ses WATER

APPENDIX SES008

ENHANCED LEAKAGE REDUCTION AND NETWORK RESILIANCE

Contents

APPENDIX SES008: ADDITIONAL LEAKAGE REDUCTION AND ENHANCED NETWORK RESILIENCE

A. Introduction

This enhancement case sets out the actions we propose to take, and the funding needed to continue to reduce leakage and to enhance our network resilience to extreme events.

Building on our AMP7 successes in leakage reduction we are setting out an ambitious plan to reduce leakage by a further 16% in AMP9. In a continuation of our current AMP strategy, we will target leakage reduction across a range of intervention types, which set to strike the optimum balance between cost, deliverability, and long-term asset improvement. In doing so we will deliver leakage reductions and network performance improvements that are sustainable and deliver value for money for this and future generations.

1. This enhancement case is structured in line with Ofwat's assessment criteria:
   - **(a)** In Section 2, we provide a detailed description of the leakage reduction interventions that we are planning;
   - **(b)** In Section 3, we describe the need for these enhancements;
   - **(c)** In Section 4, we demonstrate why we consider the chosen actions are the best options for customers;
   - **(d)** In Section 5, we show how we have assured the cost efficiency of our proposals; and
   - **(e)** In Section 6, we explain how our proposals are in the consumers interest, and how we will protect consumers in the event that not all of the enhancements are delivered.

Summary of our Leakage reduction and Network Resilience Enhancement case

2. In the tables below, we provide short summaries of the proposed actions covered within this enhancement case. We have categorised the actions into four intervention areas as set out below.
   - Active Leakage Control;
   - Network Optimisation and Pressure Management;
   - Smart Supply Network (Advanced adoption and usage); and
   - DMA (District Metered Area) Asset Health and asset condition assessment (Advanced Adoption and Use).

Table 1: Active Leakage Control Summary

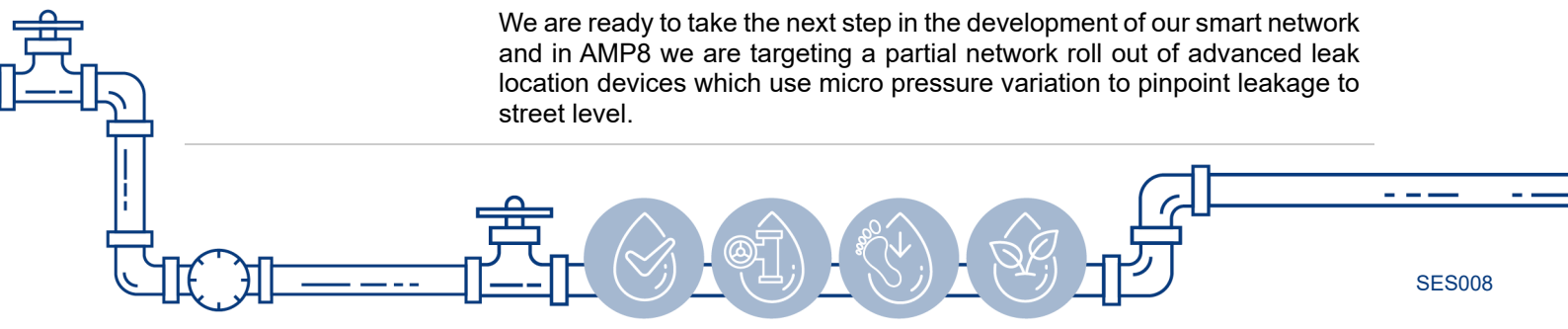
Reference	Leakage and Network Resilience - ALC
Description	Active Leakage Control (ALC) activities form a vital part of our leakage strategy. Often viewed as the fundamentals of good leakage management our actions in ALC include systems and processes for the identification and awareness of leakage, actions to prove and locate leaks and then actions to repair the leaks. For the most part we consider this to be base expenditure required to maintain or deliver incremental benefits. We set out elsewhere in our plan how we demonstrate a strong track record of delivery and cost effectiveness in this area of delivery. In addition to our base costs, we have identified a need to increase investment in ALC in AMP8. This will help us to target reductions through the enhanced use of ALC processes, practices, and technology. Innovation is at the heart of our plan and the enhancement investment sought will ensure we continue to lead the industry.
Outputs & outcomes	Enhanced ALC will contribute to a 0.5Ml/d (2.5%) reduction in leakage in AMP8 and further reductions as follows in later AMPs. Investment here will also be complemented by investment in the smart network (see separate intervention area). AMP9 – 1.5Mld (8%), AMP10 – 1.25Mld (8%), AMP11 – 1.0Mld (8%) and AMP12 – 1.0Mld (10%). Over the course of the five AMP period ALC will contribute a 27% reduction in leakage.
Cost	The costs associated with the enhancement element of ALC are as follows: AMP8 – £0.99m (Capex only); AMP9 – £1.97m (0.17 Capex and £1.8m Opex); AMP10 – £2.62m (0.22 Capex and £2.4m Opex); AMP11 – £3.51m (0.31 Capex and £3.2m Opex); and AMP12 – £4.96m (0.46 Capex and £4.5m Opex).
Spend apportionment	All costs have been allocated to the Network+ price control under the Treated Water Distribution sub-classification. This spend is requested in addition to base expenditure. Over the entire life of the five AMP plan, enhancement spend on ALC is calculated to total £14m which against a total ALC cost of £160m accounts for 8.8% of total cost to deliver ALC.
Delivery year	This programme will deliver annually over the entirety of the planning period.
DPC	We do not consider this scope of works being suitable for DPC as its value falls significantly below the value threshold set out by Ofwat.

