed at the Board. We have supported the endeavours to address this by engaging with stakeholders to defer

enhancement where the need is less urgent. For example, we have been working with the EA to defer some elements of WINEP enhancement from AMP8 to AMP9 a process that is subject to regulatory uncertainty as outlined in our Data and Assurance chapter.

22.6 Meets statutory and licence obligations

Our wider assurance framework has focused on the requirements on the Ofwat guidance and our regulatory and statutory obligations. This work has included a review of the LTDS in addition to significant assurance on the input strategic frameworks including the WRMP and DWMP. The LTDS is subject to a number of regulatory uncertainties as summarised below and detailed in the Data and Assurance chapter. The Board have been engaged in this assurance process in detail and have provided input on this process and have reviewed the outputs of this assurance process.

There are a number of areas where there is material uncertainty in the parts of the business plan. Many of these uncertainties relate to legal or policy decisions that are yet to be made at the point of business plan submission. Detail on these uncertai nties identified by our plan is provided in Data and Assurance, Chapter (9), including those, noted below, pertinent to our LTDS which include:

- **Regulator agreement EA – WRMP:**
  Our plan is based on our dWRMP24 which has not been signed off by the Secretary of State and hence is subject to change.

  Our proposed environment programme and Water Resources Management Plan require a step change in investment to an unprecedented level, and this plan is four times larger than our equivalent plans in AMP7. This submission and linked WRMP submissions in August and September 2023 do not yet close all the deficits. We will work with regulators to develop and agree potential mitigations over the medium term to provide drought contingency as the solutions are built.
- **Regulator agreement EA – WINEP phasing:**
  To address affordability and deliverability concerns our plan is based on a proposed reprofiling of WINEP, which is being consider by the EA.

  Our proposed WINEP investment is close to requiring the total five-year AMP7 level of investment every year of the AMP8 period. We continue to work with the EA, alongside Defra and Ofwat, to find sustainable ways to deliver these programmes in a timeframe that is deliverable, having regard to the existing supply chain constraints and can be afforded by our customers. Without the proposed re-phasing the plan is neither affordable nor deliverable.
- **Regulator agreement Ofwat** – Alternative Delivery significant use of alternative delivery mechanisms.

  Prior to submission Ofwat has yet to agree to circa £2 billion of Alternative Delivery projects and these remain subject to agreement at Business Plan submission. We support this Alternative Delivery and its benefit of spreading the costs of investment over a longer period to free up internal resource on the delivery of other plan elements.

22.7 Alignment with PR24 Business Plan

We have been engaged with our 2025–30 Business Plan as reflected in our wider Board Assurance Statements.

Appendix 1

Response to Ofwat feedback

Appendix 1: Response to Ofwat feedback

The table below combines the general and company specific feedback from Ofwat following the LTDS development meetings. The table then articulates how and where we have addressed that feedback within our Long-term Delivery Strategy Technical Annex.

Area	Feedback	General	SWS specific	Response
Customer Engagement	Companies should provide sufficient and convincing evidence that customers consider the forecast bill impacts of the strategy to be acceptable.	✓	Not mentioned	We have engaged customers on our ambition, strategy and forecast bill impacts, see Customer affordability and fairness referenced in LTDS Section 18.
Coherency of performance and customer evidence	Companies should consider the coherency between their proposed performance commitment levels for PR24, their forecast performance commitment levels up to 2050, and the customer evidence used to inform its ambition, and, where appropriate, to explain how and why these differ.	✓	Not mentioned	Our proposed performance commitments for AMP 8 to AMP 12 have been integrated with our WRMP and DWMP. The approach is highlighted in the SRN18 Performance Commitment Methodologies which incorporates customer evidence. This is referenced in our LTDS Sections 3.4 and 18.
Core Pathways	We did not see sufficient and convincing evidence that you are developing a core pathway in line with our definition.		✓	We have incorporated the guidance into developing our core pathways. This is particularly evidenced in our LTDS Section 7.2 in choice of Water core pathway from the WRMP options and from our testing.
	In your PR24 submission, you should clearly explain how you have identified and prioritised low-regret investment. This includes showing that the selected investment, and the timing of that investment, is optimal given a wide range of plausible scenarios and their likely occurrence. Where possible, low-regret investments should be flexible and modular.		✓	Our LTDS has provided the framework for low-regret investment. This is reflected in our selection of pathways in our Water and Wastewater plans. Each of our business cases has individually been assessed for low-regret investment and the explanation is included in each of the cases.

