

TA 11.2 Water Horizons: Long Term Asset Management Strategy Technical Annex

September 2018
Version 1.0

Navigation: TA.11.2 – Water Horizons: Southern Water’s Long-Term Asset Management Strategy

Purpose:

This Technical Annex (TA) sets out our long-term asset management strategy which will enable us to enhance the resilience of water supplies whilst meeting the challenges of increasing population and decreasing raw water availability over the next 50 years. It comprises part of the supporting evidence for chapter 11 Wholesale Water.

The table below summarises the Ofwat tests that are addressed by the evidence presented in this Annex.

Table 1 - Relevant Ofwat tests

Ref	Ofwat test		Comment
Primary Focus Areas			
Securing long-term resilience – LR2	How well has the company objectively assessed the full range of mitigation options and selected the solutions that represent the best value for money over the long term, and has support from customers?	<p>High-quality plan:</p> <ul style="list-style-type: none"> • An organisation-wide, integrated approach to appraising risks to resilience supported by strong evidence that takes suitably long-term views using a range of forward-looking appraisal techniques across key service areas. • Effectively engage with customers on resilience in the round, including facilitating informed choices. • Use innovative approaches to the appraisal of risks to resilience, supported by best practice techniques to understand and appraise uncertainty across the full range of pressures, from acute shocks to longer term chronic stresses. It should also consider hazards and threats, such as cyber security, flooding and disruptions to energy supplies. • Include cross-references to changes in operational risk and planned levels of service, supported by strong evidence. • Thoroughly appraise options for mitigating resilience presenting a full range of options as evidence that the plan will deliver the best value long-term options for customers. This will include utilising options beyond its boundary to mitigate risks in its own area (and also looking beyond its boundary to understand how it can support long-term resilience elsewhere). <p>Ambitious and innovative plan:</p>	<p>Through water horizons we set out our plans to manage both our assets and the demand for water across our region.</p> <p>Our approach to asset management encompasses not only our operational assets but also the water resource assets through hazard reviews and catchment management. The stewardship and management of our water resources extends to both our network and our customers where we have a particular focus on demand management to minimise the amount of water taken from the environment. Industry leading consumption targets and the use of innovative techniques to monitor and control leakage are key to successful delivery in this area.</p>

- Strong evidence that innovative approaches will deliver sector-leading operational resilience including the role of partnership, use of markets, catchment management and other softer option in combination with fixed asset based solutions.

Secondary Focus Areas

OC1	Delivering Outcomes for Customers
CMI1, CMI2	Targeted controls, markets and innovation

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Executive Summary

An increasing population and decreasing availability of water represents a substantial and intensifying challenge for Southern Water over the next 50 years. There are also a number of emerging water quality risks which will provide significant challenges in the short, medium and long term.

This document sets out our long term asset management strategy which enables Southern Water to meet these challenges up to 2070. This strategy has been informed by the **Drinking Water Inspectorate's (DWI) Long Term Planning Guidance (2017)**, Southern Water's Draft Water Resource Management Plan 2019 (WRMP19) and HM Government strategic planning, putting resilience at the centre of our thinking.

We also recognise the need to change and adapt to these challenges and working closely with the DWI we have created the **Water First** transformation programme to ensure we address immediate priorities and align with our future plans.

By using innovative approaches and technologies, we will ensure a resilient water future for the South East. This includes programmes such as **Catchment First** and **Target 100** which align to the Governments long term environment plan: **A Green Future: Our 25 Year Plan to Improve the Environment (2018)** in delivering sustainable, clean and plentiful water. We will also significantly invest in smart technologies aligning to the Governments Industrial Strategy **Building a Britain fit for the future (2018)** through our **Network 2030** initiative. Our long term objectives for demand management and new infrastructure also align with the outputs of the National Infrastructure Commission (NIC) report: **Preparing for a drier future: England's water infrastructure needs (2018)**.

We have listened to our customers and this insight has indicated that they want us to focus on improving the quality of water (including the taste, smell and appearance), reduce leakage and protect the environment. We have therefore developed a set of ambitious proposals to enhance water quality, reduce leakage, cut per capita consumption and develop new water resources.

In the short term (2025) we will aim to:

- Transform our water quality performance and embed a public health culture at the heart of everything we do.
- Implement and embed our single resilience framework. This will ensure that we can accurately measure resilience and embed this in all our asset management decision making.
- Improve water quality compliance to be Top 5 in the water industry (including Compliance Risk Index (CRI), discolouration and taste and odour performance).
- Implement our Lead Strategy (the Six Pillars) to eliminate lead by 2045.
- Reduce PCC to 120 l/h/d (as part of the Target 100 initiative).
- Reduce Leakage by 15% and create 45 Zero Leak Areas.
- Begin the development of significant new resources for completion in 2027, this includes the Hampshire Water Grid, a 75 Ml/d Desalination Plant, a programme of wastewater reuse schemes and joint development of the Havant Thicket Reservoir Resilience Project with Portsmouth Water.
- Reduce the impact of our abstractions on sensitive water bodies (Catchment First).
- Increase resilience by improving network flexibility and using cutting edge technology to respond and react faster to events.

- Conduct innovative research into alternative solutions for metaldehyde treatment, organic nitrate treatment and the impacts of microplastics on public health.

In the long term (2050) we will aim to:

- Improve water quality compliance to be industry leading by 2030 (including Compliance Risk Index (CRI), discolouration and taste and odour performance).
- Complete our Six Pillars strategy to eliminate lead by 2045.
- Reduce PCC to 100 l/h/d by 2040 (as part of the Target 100 initiative).
- Reduce Leakage by 40% by 2040 and 50% by 2050.
- Further resource developments for 2030 to 2050 are fully detailed in our WRMP, these include options for a new impounding reservoir in Central Area, further wastewater reuse in Eastern Area and additional imports from other companies into our Western Area.
- Use the Integrated Water Cycle Management approach in all catchments by 2040.
- Use of Artificial Intelligence in network control by 2030 and full automation of the network by 2040 to exponentially improve network performance.
- Implement innovative solutions for metaldehyde treatment and nitrate treatment from 2025 onwards.

Southern Water's goal is to continue to provide clean, safe water in a sustainable manner, not just today but for generations to come.

Water First (AMP6 into AMP7)

By the start of AMP7 Southern Water aim to be one of the most improved water and sewerage companies in the UK by putting public health central to our water quality management. Water First is a long term programme developed in collaboration with the Drinking Water Inspectorate (DWI) which started in AMP6 and will continue into AMP7.

Water First will transform our Water Quality performance through a focus on improving our ways of working and embedding a public health culture at the heart of everything we do.

Water First ensures that public health is at the centre of our water quality management across all directorates by embedding more collaborative, simpler, effective and transparent work practices alongside improvements to our policies, processes and reporting. The key Water First deliverables are shown in Figure 1.



Figure 1 – Water First deliverables

Southern Water has already made significant progress with its Water first programme (see Figure 2).

So far we have established a new Catchment Management team, begun to roll out water quality awareness across the company, developed new standards for our water treatment sites, and collaboratively worked with the DWI to agree where we need to improve most quickly.

In the coming year, activity on Water First will focus on conducting a detailed review of risks at our water supply works, building up the information we have about our networks and operating procedures, checking how we could respond better to extreme incidents and looking at how we improve on the quality of information to our customers and regulators. Further improvements will continue to be made incrementally through the end of AMP6 and into early AMP7.

Delivered:

- ✓ Transformation programme agreed with DWI
- ✓ Compliance review at Surface Water source sites completed
- ✓ New Disinfection Policy and Standard
- ✓ Site Hygiene and Grounds Maintenance standards
- ✓ New Water Quality Risk Assessment process implemented
- ✓ New Incident Command Management procedures developed
- ✓ Water Quality and Public Health training delivered to Customer teams
- ✓ Increased Catchment management capability recruited
- ✓ Existing Site Operating Manuals updated

Highlights for 2018/19

- Hazard Review (HazRev) for Surface Water and Ground Water
- New Incident management process implementation
- Catchment Risk surveys integration with HazRev and DWSP
- Updating and simplifying Water Supply Manual
- Review of Mechanical & Electrical maintenance tasks
- Review best practice for Operating Standards and Procedures
- New Site Information standard and Site manual enhancement
- Wider WQ and Public Health Training delivery across the company
- Improved Water Quality information on SW website
- Updates and alignment of Water Quality manuals
- Rownhams Network Intelligence pilot results

Figure 2 - Water First Progress

By achieving these outcomes, which put public health at the forefront of our approach, Southern Water will be in an ideal position for achieving Upper Quartile performance for the Compliance Risk Index (CRI) in AMP7 and become an industry leader on CRI for 2030 and beyond. Southern Water will also become an Upper Quartile company for interruptions to supply and significantly increase our resilience. The following sections of this strategy outline how Southern Water will achieve this over the next 5, 10 and 25 years.