Table 2: Network Optimisation and Pressure Management Summary

Reference	Leakage and Network Resilience - PM
Description	This enhancement case seeks funding for the expansion of pressure management in the operational network. This builds on and looks to complete work started in AMP7 to implement improvements across the entirety of our network. We will use this enhancement funding to optimise our network, creating new and improved pressure managed zones, making use of the latest technologies to stabilise and harmonise pressures. Delivery will reduce leakage, reduce the risk of bursts and other failures, and prolong the life of ours and our customers assets.
Outputs & outcomes	This investment will contribute to a 2.0Ml/d (9%) reduction in leakage in AMP8. At present we do not foresee any potential for further benefits in later AMP periods. This is based on the current technologies available and our plans to fully optimise our network as much as currently possible in AMP8.
Cost	The costs associated with this investment are as follows: AMP8 – £2.05 (Capex only).
Spend apportionment	The costs are allocated to the Network+ price control under the Treated Water Distribution sub-classification. This spend is requested in addition to base expenditure. The maintenance of existing network control systems, including control valves, advanced pressure controllers, logging devices, ancillaries and manpower are funded through base expenditure. This includes the maintenance and upkeep of schemes implemented as part of our AMP7 programme.
Delivery year	This programme will deliver uniformly over the course of AMP8.
DPC	We do not consider this scope of works being suitable for DPC as its value falls significantly below the value threshold set out by Ofwat.

Table 3: Smart Supply Network Summary

Reference	Leakage and Network Resilience – Smart Network
Description	This enhancement case seeks funding for the continued expansion and growth of our smart network infrastructure. Our smart network (iDMA) has been delivered in AMP7 and covers the entirety of our supply network with a network of advanced, near real-time sensors, reporting to an AI powered event management software. We have developed business processes that work alongside this technology allowing our teams to engage with it daily. It means that we can now identify leakage in a DMA within minutes of its occurrence. We are ready to take the next step in the development of our smart network and in AMP8 we are targeting a partial network roll out of advanced leak location devices which use micro pressure variation to pinpoint leakage to street level.



Outputs & outcomes	This investment will contribute to an anticipated 0.5Ml/d (2.5%) reduction in leakage in AMP8 and will work alongside the ALC initiatives to help deliver an overall saving of 1Ml/d. Crucially this investment is a fundamental enabler to achieving further leakage reductions though ALC in future AMPs. Investing in the technologies to better locate leakage will unlock the potential to achieve the outputs and outcomes described in the ALC case.
Cost	The costs associated with the enhancement element of AL are as follows: AMP8 – £1.13m (Capex – £0.71m and Opex – £0.42m); AMP9 – £1.44m (Capex – £0.94m and Opex – £0.50m); AMP10 – £0.51m (Capex – £0.14m and Opex – £0.37m); AMP11 – £0.29m (Capex – £0.13m and Opex – £0.16m); and AMP11 – £0.11m (Capex – £0.03m and Opex – £0.08m).
Spend apportionment	All costs have been allocated to the Network+ price control under the Treated Water Distribution sub-classification. This spend is requested in addition to base expenditure. All maintenance of existing smart networks including software, sensors and manpower is excluded from this enhancement case. This includes the maintenance and upkeep of schemes implemented as part of our AMP7 programme.
Delivery year	This programme of investment will commence at the start of AMP8. In reality it forms part of an ongoing programme of enhancement and follows investment made in AMP7. Each year thereafter AMP8 will deliver further phases and improvements to our smart network infrastructure.
DPC	We do not consider this scope of works being suitable for DPC as its value falls significantly below the value threshold set out by Ofwat.

Table 4: DMA Asset Health Summary

Reference	Leakage and Network Resilience – DMA Asset Health
Description	This enhancement case seeks funding for the continued adoption and use of our DMA Asset Health approach to holistic network asset management. In AMP7 our industry leading approach has helped us to deliver sustained leakage savings and improved performance against our supply interruptions and mains repair performance commitment targets. The programme has seen us systematically test over half of our supply network using non-invasive acoustic technology to determine the remaining life of our assets giving us unparalleled knowledge of its condition. We have coupled this with combined data sets to revolutionise the way in which we select assets for renewal. We are now seeking enhancement funding to take our approach even further, to a point where we can predict and plan for asset failure and intervene before this happens. To do this, we first need to complete a full survey of our network. Following this we will retest up to 10% of the mains assets in order to produce deterioration models. This information will help us to develop a sophisticated prediction engine, used to target renewal and other network interventions in the most optimum and timely way.

Outputs & outcomes	This investment will directly inform our mains asset renewal programme which will contribute to an anticipated 1Ml/d (5%) reduction in leakage from AMP9 onwards. It will also ensure that we meet our supply interruption and mains repair performance commitments contributing the following: Mains Repairs: a reduction in mains repairs per 1000km of 2 repairs per AMP (from AMP9 – AMP12) – 40% of the reduction target; and Water Supply Interruptions: a reduction in minutes lost to WSI of 0.1 minutes per property per AMP (from AMP9 – AMP12) – 20% of the reduction target.
Cost	The costs associated with the enhancement element of AL are as follows: AMP8 – £6.27m (All Capex); AMP9 – £1.81m (All Capex); AMP10 – £0.50m (All Capex); AMP11 – £0.50m (All Capex); and AMP12 – £0.50m (All Capex).
Spend apportionment	All costs are allocated to the Network+ price control under the Treated Water Distribution sub-classification. The spend requested is all enhancement as it relates to new activities and the creation of new models.
Delivery year	This programme of investment will commence at the start of AMP8. It forms part of an ongoing programme of enhancement and follows investment made in AMP7. Each year thereafter AMP8 we will further develop our models and seek funding to make continuous improvements to our models and our approach.
DPC	We do not consider this scope of works being suitable for DPC as its value falls significantly below the value threshold set out by Ofwat.