Core Pathways Continued	We expect companies to set out a core adaptive pathway which includes only low-regret investment.	✓	✓	Core pathway includes only no and low-regret investment. This is reflected in our selection of the Water core including WRMP. The Wastewater includes key statutory elements of WINEP, although recognising the need to deliver the WINEP over a slightly longer timeframe due to the affordability and deliverability issues.
	Some companies are basing their core pathway on benign scenarios only. This approach is not acceptable, as if more adverse futures come to pass, the costs of meeting long-term outcomes could be much higher.	✓	Not mentioned	Core pathway based on no and low-regret investment from the strategic frameworks. Choice of core water pathway influenced by schemes / projects included across multiple WRMP Situations as evidenced in LTDS Section 7.2. Wastewater pathways are based on the DWMP which considered risks for 14 planning objectives, and explored how the risks change in future scenarios, including adverse scenarios.
Adaptive Planning	It was not clear from your presentation how you are formulating alternative pathways in line with our guidance. The strategy should identify a relatively small number of alternative pathways, focused on the key areas of risk and uncertainty.		✓	LTDS incorporates a core pathway and eight adaptive pathways focussed on the key areas of risk and uncertainty. For our plan the key uncertainties are in abstraction reductions, climate change and demand. Evidenced in LTDS Chapter 2.
	This includes isolating low-regret investment, identifying where investing to support future options is likely to be cost-effective, and considering the optimal timing and criteria for decisions about 'higher-regret' investments in future.	✓	✓	We have considered the need for investing in future options and these are reflected through our WRMP and WINEP programme. Our Adaptive Monitoring Plan identifies how we will make decisions on future investments. Evidenced in LTDS Chapter 2 and Section 19.

Adaptive Planning Continued	We expect companies to clearly explain how their strategy reflects key principles of adaptive planning. The UK Government's Supplementary Green Book Guidance sets out principles for well-designed adaptation measures.	✓	Not mentioned	Our adaptive planning approach detailed in LTDS Chapter 2. This reflects the approach of our WRMP and DWMP which followed their national guidance on adaptive planning.
Decision and trigger points	We expect companies to explain how they have decided on the timing of these points, taking into account factors such as the lead time associated with options and the nature of the uncertainty being mitigated, rather than the timing of price review cycles (explain how you have decided on the optimal timing of these points).	✓	✓	Timing of adaptive pathways has been influenced by: • Anticipated availability of data to support informed decisions • Lead time of infrastructure build • Timing of water supply / demand deficit projections • High level strategy articulation vs. scheme level decision-making (particularly for water) • Price review cycle timing Details articulated within LTDS Chapter 2.
	Companies should also clearly identify the circumstances under which the alternative pathway would need to be followed. The level of detail required around decision and trigger points is particularly important where companies request enhancement expenditure at PR24 to support an alternative pathway.	✓	✓	Circumstances under which adaptive pathways would need to be followed are detailed within LTDS Chapter 2.
Scenario testing	We expect companies to use scenario testing to help optimise the selection and timing of activities given future uncertainties.	✓	✓	Water and Wastewater scenario testing detailed in LTDS Chapter 3.