Long term planning and emerging risks (to 2030)

Southern Water’s current Drinking Water Safety Planning approach is based on the World Health Organisation’s methodology which is part of our Integrated Water Cycle Management (IWCM) Programme. IWCM is key to managing our water resources and ensuring we manage water quality hazards from source to tap.

Southern Water will continue to apply these robust principles in the long term to provide safe, high quality, reliable drinking water supplies which maintain the trust of our customers. In combination with a robust Drinking Water Safety Planning approach Southern Water has also developed a new HazRev (Hazard Review) approach through our Water First programme to ensure a more comprehensive review of catchment, operational and asset based hazards at our Sources and Water Supply Works (WSW).

The first phase of HAZREV is being undertaken in AMP6 and will continue to be a critical component of customer protection going into AMP7 and beyond. This will be used within our resilience framework to maintain safe and resilient supplies to our customers.

Full review of catchment, operational & asset based hazards at our supply works

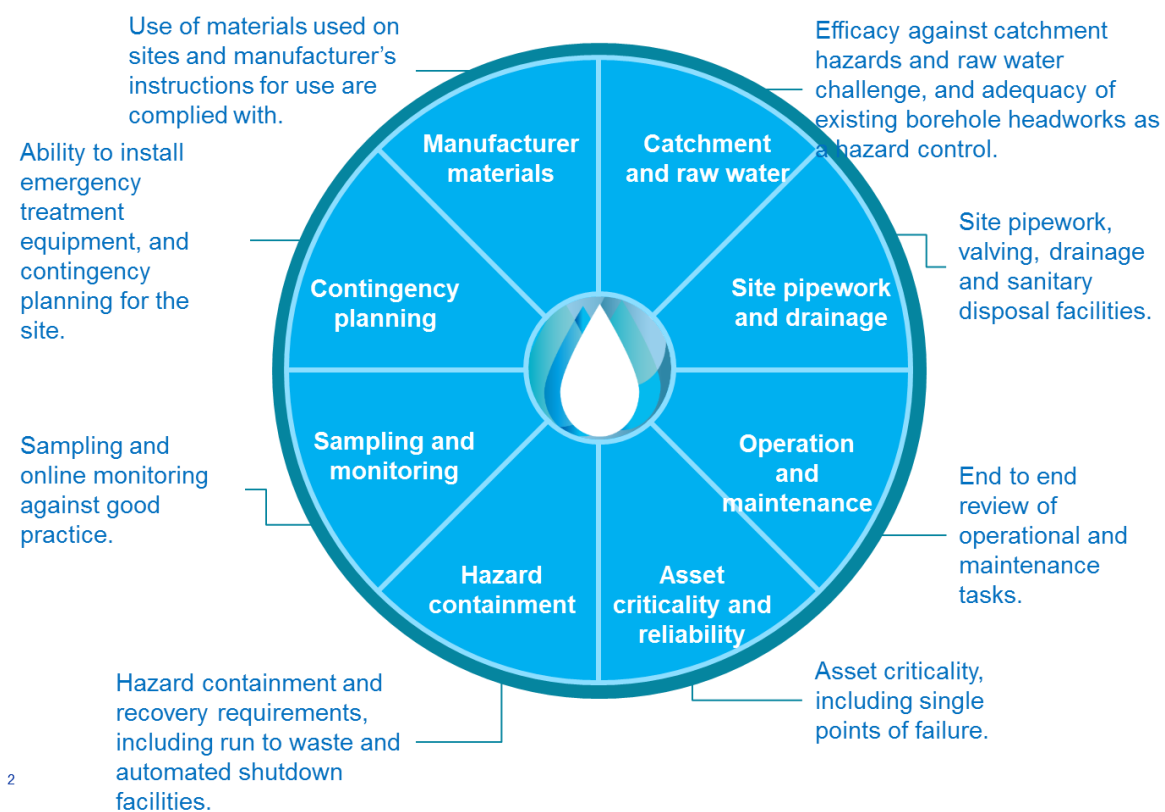


Figure 3 - Diagram of Key HazRev Elements

In addition to maintaining a robust DWSP methodology and making a step change in our ability to assess water quality hazards we have assessed the potential impact of the Drinking Water Directive (DWD) to our planned investment in AMP7.

The DWD is currently under consideration by the European parliament. It will be reviewed and further developed over the coming year and is likely to be passed into law by the European Union (EU) in May 2019. It will then take at least 2 years to become ratified into United Kingdom (UK) law. At this point all UK water undertakers will need to comply with any new limits immediately, with the exception of Lead and Chromium.

Our future plans will broadly meet these requirements, however we are undertaking further assessment of any potential impacts and will revise our plans accordingly.

We have also made the following broad considerations when considering long term risk planning:

- Catchment management & raw water deterioration (also see section 5), adopting a true catchment management approach within our water risk framework to ensure benefits for current and future customers. Our primary raw water quality deterioration risk in AMP7 and AMP8 comes from Nitrate. We have used our systems thinking approach (see Section 8 – Network 2030) to find the most resilient and cost effective approach to mitigating this risk, this includes using a combination of catchment management approaches, raw water blending and nitrate treatment. A summary table of nitrate approach for AMP7 to AMP9 is given in Appendix A.
- Resource and supply management (also see section 6), we have undertaken an assessment of our future water resource schemes to ensure there is no detriment to quality.
- Pesticides (also see section 5), in AMP7 further research will be undertaken into alternative solutions to the Metaldehyde risk for potential complimentary use with catchment solutions.
- Water treatment and distribution, in addition to the embedment of HAZREV, our long term objective is to progressively make our treatment processes and networks more resilient to meet future challenges. This will include investigating new treatment processes in AMP7 (e.g biological nitrate treatment and increased modularisation) and using smarter technology for enhanced monitoring, control, and optimisation. This builds on our industry leading approach for distribution water quality analysis currently being undertaken in our Rownhams Water Supply Zone (please see section 8 for how we intend to evolve from 2020 to 2070).
- Microplastics, Southern Water recognise this as a potential emerging risk and will apply a precautionary approach. Southern Water will work with industry partners to better understand the pervasiveness and threat posed by micro-plastics to public health.
- Lead, we will implement our 6 Pillars Strategy for Lead which we believe will lead the industry in scale and is the first step to a Lead free future by 2045 (please see Section 6 for full details) including compliance with the DWD standard.
- Radioactivity, we will continue to monitor and assess radioactivity risks through our Water Risk Framework to ensure full compliance with the recent change in legislation.
- Chromium VI, we will continue to monitor and assess Chromium VI risks through our Water Risk Framework to ensure full compliance with the proposed DWD standard.
- Taste and Odour, Southern Water will become a top quartile company for Taste and Odour (which is one of our discretionary performance commitments) in AMP7 and will continue to improve to an industry leading position in AMP9.

Southern Water will undertake further Research and Development into alternative solutions for metaldehyde treatment, organic nitrate treatment and the impacts of microplastics alongside our industry leading research in distribution water quality sensor analytics.

CRI and ERI will be key to measuring our short, medium and long-term water quality performance. We are aiming to become a top quartile company for CRI by the end of AMP7 and be industry leading by 2030. We are not proposing to make ERI a performance commitment in AMP7 as this is new measure which will require more analysis of trends. The metric will continue to be monitored and reported with a view to significantly improving performance in AMP7 and beyond.

Catchment First

Catchment First is our plan for bringing catchments into the heart of our decision making and delivery processes in order to achieve a more resilient service and environment. This is a key part of our long-term eco-systems thinking approach.