Table 5: Enhanced Customer Side Leakage Summary

Reference	Leakage and Network Resilience – CSL
Description	This enhancement case seeks funding for additional customer side leakage (CSL) expenditure above base. This investment is vital to our leakage reduction strategy and will allow for the creation of a new enhanced CSL function in the business with the appropriate staffing and processes to deliver a CSL service to our customer built on the data insights we receive from our smart metering roll out.
Outputs & outcomes	We anticipate that faster detection through smart meters will yield an initial reduction in leakage by at least 0.5 Ml/d in AMP8 with further savings expected when our proposed 7 year roll out programme is complete in AMP9. This is a conservative estimate based on an assumption that 7% of properties will be found to be leaking when the meter is installed and then a 5% reoccurring breakout rate each year following the install. Knowing about leaks in near real time will help us to confirm them quicker and work with our customers to get them fixed.

Cost	The costs associated with the enhancement element of customer side leakage are as follows: AMP8 – £0.5m (All Opex).
Spend apportionment	All costs are allocated to the Network+ price control under the Treated Water Distribution sub-classification. This spend is requested is all enhancement as it relates to new activities and the creation of new models.
Delivery year	This programme of investment will commence at the start of AMP8. It will be delivered in its entirety by the end of the AMP with any future costs associated with this coming from base in future AMPs.
DPC	We do not consider this scope of works being suitable for DPC as its value falls significantly below the value threshold set out by Ofwat.

B. Description of our proposed Leakage and Network Resilience enhancements

3. As set out in our Long-Term Delivery Strategy (LTDS) and our Water Resources Management Plan (WRMP), our ambition is to reduce leakage by at least 50% by 2050. Leakage is one of our top business priorities and following our WRMP and customer research, we have promised to go further than the 50% target and to reduce leakage by 63% by 2050. We have therefore set out an ambitious glidepath of reduction to ensure that we meet this ambition. Building on our successes and approaches in AMP7 we want to reduce leakage in the most sustainable way possible and our plan reflects striking a balance between current and future costs to ensure best value for our customers whilst still meeting our goals.

4. To deliver our ambition, we intend to:

   (a) Leverage the latest technologies to help us to find and fix leaks as quickly as possible, in the most efficient and cost-effective way that we can;

   (b) Tackle the root cause of leakage, understanding both where and why leakage occurs so we can move to a more proactive and preventative approach to leakage reduction and management;

   (c) Put asset management and resilience at the core of our leakage reduction strategies, recognising that the two are not mutually exclusive and good asset health and performance will help us to manage and reduce our leakage;

   (d) Be data led in our operational decision making for leakage management and in the way we set our strategies;

   (e) Embrace and adopt innovation and emerging technologies where there are proven to deliver benefit and are cost effective to implement (over the full planning period); and

   (f) Help our customers to locate, repair and prevent reoccurrence of leaks on their own property and pipework. In doing so provide a first-class service to our customers.

5. Through out What Base Buys (WBB) modelling we have identified an element of continued reduction in leakage that we will achieve though base expenditure alone. This represents 14% of our target reduction in AMP8 and will represent 20% of the total reduction by the end of AMP12. This demonstrates that we see a drive for continued efficiency though base as a key part of our leakage reduction and network improvement plans, but it is not enough on its own and additional funding is required.

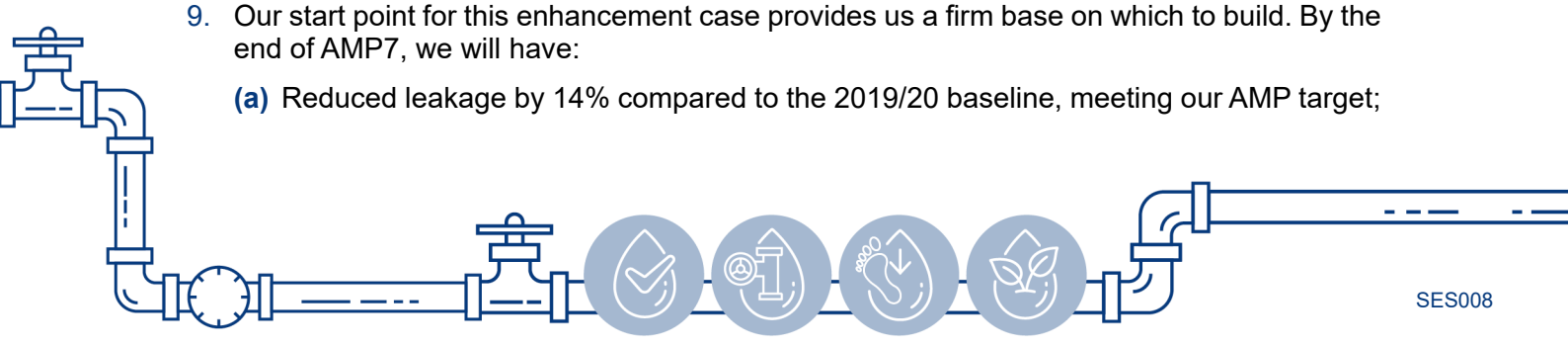
6. We need enhancement expenditure to ensure that we keep pushing to meet our ambitions. In our plan, we make a clear distinction between base expenditure which we need to maintain our leakage at end of AMP7 levels and the additional enhancement expenditure that will help us reduce leakage to new lower levels. We set out our requirements in this enhancement case.

7. All enhancement costs spent in AMP7 will be committed to base and the new expenditure being requested is for new initiatives, schemes and assets.

8. Funding requested in this case provides additional resilience benefits to our network. This is driven by the fact that our leakage intervention strategies are centred around asset improvement and the prevention of future leakage occurrence.