Scenario testing continued	Using scenario testing to optimise the investment programme is essential to demonstrate that short-term enhancement proposals are low regret. It will not be sufficient for companies to state that the strategy meets the ambition under all scenarios. They should provide sufficient and convincing evidence of scenario testing to support this assertion.	✓	✓	Our core pathway strategy will not meet the ambition under all scenarios. Scenario testing proves this. Adaptive pathways apply a number of additional investment programmes that address the uncertainties highlighted by the scenario testing. See LTDS Sections 2 and 3.
	They should evidence low-regret, best value proposals by showing that the selected investment and its timing are optimal given a wide range of plausible scenarios and their likely occurrence.	✓	✓	Our plans show that the proposals are best value and optimal for either SWS or our region across a wide range of scenarios as evidenced in LTDS Section 7.2.
	We expect all companies to clearly explain their decision-making process, including how they have selected and optimised low-regret investments, and any assumptions made in doing so.	✓	✓	Water based upon supply / demand deficit projections. Wastewater based upon BRAVA risk assessment methodology. Bioresources based upon aged asset replacement need and power generation opportunity. Water quality based upon present and future quality needs. Decisions influenced by environmental principles along with customer and stakeholder feedback. Evidenced across LTDS.
	Companies should provide evidence to demonstrate that the scenarios underpinning their investment programme are possible, if not necessarily the most likely.	✓	✓	Scenario testing based upon Ofwat common reference scenarios and 2025 regulatory review for Bioresources. All are possible, if not necessarily the most likely. Evidenced in LTDS Chapters 2 and 3.

Scenario testing continued	We expect companies to clearly set out the estimated impact of each individual reference scenario over the full period from 2025 to 2050.	✓	Not mentioned	Water enhancement adaptive pathway spend primarily based upon combined scenario supply / demand deficit impacts. Individual reference scenario impact available but limited in its relevance. Wastewater adaptive pathway structure clearly identifies impact of individual reference scenarios. No common reference scenario additional enhancement impact upon Bioresources or Water quality. Evidenced in LTDS Chapters 2 and 3 and LS 5 and 6 data tables.
	When testing each of the reference scenarios, it is for companies to **determine the default position for other parameters**. These should lie between the 'plausible extremes' described by the reference scenarios.	✓	✓	Corresponding default positions for associated parameters detailed within the testing as evidenced within LTDS Chapter 3.
	Technology: We saw only limited evidence that you are testing the common reference scenarios for technology in line with our guidance. We expect you to use the technology scenarios to test the sensitivity of options to different futures and justify the optimal timing and sequencing of activities in your strategy.		✓	Technology scenarios reviewed but considered to be much less impactful than the other three common reference scenarios. Technology scenario testing evidenced at LTDS Section 16.3.
	Technology: We expect companies to use the reference scenarios to explore the potential impact of technological development on the relative costs and benefits of options.	✓	✓	We have explored the potential technological impact of the reference scenarios on our plans. Our WRMP and DWMP both included technological delivery within the costs and benefits.

Scenario testing continued	Abstraction Reductions – Benign: To form this scenario, companies in England should: • Include agreed WINEP changes and licence capping; and • Use the agreed BAU+ scenario to form a long-term view, but use local reviews to remove licence reductions with significant uncertainty, to form a plausible 'extreme low' scenario.	✓	Not mentioned	Approach on abstraction reduction scenario testing detailed in LTDS Section 16.1.2 with further detail referenced in WRMP Annex 9: Protecting and enhancing the environment.
Delivering Improvements from base expenditure	Companies should provide an informed and stretching view of what base delivers over the long term.	✓	✓	Detailed explanation of the base performance improvement evidenced in LTDS Sections 7.5 and 20. SRN18 Performance Commitment Methodologies.
	We expect all companies to challenge themselves to deliver stretching levels of performance from their base allowance.	✓	✓	
	This should inform a clear narrative for each of the targeted areas of improvement, explaining how the company's approach to base and enhancement activities will contribute to meeting long-term outcomes.	✓	Not mentioned	Our approach to base performance improvement and enhancement is evidenced in our LTDS Sections 7.5 and 21. Detailed explanation of the performance from base outcomes is in the SRN18 Performance Commitment Methodologies.

Engagement	Companies should use customer engagement to inform their ambition, the selection and sequencing of key investments, and considerations about affordability and fairness.	✓	Continue	Details on how customers and stakeholders have shaped our strategy are evidenced in LTDS Sections 3.4 and 18.
	The views of wider stakeholders should inform the ambition and the core pathway.	✓	Continue	Wider stakeholder feedback from our consultations and workshops is evidenced in LTDS Section 3.4.
	Company Boards should challenge company management to ensure the strategy is the best it can be, and provide assurance according to our requirements.	✓	Continue	We have detailed the engagement with our Board and how they have ensured that our strategy is the best it can be given our unique situation. This is together with our assurance is included in LTDS Chapter 5.