To do this we will develop an approach that can be systematically applied and incorporated into our strategic investment planning framework to support decision and delivery processes that enable us to deliver different and more holistic solutions with wider environmental and societal benefits.

The approach will be applicable to both water and wastewater and will identify opportunities to deliver more integrated solutions. This will embed natural and social capital accounting into our business processes so that Catchment First becomes part of business as usual.

Principles and tools developed through AMP6 Integrated Water Cycle Management (IWCM) project are informing and supporting our approach.

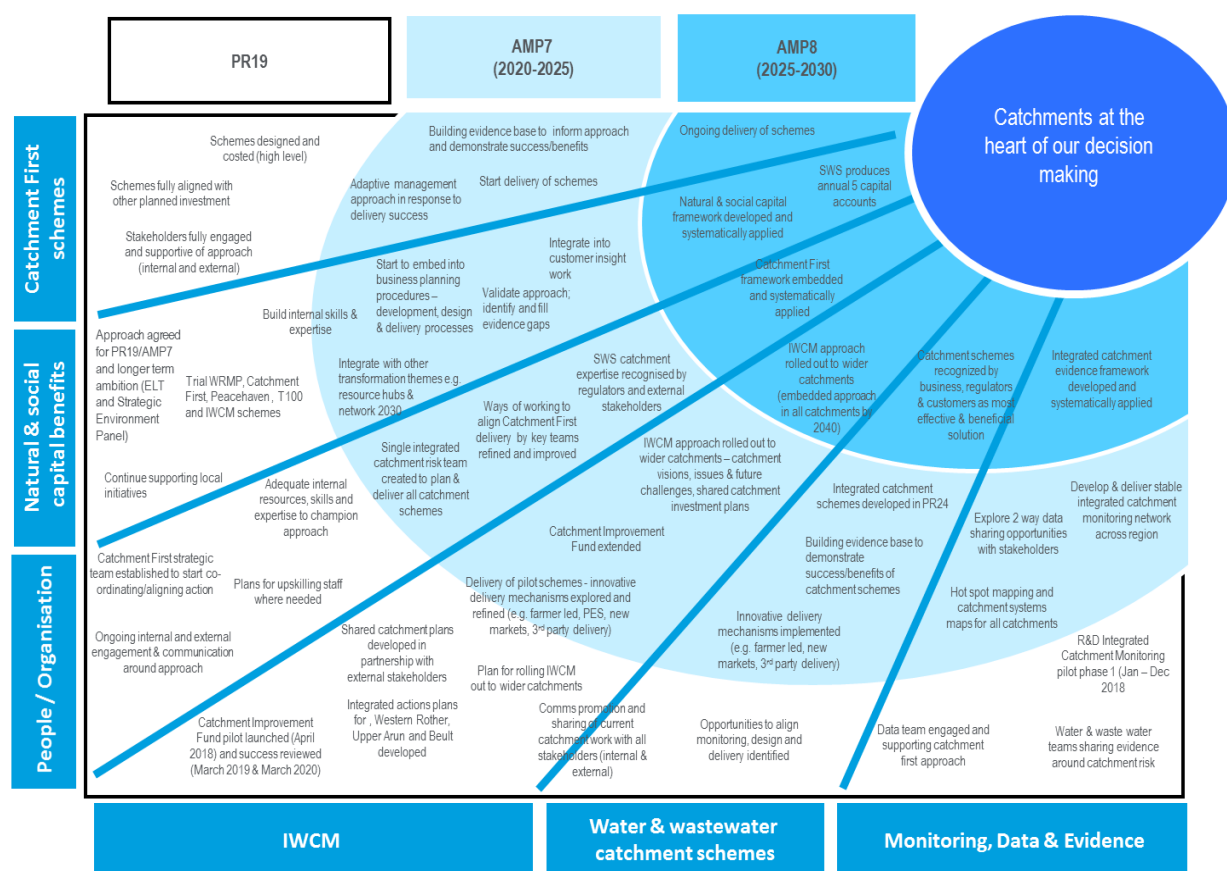


Figure 4 - Catchment First IWCM Plan to 2030+

The Catchment First approach will have to meet a number of emerging challenges and trends:

- Land use and area of land given to agriculture may change in the future.
- The UK leaving the European Union could result in a significant change in the agricultural industry, either as a result of the impact on changing market forces in general or as a result of its impact on agricultural subsidy regimes.
- Climate change could see different weather patterns with increased frequency of drought and more severe rainfall events.

- Market forces may change as the UK settles into new global markets outside of Europe.
- Advances in agricultural technology could result in different crops being grown, new substances used, alternative harvesting techniques and changing land drainage in the longer term.
- Finally, advances in water treatment may change the way the water industry can mitigate changes in pesticides and other substances.

Southern Water will roll out an Integrated Water Cycle Management (IWCM) approach starting in 2020, this will be in place for all catchments by 2040. This will lead to significant social capital benefits including improvements to water quality and minimising water quality risk.

In order to respond to these challenges we have set the following key objectives for Catchment First:

- Develop an approach that can be systematically applied and incorporated into our strategic investment planning framework to support decision and delivery processes to deliver more. This will inform AMP8 business planning.
- Test and validate this approach in the River Test, Arun & Western Rother and Medway catchments. In AMP 7 delivery will focus on monitoring, options appraisal and feasibility studies with a view to developing shared catchment plans with partners.
- Identify the right delivery mechanisms for these locations – e.g. payments for ecosystem services, new markets for clean water e.g. EnTrade, Natural Infrastructure Scheme and 3rd party delivery.
- Align IWCM, catchment management, wastewater catchment first and wider WINEP investments to contribute to Catchment First outcomes where it's appropriate to do so (i.e. we still deliver our core regulatory/compliance requirements but where it makes sense to join things up for efficiency or effectiveness reasons we'll do so).
- IWCM approach rolled out to wider catchments by 2030 and then embedding our approach in all catchments by 2040.

Eliminating Lead by 2045 – The Six Pillars

The Six Pillars approach will become central to all our asset management decisions regarding lead risk at strategic, tactical and operational levels. We believe this approach is industry leading in its scale and the diverse range of approaches. The Six Pillars approach will be implemented in AMP6 and further enhanced towards 2045.

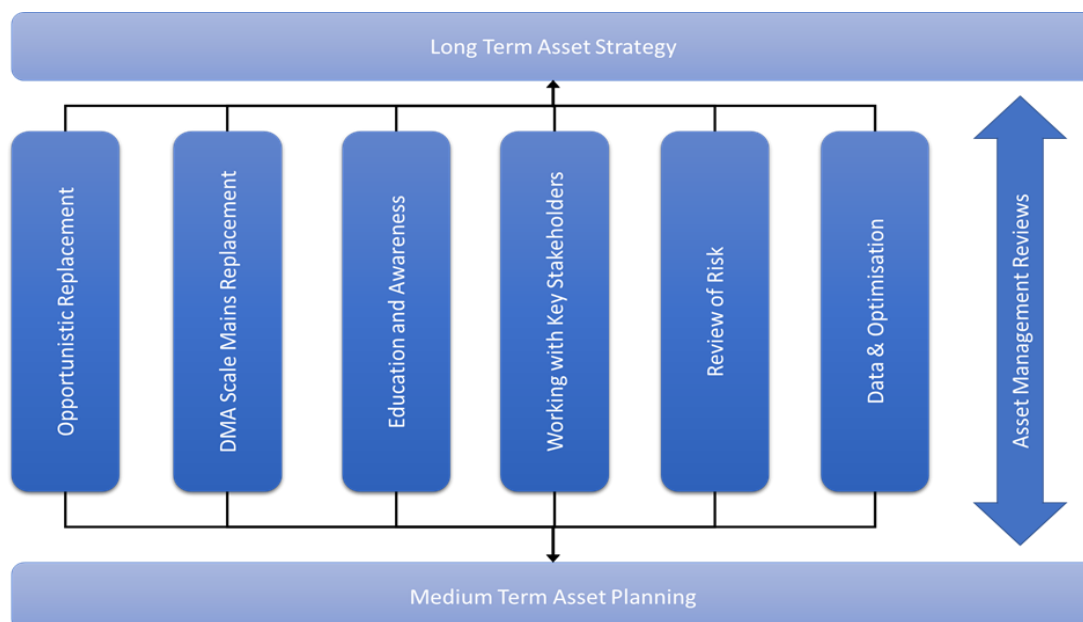


Figure 5 - Six Pillars Approach

1st Pillar – Opportunistic Replacement

Southern Water will continue to replace lead communication pipes and customer supply pipes which are found through reactive works and customer discoveries. We anticipate approximately 7,500 opportunistic replacements in AMP7.