9. Our start point for this enhancement case provides us a firm base on which to build. By the end of AMP7, we will have:

   (a) Reduced leakage by 14% compared to the 2019/20 baseline, meeting our AMP target;



(b) Completed the full roll out of the phase 1 of our smart network – this means we have a near real time AI driven event detection solution in place in over 90% of our supply network;

(c) Completed a full appraisal of our network asset health and pressure reduction potential in just over half of our supply network gaining an unparalleled knowledge into the health of our supply network, and

(d) Delivered a substantive number of pressure management and network optimisation schemes with clear immediate leakage reduction benefits and expected associated future reductions in mains repairs and water supply interruptions.

10. Our plan for AMP8 builds on these components. We continue to believe that our approach to leakage reduction is the right one and our request for enhancement funding in this case looks for funds to continue this approach which has demonstrated, through our performance in AMP7, that it can deliver the results and increase in performance that we have set out to achieve.

11. A summary of our prosed interventions with their associated enhancement funding needs and performance commitment (PC) outcomes are set out in the table below. We present information for AMP8 only, recognising that these interventions are in most cases multi-AMP projects that will require further enhancement funding. We set out the case for this and reference to our longer-term planning considerations later in this document.

Table 6: Summary of Interventions

	Intervention	Description	PC Benefit(s) in AMP8	AMP8 Totex cost (£m)
1	Enhanced Active Leakage Control (ALC)	Enhancement funding is requested in addition to base funding in this area to deliver transitional performance in leakage ALC activities. Each year of the AMP we will reduce leakage to new lower levels with savings then committed to base.	**Leakage**: 0.1Ml/d per year (0.5Ml/d total for the AMP)	1.0
2	Smart Supply Network (advanced adoption and usage)	Complementing but independent to our ALC intervention, enhancement funding is needed to continue to enhance and grow our smart supply network infrastructure and processes. We will target expansion of our existing systems plus adoption of new technologies, sensors and software.	**Leakage**: 0.1Ml/d per year (0.5Ml/d total for the AMP). Also unlocks further benefits from AMP9 onwards. **Water Supply Interruptions**: 0.02 minutes per property (AMP total)	1.1
3	Network Optimisation and Pressure Management	Enhancement funding in this area will be used to improve our network focusing on optimum network layout, optimal pressure regimes and the removal of network transients to create calm resilient networks. This intervention is targeted at background leakage reduction as well as preventing leak outbreak.	**Leakage**: 0.4Ml/d per year (2.0Ml/d total for the AMP) **Mains Repairs**: 0.5 repairs per 1000kms (AMP Total)	2.1

4	DMA Asset Health and asset condition assessment (advanced Adoption and Use)	Enhancement spend is requested to enable completion of our DMA Asset Health initiative started in AMP7. We will complete the appraisal of the whole of our network producing a targeted enhanced mains renewal programme for AMP9 onwards. We will also collect repeat survey data in 10% of our network which we will use to create deterioration models so we can predict future poor performance before it happens.	**Mains Repairs**: 2 repairs per 1000kms (AMP Total) **Water Supply Interruptions**: 0.1 minutes per property (AMP total) **Leakage**: Benefits to be realised from AMP9 onwards.	6.3
5	Enhanced CSL Function	Enhancement funds are requested to set up a new CSL function in the business. The function will include new processes established to leverage and act on the enhanced data we get from our smart meter data platform.	**Leakage**: 0.1Ml/d per year (0.5Ml/d total for the AMP). Future AMP leakage savings from this will also depend on this investment.	0.5
	Total		**Leakage**: 0.7Ml/d per year (3.5Ml/d total for the AMP or 16%) **Mains Repairs**: 2.5 repairs per 1000kms (AMP Total) **Water Supply Interruptions**: 0.102 minutes per property (AMP total)	**11.0**

Source: SES Water PR24 Leakage Modelling

C. The need for our proposed Leakage Reduction and Network Resilience enhancements

Ambition

12. We will reduce leakage by a further 16% in AMP8 on our path to achieving over a 62% reduction in leakage by 2050. By following a sustainable approach, we will take the opportunity to enhance the resilience of our network which in turn will help us to meet our water supply interruptions and mains repair PCs and in doing so improve our network asset health.

13. In our long-term delivery strategy we set out our 2050 ambition relative to this enhancement case. We committed to:

- Reduce leakage by 63% by 2050;
- Align our leakage reduction ambitions with those of our customers and with the regional water resource planning needs (in our WRMP);
- Meet all Environment Improvement Plan (EIP) targets for leakage reduction (20% by 2027 and 30% by 2032);
- Target zero supply interruptions by 2050, achieving clear AMP milestones on route to this ambition; and
- Target more than halving our reported mains repair performance by 2050, achieving clear AMP milestones on route to this ambition.

14. In our LTDS we set out our approach to address leakage with a long term and sustainable strategy, which balances short term (reactive) interventions with longer term (proactive) interventions.

15. We have closely followed and considered the industry's leakage route map work, noting that leakage reduction needs to be bespoke for each company, who must consider historic performance, current leakage position and a raft of other specific factors unique to them when planning their leakage reduction strategy.

16. We have listened to our customers who tell us that leakage is their second highest priority (behind water quality). They have told us that they expect us to go further and faster to reduce leaks with 75% of customers choosing additional investment to exceed the Government's leakage target of 50% reduction by 2050 (from 2019/20 levels). We will meet the expectations of our customers and achieve a 50% leakage reduction by 2041 and 62% reduction by 2050.

Our Investment Drivers

17. We have completed extensive modelling to understand our current leakage performance (and cost to achieve it). Following best practice guidelines, we have produced leakage cost curves which show where we sit on the curve and the future costs per megalitre to continue to reduce leakage.

18. The curves shown in Figure 1 highlight that we are operating well below the economic level of leakage and that as we approach the steeper section of the graph our costs to reduce leakage will continue to rise. Our plan and this enhancement case reflect this.

19. It is clear from this modelling work that we cannot reduce leakage in line with our ambitions through more efficient base activities alone (although we have calculated a possible 0.5Ml/d saving in AMP8 though base – see our what base buys analysis).

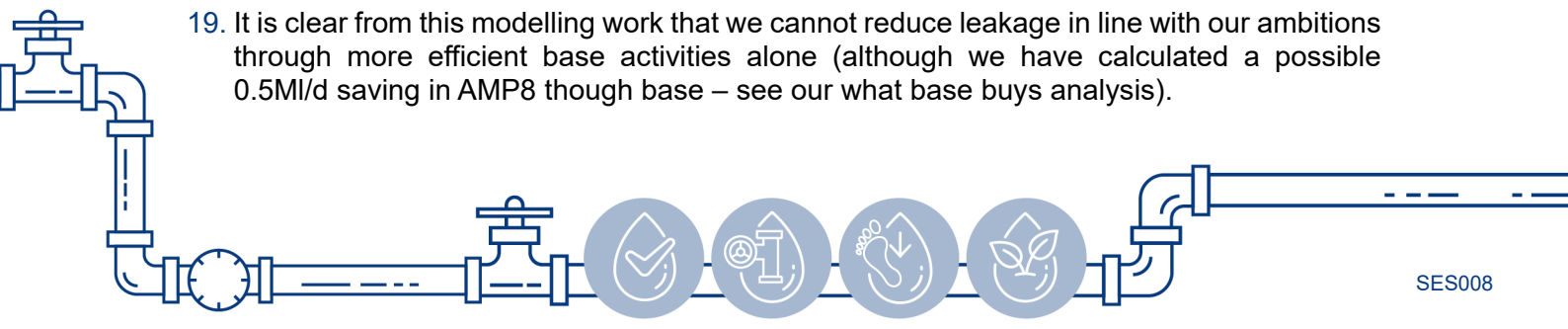
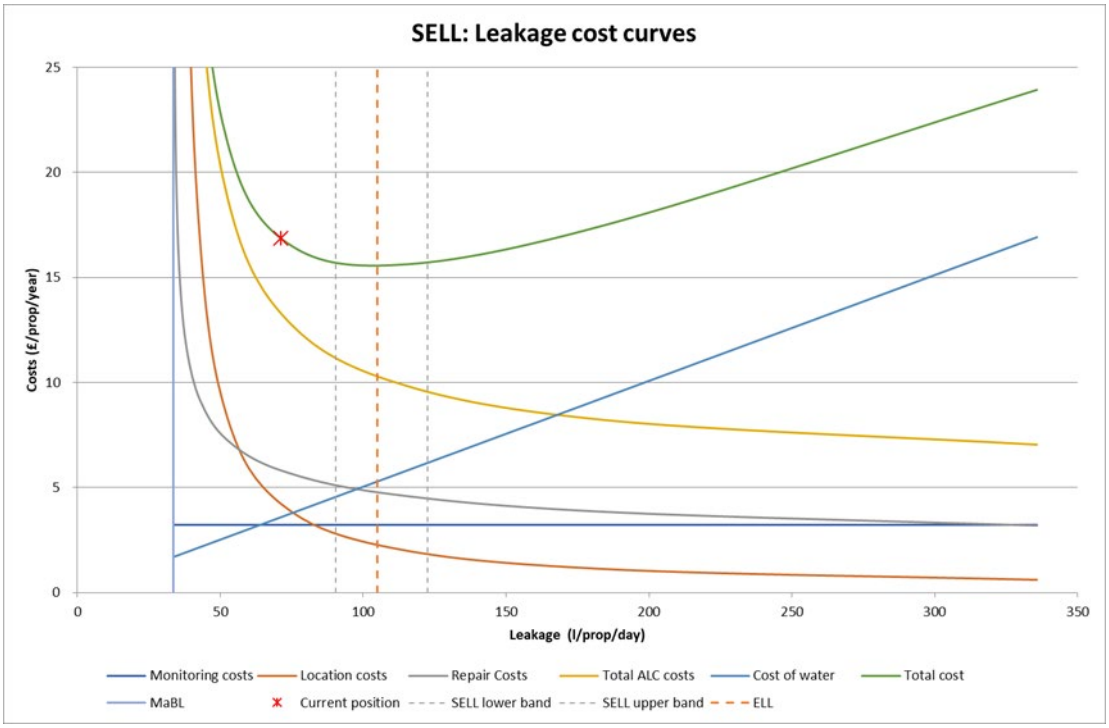