2nd Pillar – Long Term DMA Scale Mains Replacement

Southern Water has developed a DMA scale mains replacement programme targeting reducing leakage, bursts, interruptions to supply and discolouration. The revised programme for AMP7 consists of ~330 km of mains replacement, making Southern Water a top quartile company for most performance commitments (including CRI). The programme will also remove approximately 20,500 lead communication pipes from the asset base. In total (including opportunistic replacements) we therefore anticipate removing approximately 28,000 lead communication pipes in AMP7. We anticipate that by 2045 this approach will lead to the removal of 99% of our lead communication and customer supply pipes from our asset base, a major step towards a lead-free future.

3rd Pillar – Education and Awareness

Southern Water will expand its advice service to customers with regards to lead services and lead pipe risk within the home. The above will be undertaken in close conjunction with the 4th Pillar.

4th Pillar – Stakeholder Engagement

Continue the work of Lead Working Group (LWG) set up in AMP6. The groups have been setup through community engagement to ensure the LWG meets the needs of individual communities. The objectives of each LWG are:

- Work with local authorities to identify vulnerable consumers, and to identify appropriate solutions, including the replacement of lead pipes in public buildings.
- Work with local authorities to subsidise the management of lead pipe risk in the home for vulnerable customers (this will be initially trialled in our AMP7 Lead pilot in Deal, Kent).
- To provide technical advice on lead risk within public buildings and other local authority assets.

The LWG may also have accountability for a Community Fund to help subsidise the replacement of private/public supply pipes.

5th Pillar – Review of Risk

Southern Water will continue to review Lead risk on a cyclic basis through its risk assessment and management processes and update the Southern Water Drinking Water Safety Plan (DWSP) accordingly. This review process will be enhanced further by additional data, assessment of that data and further optimisation of the risk controls (the 6th Pillar).

Southern Water will use the diversified Six Pillars strategy to proactively remove lead assets from both the network and customer properties. This will result in the practical elimination of lead communication and service pipes by 2045. We will also trial subsidising the removal of lead pipework in customer homes in Deal, Kent with the aim of making a lead free future a reality by 2045.

6th Pillar – Assessment and Optimisation

In order for Southern Water to continue to improve its assessment of lead risk a number of initiatives are being undertaken that will help to optimise treatment and identify future requirements for new assets. Over the course of AMP7 and AMP8 Southern Water will implement Phase 1 of the Intelligent Networks Strategy. This will see the asset base deployment of additional water quality monitors into the water network, this data will be fed into our network management systems (including new analytics software). Giving Southern Water a significant improvement in analytic and diagnostic capabilities. To further enhance optimisation, we intend to trial Phase 2 of the Intelligent Networks in AMP8 and be fully operational by 2035.

Water Resources – Long term plan to 2070

Our long-term objective is to secure a resilient future for affordable water in the South East, whilst supporting economic and housing growth and improving the environment. The plan is based on being able to meet our customer needs during a 1:200 year drought without invoking drought permits (except in the Western area) and a 1:500 year drought by using our drought permits and orders.

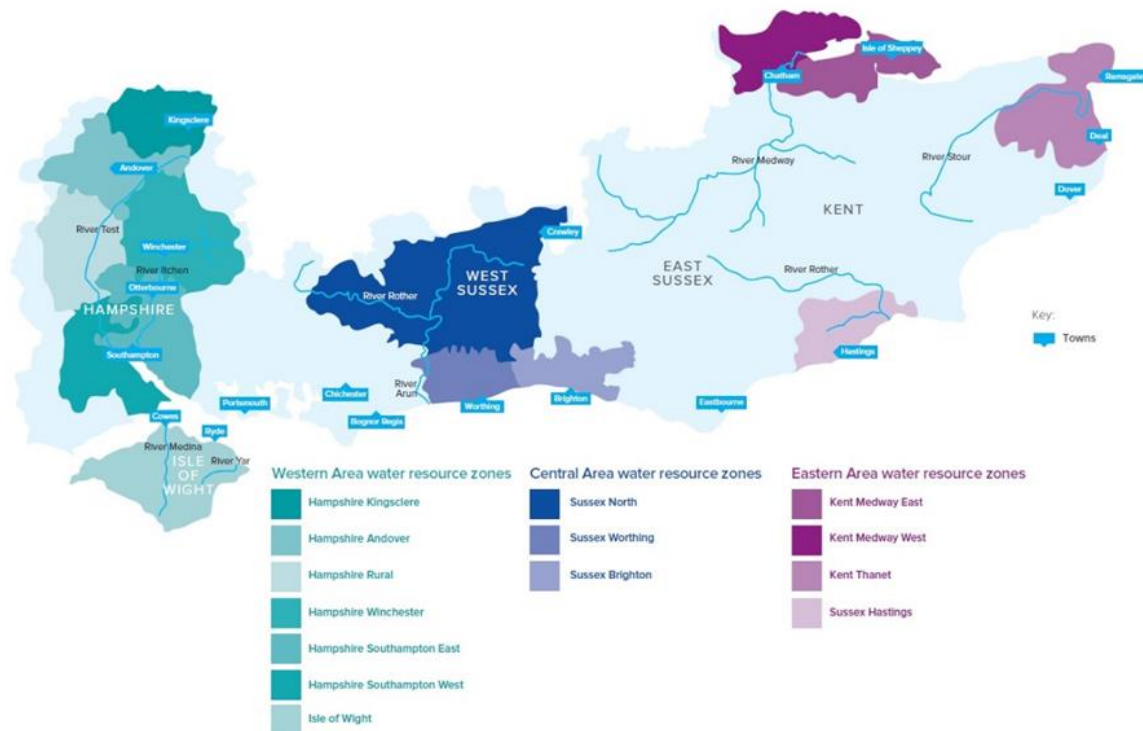


Figure 6 - The Southern Water Resource Areas

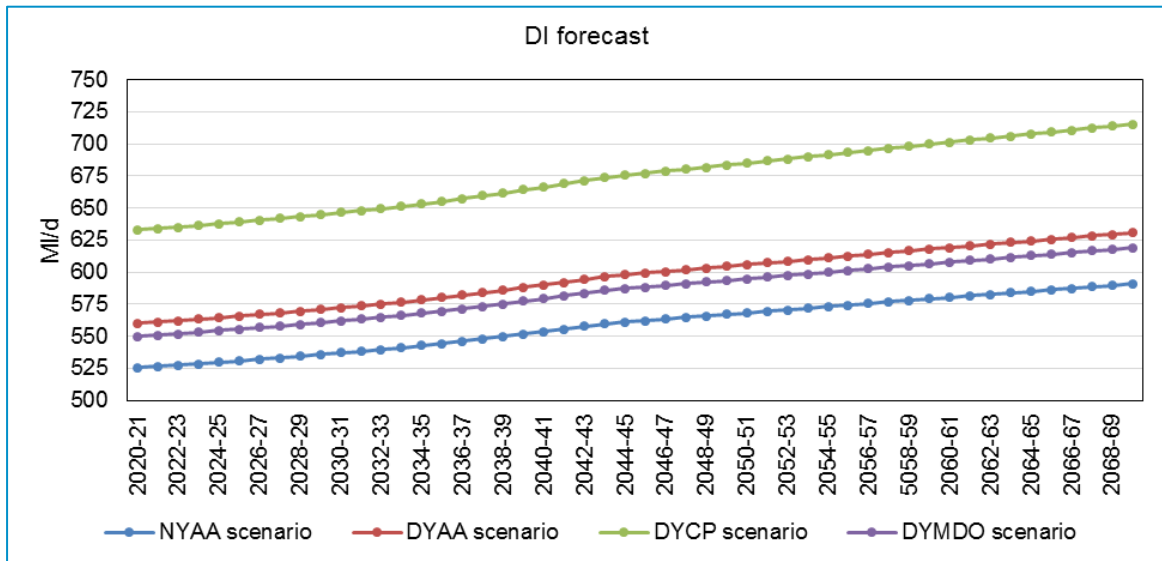
To do this Southern Water and our stakeholders must meet a number of significant long term regional challenges:

The region’s population has grown consistently and is forecast to increase by 20% by 2040.

- The South East is one of the driest regions of the UK and is already “water stressed”. Rainfall is forecast to decline by 20% by 2045.
- The combination of an increasing population and increased water scarcity will put substantial pressure on the natural environment. This means abstraction licences will have to change significantly to protect and improve the natural environment.
- The abstraction licence changes have the most immediate effect in Hampshire and the Isle of Wight, where reductions in the volumes we can abstract, mean a predicted supply deficit of around 100 MI/d initially (2020) and another step change in 2027 when further licence changes are expected to increase the deficit to around 130 MI/d in our Western Area.

The pressure on our natural environment will lead to tighter environmental standards and reductions in the amount of water we can abstract in severe droughts. This could lead to a reduction in our abstractions from rivers and

aquifers of up to 300 MI/d over the next decade, 1/3rd of our current Deployable Output (DO) for the company.



NYAA = Normal Year Annual Average, DYAA = Dry Year Annual Average
 DYCP = Dry Year Critical Period, DYMDO = Dry Year Minimum Deployable Output

Figure 7 - Long Term Distribution Input projection:

We will address these challenges through five key long term approaches:

1. Reduce per capita consumption (Target 100 – see Section 6)
2. Reduce leakage (see Section 8)
3. Improve the natural environment (Catchment First)
4. Improve resilience and interconnectivity (Network 2030 – see Section 8)
5. Build new water resources

Through our Water Resource Management Plan (WRMP) we have undertaken an extensive optioneering exercise, including an assessment of customer preferences, to identify the most cost beneficial ways of meeting these challenges. We are also playing a key role in Water Resources in the South East (WRSE) driving the development of cross company transfers and regional grids. In developing schemes our WRMP has given consideration to water quality both in the context of public health and impacts on the environment. This has been fundamental to the options appraisal process and will continue to be assessed as part of our final WRMP including customer acceptability.

Key developments in the medium term to 2030:

- Reduce per capita consumption to 120 l/h/d by 2025 and to 110 l/h/d by 2030 (2017 = 131 l/h/d) as part of Target 100.
- Reduce leakage by 15% from 2020 to 2025 and by a further 15% by 2030.
- Introduction of Catchment Management and initial roll-out of the Integrated Water Cycle Management approach (IWCM).

■ [Redacted text block]



- [REDACTED]
- A programme of wastewater reuse schemes, these return flows upstream of existing abstractions including two schemes in the Western Area (17.5 MI/d of additional output), a scheme in the Central Area (20 MI/d of additional output) and a scheme in the Eastern Area (18 MI/d of additional output). This adds 56 MI/d of additional deployable output.
- Jointly developing resources with other water companies, including new water imports. In AMP7 this includes an additional 9 MI/d import from Portsmouth Water and up to 23 MI/d in additional resource from a planned new reservoir at Havant Thicket jointly developed with Portsmouth Water.

By 2050 we will aim to:

- Reduce per capita consumption to 100 l/h/d by 2040 part of the Target 100 initiative.
- Reduce Leakage by 40% by 2040 and 50% by 2050.
- IWCM in established operation across all catchments.
- Regional Pipeline Grid, in combination with the Network 2030 initiative we will continue to increase connectivity of our water supply areas and with other water companies to increase resilience. By 2040 this will include greater strategic connectivity between our Western and Central Areas with full inter-area connectivity (including Eastern Area) achieved by 2050.
- Further resource developments for 2030 to 2050 are fully detailed in our WRMP, these include options for a new impounding reservoir in Central Area, further wastewater reuse in Eastern Area and additional imports from other companies into our Western Area.

By 2070 we will aim to:

- Further reduce per capita consumption and leakage.
- Continue evolution of IWCM.
- Further resource developments for 2050 to 2070 are fully detailed in our WRMP, these include options for two new impounding reservoirs and desalination on the loW.

A full list of our current and future water resource schemes are included in our draft WRMP.

Target 100 – Reducing per capita consumption by 2040.

The South East of England is officially declared as ‘water stressed’. With population growth and future climate scenarios suggesting lower water availability, then balancing supply and demand is in even greater focus.

As part of our response to this challenge, Southern Water is leading a bold demand reduction programme, Target 100 seeks to reduce per capita consumption to 100 litres per head per day across our region by 2040.

Target 100 is not just about reducing water consumption; it is about shifting society to value water. In a climate restrained world, Southern Water is aiming to be at the forefront of taking action to effectively manage water resources, keep bills affordable, drive innovation and support our customers. Having been a leader in water efficiency right through AMP5 and AMP6 which included delivery of an ambitious Universal Metering Programme we have built a good platform for substantial further reductions in usage in the years ahead. This will place Southern Water as the leader in demand reduction across the industry.

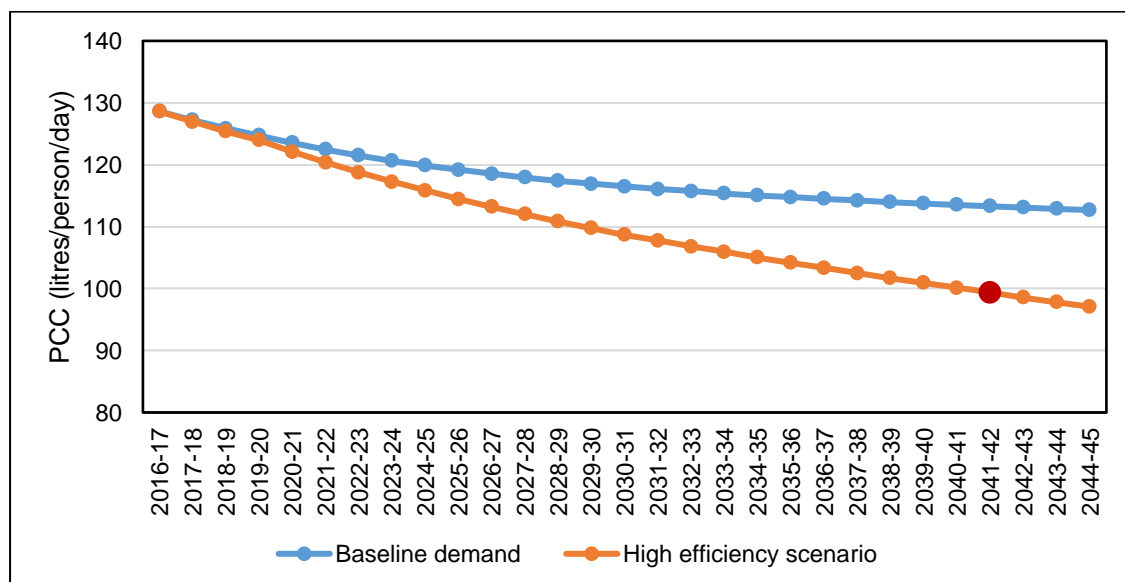


Figure 8 - Targeting a high efficiency scenario

Our Target 100 approach is founded on four main components:

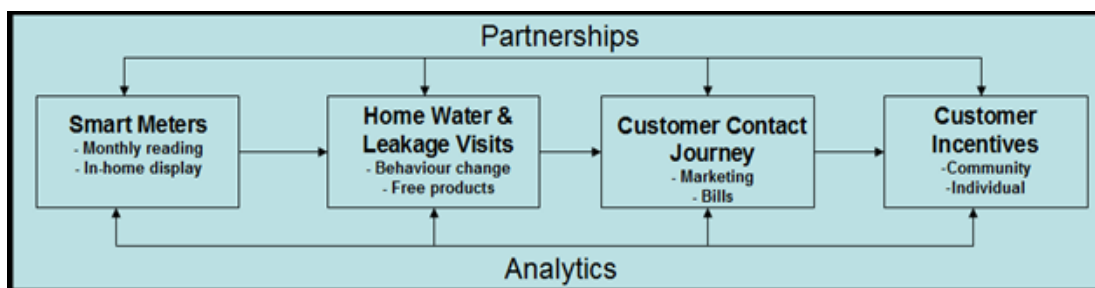


Figure 9 - Foundations of Target 100

Smart meters – Southern Water has deployed meters that can be read remotely and provide lots of data on usage. Currently our meters do not communicate with customers (through an app for example on a phone or tablet) and beyond two bills a year we are currently not optimising the information afforded to Southern Water to help the customer in a

prompt and proactive way. We are therefore moving to at least a monthly reading with which to promote our new incentive scheme. We will also be installing more smart meter devices to provide customers with more direct access to consumption information.