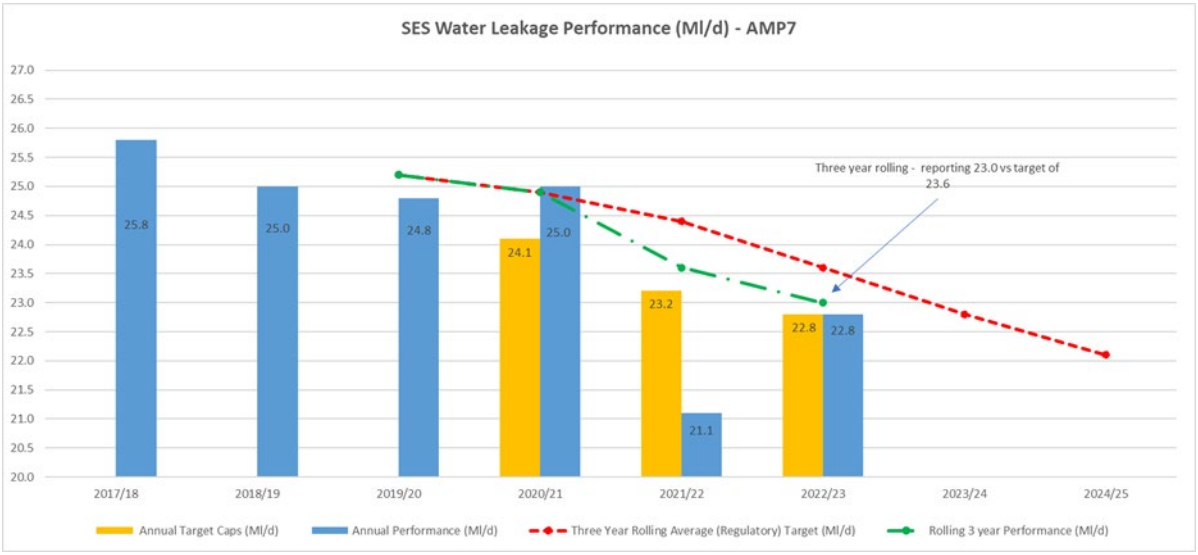
Figure 1: SES Water SELL Leakage Cost Curves



Source: Artesia SELL calculation for SES Water

20. We have delivered strong leakage performance in AMP7 and have continued our record of having never missed a regulatory leakage target. Figure 2 below shows our leakage performance to date in AMP7.

Figure 2: Leakage performance in AMP7



Source: SES Water Leakage performance tracker

21. It can be seen in Figure 2 that we remain on track against our LTDS ambitions and to meet our AMP7 targets.

22. Assuming we continue our reduction profile and meet our 3-year rolling target we will finish AMP7 on an annual leakage of 21.3Ml/d which is 14% lower than our 2019/20 baseline and strong evidence that our AMP7 strategy for leakage reduction has worked.

23. Having delivered on our promises in AMP7 we will then be well placed to continue to reduce leakage in line with our AMP8 and future AMP profiles.

24. We have set ourselves a further 16% reduction target for AMP8 which will take us to a total reduction against 2019/20 baseline of 28%. We will need enhancement expenditure to achieve this.

25. In relation to leakage, enhancement is needed for several reasons; these can be summarised into the following categories:

    (a) Leakage Economics – as we move further along our reduction journey the cost to reduce leakage becomes greater. This is most starkly noticed in the cost to deliver ALC activities where smaller, less visible, and less detectable leaks cost more to be aware of, to locate and then to repair;

    (b) Options Available – In AMP7 we have proactively led the way, and in the case of our smart network pioneered an approach to leakage reduction that has delivered demonstrable benefits. We have also pulled firmly on traditional leakage intervention levers, the best example of which is pressure management which has delivered over half of our leakage reduction in AMP7 to date. These interventions, whilst we calculate can still yield benefits, are becoming less numerous in number and possible reduction yield in AMP8;

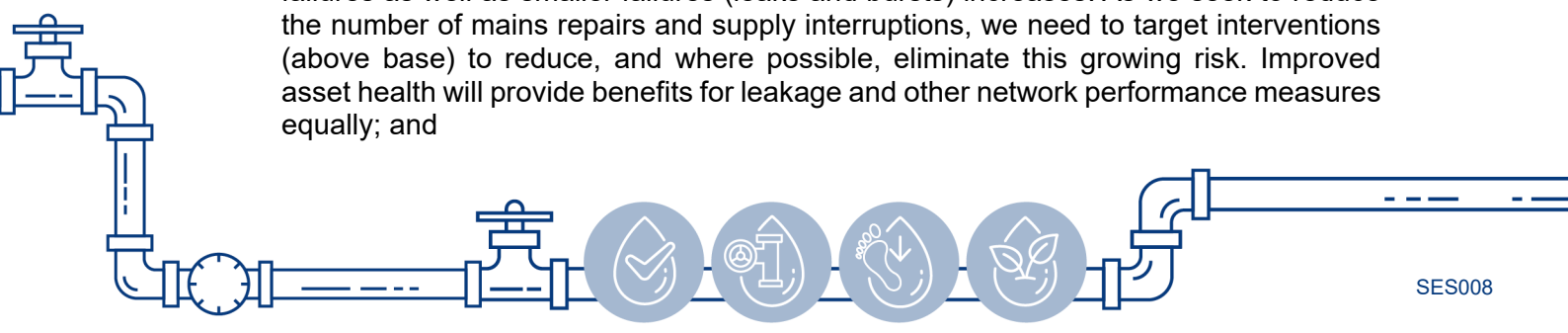
    (c) Our network age and condition – Our network continues to age at a rate greater than we can replace it. Our average network age of 67 years grows by a year every year, meaning that unless we can significantly increase our asset renewal rate, we need to find other ways to improve network performance and prolong and maximise asset life; and

    (d) External factors – Climate and weather have a significant impact on the resilience of our network. Extreme events are becoming more frequent and these changes in conditions are creating network and leakage impacts. Summer 2022, with the drought conditions experienced in the Southeast resulted in a significant leakage outbreak event, felt widely across our supply area. Furthermore, in December 2022 we experienced a significant winter freeze/thaw event, which for SES Water caused an instantaneous leakage impact greater than that experienced in the 2017 ‘Beast from the East’ event. Put simply these events make it harder to maintain leakage and even harder to reduce leakage in the report years that these events affect.

26. In relation to our supply interruptions and mains repair PC targets, enhancement is needed for several reasons; these can be summarised as follows:

    (a) Options Available – We have all but saturated the potential for traditional network optimisation, including DMA and pressure optimisation. This means that we have not only almost reached the end of possible leakage reduction through background leakage, but we have also reached the end of the potential to mitigate against failures. We now seek enhancement expenditure to implement new emerging technologies designed to further reduce risk and the frequency of such events;

    (b) Our network age and condition – As our network ages the risk of major catastrophic failures as well as smaller failures (leaks and bursts) increases. As we seek to reduce the number of mains repairs and supply interruptions, we need to target interventions (above base) to reduce, and where possible, eliminate this growing risk. Improved asset health will provide benefits for leakage and other network performance measures equally; and



(c) **External factors –** As described in the leakage drivers above, weather and climate changes are driving a greater likelihood and occurrence of failures on the network. We know that more failures will lead to not only proportionally more mains side failures (reported as mains repairs) but also associated supply interruption events. The enhancement funding put forward ensures that we can offset this impact and continue to make improvements against our target.

27. The investment drivers as described above are outside of management control and aside from the base efficiencies that we have modelled will require the enhancement funding that we are putting forward in this case.

Why action is needed now: adaptive planning and justifying the scale and timing of the proposed enhancement.

28. Our modelling has demonstrated that to meet our ambitious targets we must begin the journey now. The glidepath to our longer-term targets have been set in a realistic profile to make them both achievable and affordable.

29. Our leakage reduction strategy is set to match our WRMP and this has been agreed in collaboration with other South East water companies – it can therefore be viewed as a statutory requirement. We have also set our reduction profile to meet EIP targets.

30. For LTDS we have modelled alternative leakage reduction profiles, however the chosen option is the only option that meets all statutory obligations including the WRMP demand reduction. In all but the lowest scenario in terms of ambition (a non-compliant option against our statutory obligations), a 16% reduction in AMP8 is required. This makes this option no regrets.

D. Why our proposals are the best option for customers

31. In this section, we detail our approach to modelling and the options we have considered for each of the interventions we have proposed as part of this enhancement. We then demonstrate how and why we have selected the preferred option and why it offers best value to our customers.

Approach

32. Building on our approach to PR19, we have continued to use the same methodology for estimating the costs of leakage reduction for the next 25-year planning period. We have consistently applied this approach to both the WRMP and PR24 (including all LTDS work). Like PR19 our leakage reduction interventions fall into three categories:

    (a) Active leakage control – made up of steady state (maintaining leakage) and transitional activities (driving leakage down);

    (b) Pressure management (includes network optimisation); and

    (c) Asset Renewal – targeting mains and communication pipe renewal with the specific target of achieving leakage reduction.

33. Fundamentally we continue to aim to meet the National Infrastructure Commission (NIC) requirement of a 50% reduction in leakage by 2050 and the Public Interest Commitment (PIC) to triple the rate of sector-wide leakage reduction by 2030. In addition, we also now acknowledge the Government's EIP targets set at the 2027 and 2032 milestones.

34. We have built and tested scenarios with these targets in mind (although not all meet the EIP) and have tested a range which meet our water resources needs we believe offer credible affordable alternative to our customers, and show the correct level of environmental ambition.

Data Inputs

35. All cost data used in the scenarios and modelling is, where possible, based on actual costs incurred by SES in previous years. Artesia Consulting have been engaged to assist in building our cost model.

36. At the core of this cost model has been a revised assessment of our SES specific Sustainable Economic Level of Leakage (SELL) cost curve for leakage. This cost curve underpins all the ALC costs used in the models working on the basic premise that the closer you get to zero leakage the more expensive it gets.

37. Costs for pressure management interventions are based on unit rates derived from our recent DMA Asset Health implementation work.

38. Asset renewal costs are derived from unit rates per metre for asset renewals combined with assumptions about the leakage benefit per metre renewed. Our common framework modelling for below ground asset renewal, coupled with our well established and now widely adopted DMA Asset Health programme outputs has helped us to ensure that we accurately estimate the cost and benefits of the interventions being put forward and crucially that we avoid double counting any incidental benefits (i.e, benefits from other workstreams that might also yield a leakage benefit, such as burst and supply interruption targeted asset renewal).

39. Table 7 below shows the average unit rates for AMP8 calculated for the different intervention types, compared against the rates calculated for AMP7 at PR19. Whilst ALC and pressure management (PM) rates are similar there has been a big increase in the calculated unit rate for asset renewal. This is based on improved data that we have gained from DMA Asset Health.

Table 7: Intervention Unit Costs

Intervention type	PR24 calculated unit rate (AMP8) £/Ml	PR19 calculated unit rate £/Ml
ALC	0.95	1.0
Pressure Management	1.0	1.7
Asset Renewal	65.3	12.3

Source: Artesia Consulting: Final PR24 Leakage Reduction Scenarios

40. For our modelling, we have assumed that the starting point of AMP8 (the start of this planning period) will be as per our PC target. This will see us ending AMP7 at an annual leakage figure of 21.3Ml/d with this and the previous two report years figure forming the baseline for the anticipated three-year rolling leakage PC.

Intervention types

41. All of the modelled scenarios include an element of four intervention types for which we require enhancement funding, these are ALC, Smart Supply Network, Pressure Management/Network Optimisation and Asset Renewal. We set these out in detail below.

42. Continuing our approach from PR19 we fundamentally believe that a mix of all four of these interventions are needed to achieve the required balance between affordable leakage reduction in the short term and sustainable and affordable reduction in the medium to long term. Put simply this means we have a duty to ensure that our approaches to leakage reduction today (and in AMP8) do not store up problems (either technological or financial) for future generations of bill payers. Our aim is to achieve the right mix of interventions now that spreads the cost and benefits over the entirety of the 25-year planning period and beyond.

43. Our approach taken at PR19 has recently been backed up by the Water UK commissioned leakage route map work. The route map study recognises that all of our proposed leakage reduction interventions will be required to meet the PIC, NIC and EIP targets over the next 25 years. The study sets out clear evidence that companies will be both starting their leakage reduction journeys from different places, but also that they will have a different mix of interventions available to them over different timescales.