Home Water & Leakage Visits – Our current water efficiency home water saving visits are delivering a further 6-10% saving on top of previous savings. We want to ensure that a high level of visits continue targeting particularly those customers that lost out going onto a meter, have regular high consumption and have ageing toilets and high flowing showers. Therefore, we will combine our water efficiency and leakage detection work into one visit for the resident and work in partnership with neighbouring water only companies to expand the scheme to more customers in the South East.

Customer Contact Journey – For a majority of Southern Water customers contact with us as a utility is minimal. This poses a particular problem when related to a programme as ambitious as Target 100 with its ambition to move every water customer to a water usage of 100 litres per person per day by 2040. The very latest behaviour change messaging combined with appropriate customer support requires a different scale of communications not currently being deployed for water efficiency. A significant up scaling in both investment and ambition is therefore a central plank of Target 100 activity in AMP7.

Incentives – Having been successfully testing incentive pilots in AMP6 and with support from customers and stakeholders for rewards or incentives rather than tariffs, a bolder programme is planned. The scheme will be rolled out across Hampshire in AMP7, including the involvement of Portsmouth Water in partnership, offering rewards for recycling waste and water efficiency with each month every participating resident being shown whether higher or lower usage has occurred.

Southern Water is currently an industry leader in demand reduction and will build on this platform from 2020 to 2040 to reduce per capita consumption from 130 l/h/d to 100 l/h/d. This will protect the environment, increase resilience and keep bills affordable for our customers.

Using these foundations we will deliver the first phase of Target 100 to lower per capita consumption to 120 litres per head per day by 2025.

We aim to further reduce per capita consumption to 110 litres per head by day by 2030 and then to the 100 litres per head per day target before 2040. By taking this industry leading approach with demand reduction we will protect the environment and increase the resilience of our water supply network.

Network 2030

The objective of the Network 2030 initiative is to improve the configurational resilience of our water supply system to ensure it is sufficiently robust and fit for use by future generations. This is based on the principle that in the face of water scarcity, deterioration in raw water quality and emerging water quality risks, providing a resilient service is key. To understand the physical resilience of our supply system, we have developed a systematic method for measuring resilience across our asset base. We use this to identify threats and optimum mitigations. This will also allow us to publish the results of these assessments to give greater transparency of our short, medium and long term resilience to our stakeholders.



Measure resilience consistently in the longer term and demonstrate through the solutions we develop how resilience improves over time.



Optimise our interventions through Network 2030 to improve resilience.



Broaden our focus to identify a variety of solutions, reducing reliance on CAPEX, whilst also improving performance and cost efficiency.



Integrated approach to measuring resilience with our Asset Lifecycle Planning (ALP) process, DWSP framework, supporting governance and business operations.

Figure 10 - Key Objectives of Resilience Approach

This systematic assessment allows us to identify “households at risk” of long term interruptions to supply. Figure 11 shows an assessment undertaken for the Thanet Zone. The scenarios shown are an average day (current network configuration), drought (current configuration), drought (end of AMP6) and an optimised scenario driven by Network 2030 (end of AMP7). This initial assessment demonstrates how improving the resistance/reliability of our assets (rationalisation and centralisation), improving redundancy (adding additional connectivity) and significantly improving our ability to respond (monitoring and control) ensures our asset base becomes significantly more resilient under drought conditions.

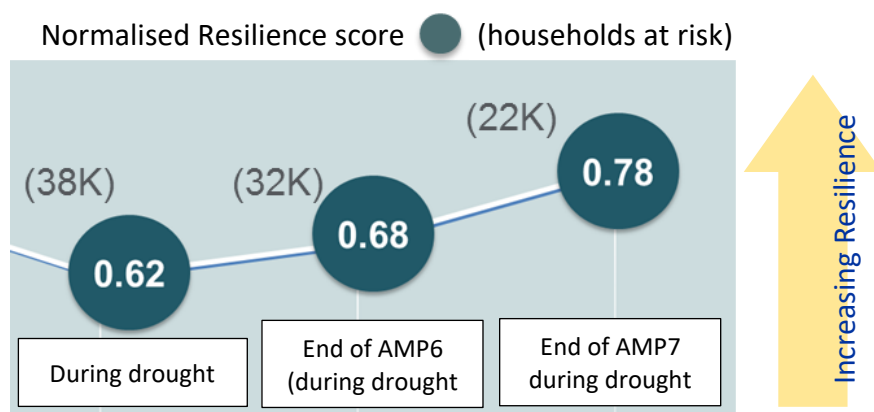


Figure 11 - Thanet Zone Resilience Assessment

We have undertaken this assessment for three of our highest risk Water Supply Zones (Thanet, Brighton and the Isle of Wight) and we will complete the remaining seven by the end of 2018. The assessment has identified a number of critical network and asset configuration changes over the next 10 years:

- Construction of Brighton East Water Supply Works (WSW) to rationalise 3 high nitrate works in the Lewes Valley area by the end of 2025.
- Construction of [REDACTED] WSW to rationalise 3 high nitrate works in Thanet by end of 2022.
- [REDACTED]
- Construction of 8 new service reservoirs and the decommissioning of 30 existing service reservoirs by the end of 2025. Construction of a further 9 reservoirs and decommissioning of a further 42 service reservoirs by 2030. This is to be undertaken in conjunction with improving our reservoir inspection process to a (1 in 5 year maximum) risk based process by end of 2025 and (1 in 3 year maximum) by 2030. This will significantly reduce our treated water storage water quality risks.
- Enhance 3 existing intra-zonal transfers in Brighton and South Hampshire to become bi-directional pumped transfers (to be completed by 2030).
- Creation of a Regional Pipeline Grid, in combination with the WRMP, we will continue to increase connectivity of our water supply areas and with other water companies to increase resilience. By 2040 this will include greater strategic connectivity between our Western and Central Areas with full inter-area connectivity (including Eastern Area) by 2050.

Using our resilience assessment framework, we have identified a number of changes to our asset base which will significantly improve resilience by 2030. This includes consolidation of our service reservoirs (retiring 72 reservoirs and building 17 new service reservoirs), centralisation of our treatment works (decommissioning 20 works and building 3 new works) and improving zonal connectivity.

In addition to these physical configuration changes to the network, Network 2030 also considers the operation and control of our water distribution network. Southern Water has maintained stable serviceability for its water distribution asset health measures throughout AMP6. However there have also been a number of emerging challenges, in particular our performance for discolouration and distribution water quality. We have targeted a number of improvements (such as our industry leading smart networks trial) to act as a springboard for improved performance leading into AMP7 and beyond. In order to co-ordinate this improvement in the short, medium and long term we have formed the Single Integrated Network Strategy (SINES) to provide strategic direction for water network investment from 2020 to 2045.

Southern Water will bring together a single integrated approach for managing our water network and will embrace the latest technologies to improve our understanding and management of our assets. It will also increase resilience through enhanced situational awareness and significantly improve network performance.

SINES utilises a diverse range of strategic options asset replacement, smart technology and operational solutions to ensure further strategic resilience and to improve network performance.

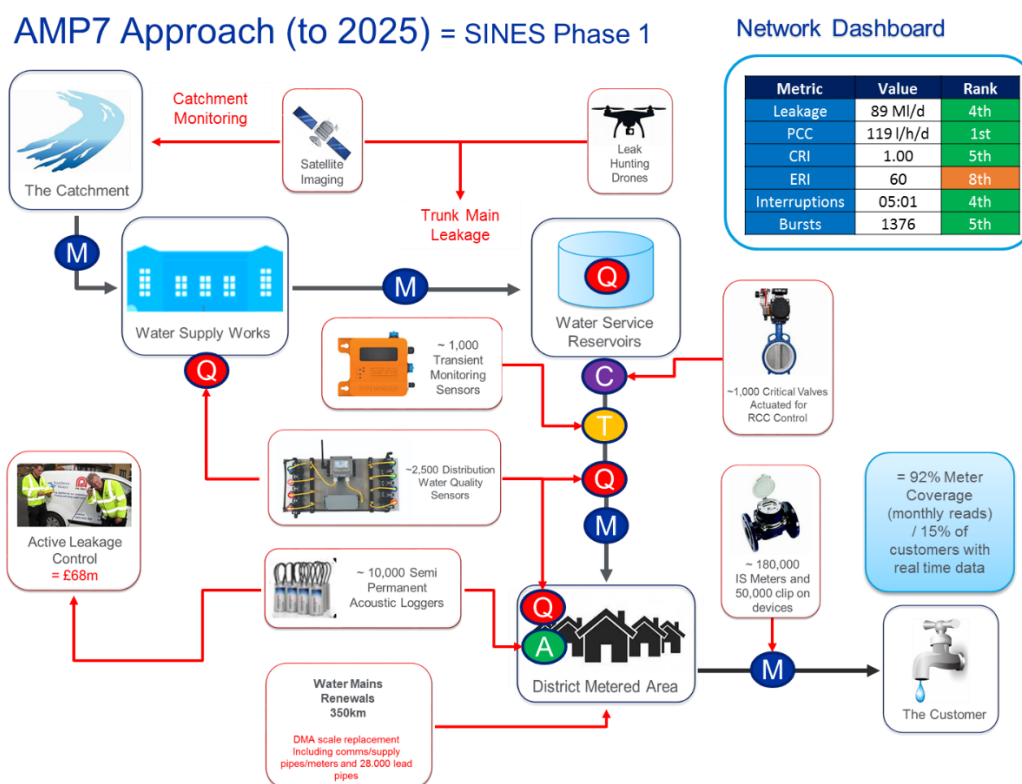


Figure 12 - Basic Schematic of the improved water network in 2025

In AMP7 this will deliver upper quartile leakage performance (a 15% reduction), upper quartile water quality performance (moving us to Upper Quartile for CRI, discoloration and taste & odour), directly supporting the Target 100 and Leakage initiatives. The primary mechanisms for achieving this involve increased monitoring, automation and control of our network using established smart technologies to reduce water quality risks to customers and improving network performance, these include:

By 2025:

- Implement the Network Management Platform (NMP) including the capability to visualise and interpret all data captured for the new systems. This will provide a significant step forward in capability for both asset management and incident management.
- Deployment of quality sensors and automation of critical control valves to improve resilience (response and recovery) and improve CRI/ERI/Appearance performance.
- Deployment of pressure transient monitors across the trunk main network for improved transient identification and mitigation.
- Deployment of semi-permanent acoustic loggers for improved Active Leakage Control (ALC) targeting.
- Deployment of remote sensing platforms (such as satellite and drone imaging) using high resolution false colour infra-red to more efficiently target strategic trunk main leakage and catchment monitoring (in support of Catchment First).

- Installation of smart meter devices to reduce both per capita consumption and customer side leakage.
- Replace 330km of water mains as part of a DMA scale asset replacement based on leakage (replacement will include the communication and customer supply pipes to maximise benefit). This programme will also remove over 20,000 lead communication pipes in support of our lead strategy and improve our discolouration performance to upper quartile.

AMP8 will see further evolution of the technologies deployed in AMP7. In AMP8 this will deliver a further 15% reduction in leakage and upper quartile water quality performance for CRI. The primary mechanisms for achieving this involves increased monitoring, automation and control of our network using established smart technologies to reduce water quality risks to customers and improving network performance, these include:

By 2030:

- Update Intelligent Network Management Platform including predictive AI.
- Deployment of 40,000 permanent acoustic loggers for leakage detection.
- Deployment of second generation remote sensing platforms using multi-parameter sensors for enhanced strategic trunk main leakage detection and catchment monitoring.
- Installation of Next Generation Smart Meters (NGSM) to reduce both per capita consumption and leakage across the whole asset base.
- Live control and optimisation of over 2,000 Pressure Reduction Valve's to better regulate pressure, further minimise interruptions and reduce leakage.
- Continue the DMA scale asset replacement based on leakage (replacement will include the communication and customer supply pipes to maximise benefit).
- Deployment of further transient monitors across the trunk and distribution main networks for improved transient identification and mitigation.

By the end of the 30 year strategy, Southern Water are forecast to be top quartile on all current performance measures, including leading the industry for PCC (as per Target 100). This includes a 40% reduction in leakage by 2040. This strategy is designed to be modular and adaptable permitting a number of strategic choices to be made both in terms of the pace and scale to allow for the emergence of new technologies.

Appendices

Appendix A: Nitrate AMP7+ Solutions Summary

Sites with nitrate interventions in AMP7

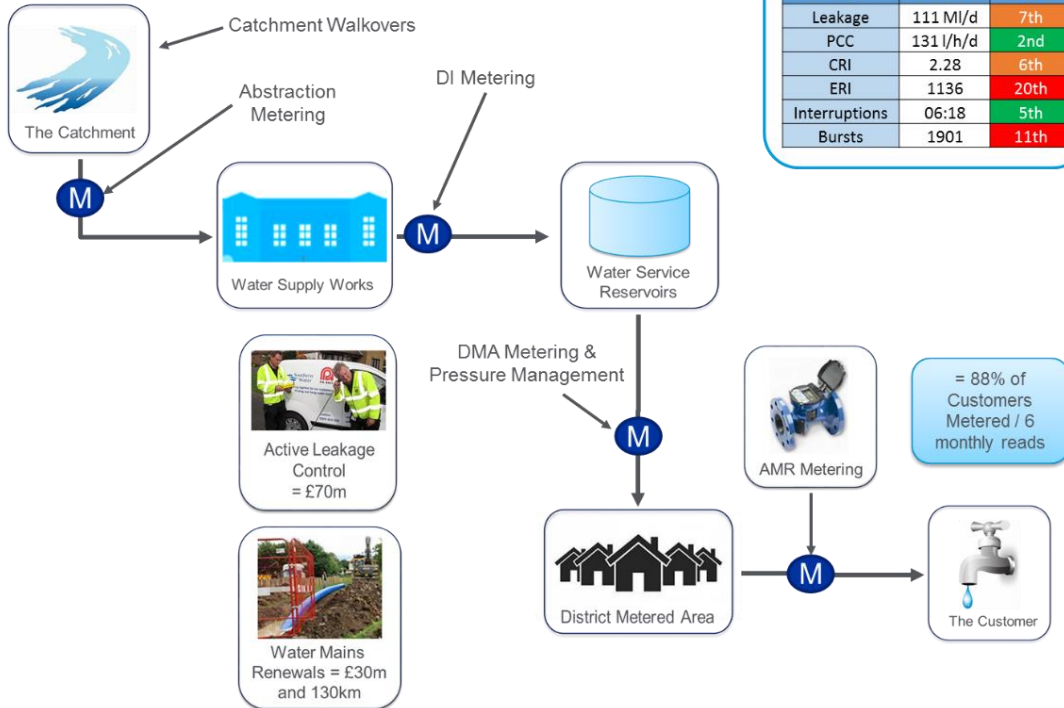
Site	Preferred Solution	Proposed Delivery Year
[REDACTED]	[REDACTED]	2024
[REDACTED]	[REDACTED]	2024
[REDACTED]	[REDACTED]	2024
[REDACTED]	[REDACTED]	2024
[REDACTED]	[REDACTED]	2023
[REDACTED]	[REDACTED]	2022
[REDACTED]	[REDACTED]	2022
[REDACTED]	[REDACTED]	2023
[REDACTED]	[REDACTED]	2023
[REDACTED]	[REDACTED]	2025
[REDACTED]	[REDACTED]	2025

Sites where interventions for nitrate are expected in the next 15 years, which are closely monitoring to see the effects of catchment management.

Site
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Appendix B: Network 2030 Infographics – Evolution of Smart Networks.

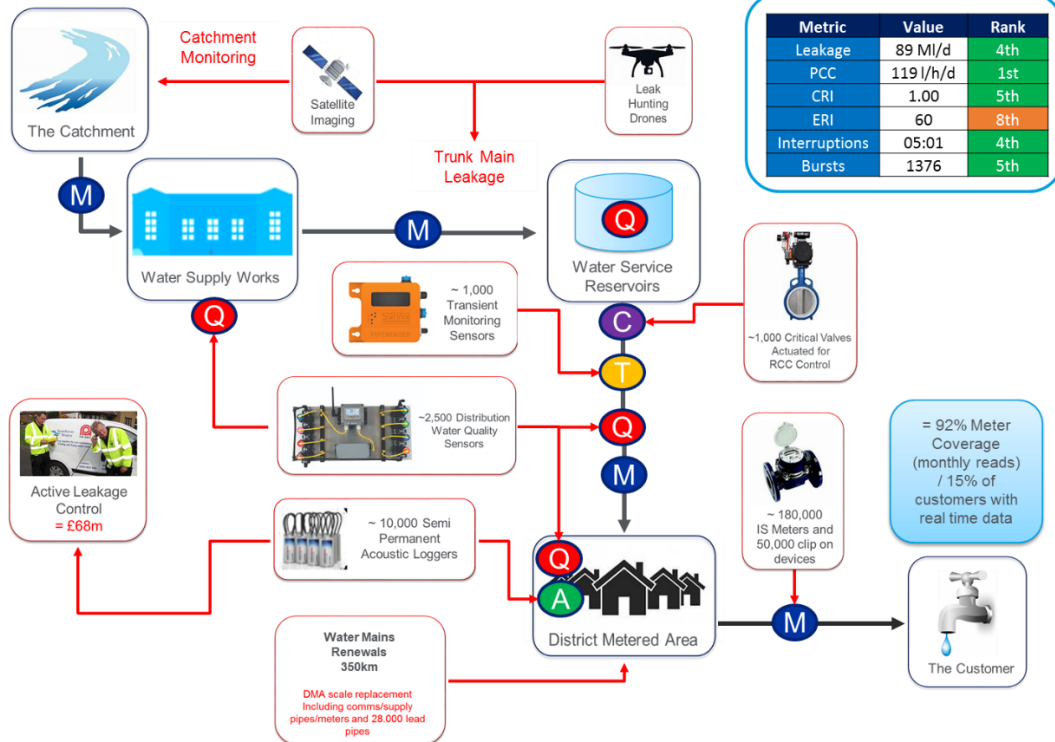
Current Approach (AMP6 Current)



Network Dashboard

Metric	Value	Rank
Leakage	111 MI/d	7th
PCC	131 l/h/d	2nd
CRI	2.28	6th
ERI	1136	20th
Interruptions	06:18	5th
Bursts	1901	11th

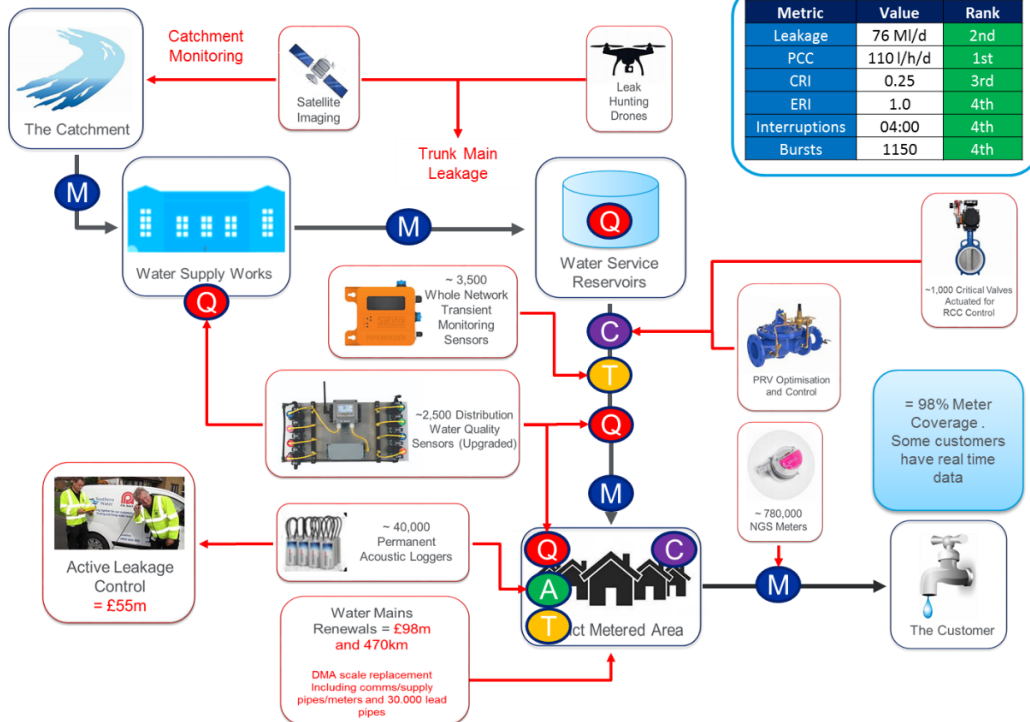
AMP7 Approach (to 2025) = SINES Phase 1



Network Dashboard

Metric	Value	Rank
Leakage	89 MI/d	4th
PCC	119 l/h/d	1st
CRI	1.00	5th
ERI	60	8th
Interruptions	05:01	4th
Bursts	1376	5th

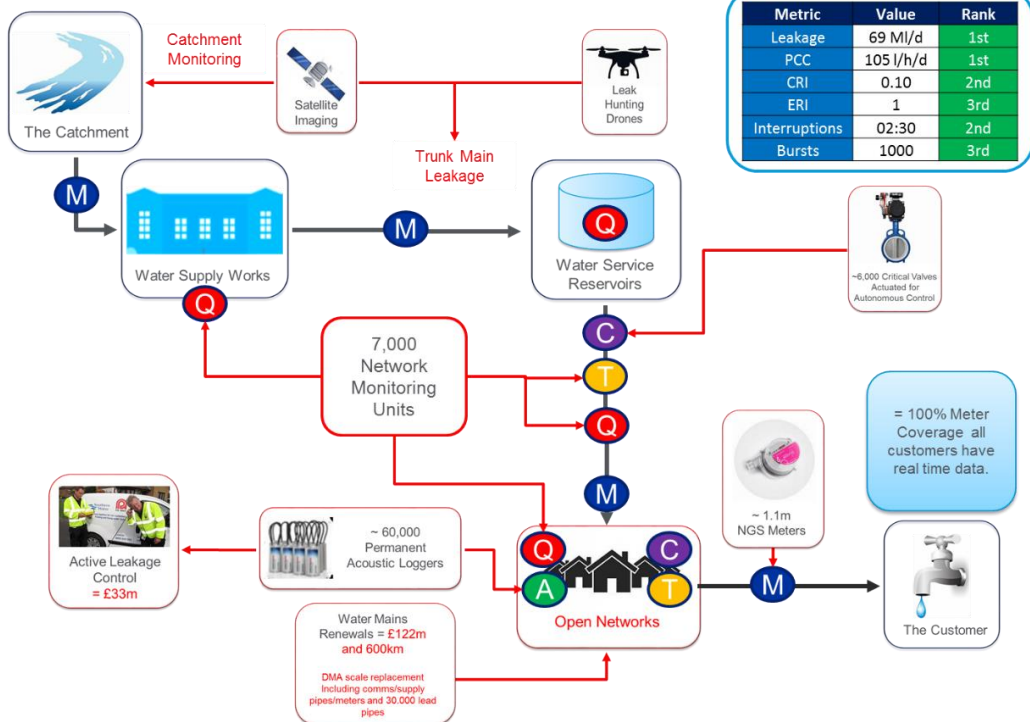
AMP8 Approach (2030) = SINES Phase 2



Network Dashboard

Metric	Value	Rank
Leakage	76 MI/d	2nd
PCC	110 l/h/d	1st
CRI	0.25	3rd
ERI	1.0	4th
Interruptions	04:00	4th
Bursts	1150	4th

AMP9 Approach (2035 to 2045)



Network Dashboard 2035

Metric	Value	Rank
Leakage	69 MI/d	1st
PCC	105 l/h/d	1st
CRI	0.10	2nd
ERI	1	3rd
Interruptions	02:30	2nd
Bursts	1000	3rd