44. **Active Leakage Control (ALC)** - For many years this has been the predominant method of leakage management for the sector. The approach has been to increase ALC effort in response to network or weather events which increase leakage or as a tool to drive leakage down. It is clear that this traditional approach to leakage management still has a place and it remains a highly effective way for us to both maintain stable service and to reduce leakage.

    In AMP8 we want to build on the strong foundations we have laid down in AMP7 and continue to push the boundaries of efficiency in this area. Our modelling tells us that we can still continue to drive leakage down through ALC and our approach will be to continue to lead and push in this area as follows:

    (a) Greater adoption and more efficient use of our iDMA approach – targeting burst location in near real time. It will build on the first phase which has seen us over half detection time, with the aim to achieve a similar result with the location element of ALC;

(b) The mass roll-out of smart meters alongside a new and improved CSL offering. Our aim is to reduce leak runtime with CSLs by tacking the detection, location, and mend elements of the lifecycle. The enhancement expenditure will enable us to deliver a circa 10-fold increase in CSL and establish dedicated resources to support our customers through the process, including a new legal compliance function and processes to ensure that all known leaks are repaired in a timely manner. Note that in this enhancement case, we are only partially requesting funding for the new enhanced CSL function set up only. The full smart metering enhancement needs are picked up separately in Appendix SES009 - Enhancement Case: Smart Water Customer Experience;.

(c) The adoption of new repair techniques for both mains side and CSL;

(d) Achieve a continuous improvement in ALC efficiency; and

(e) Continued trials and adoption of new technologies and approaches to both better measure and understand where the water is going and then to more appropriately tackle the leakage issues.

45. **Pressure Management (Network Optimisation) –** has long been acknowledged as one of the most efficient ways to reduce leakage over the short to medium term. The relationship between pressure and leakage is a well-established one and our work in AMP7 through of DMA Asset Health programme has delivered demonstrable leakage reaction benefits.

46. To date we have put just over half of our supply network through the rigorous DMA Asset Health assessment and have found and delivered many Ml/d of leakage savings through the implementation of the recommended schemes from that work. The continuation of our work in AMP7 and the plan to extend it (and finish the entire network) in AMP8 means we will continue to find opportunities to deploy Pressure Management (PM) schemes (in many cases advanced PM).

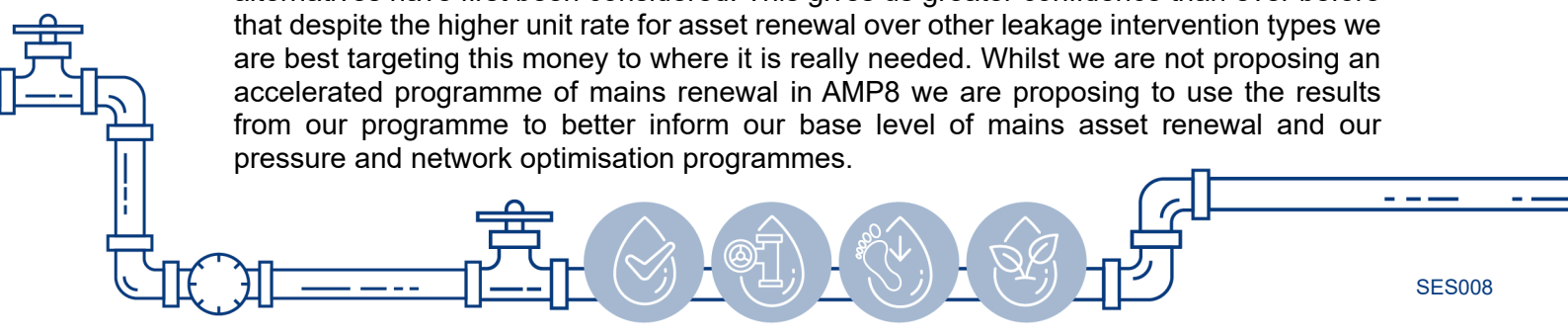
47. We are committed to continue to look for and adopt advanced technologies in this area and have a vision for the future of homogenised pressure at a suitable and acceptable level for all customers in the future. We will continue to work with the supply chain and wider sector to explore and test how this can be achieved.

48. **Smart Supply Network -** In AMP8 we aim to halve the average leak run time from 2020 levels. We'll do this by investing £1.1m to install more smart sensors so we can monitor and respond to our network even more closely and pinpoint the location of bursts and leaks more accurately using micro-pressure variation to do so. This will mean that in the future, we can respond even quicker and reduce the risk of supply interruptions further still.

49. Developments in our smart supply network will work hand in hand with our ALC efforts and act as a key enabler to us being able to reach the base efficiency that we strive for in this area of our plan.

50. We have a proven track record in this area and are seen as industry leaders – we aim to keep at the forefront of innovation here.

51. **DMA Asset Health and Asset Condition Assessment -** Our DMA Asset Health programme in AMP7 has provided us with the largest dataset of physically condition assessed assets anywhere in the world. This data gives us unrivalled knowledge of our asset base and ensures that we are only targeting assets for renewal when all other alternatives have first been considered. This gives us greater confidence than ever before that despite the higher unit rate for asset renewal over other leakage intervention types we are best targeting this money to where it is really needed. Whilst we are not proposing an accelerated programme of mains renewal in AMP8 we are proposing to use the results from our programme to better inform our base level of mains asset renewal and our pressure and network optimisation programmes.



52. We have plans to go even further in AMP8 and seek enhancement funding so that we can carry out mains condition retests. This will provide us with measured deterioration over time and by working with industry specialists we will look to turn this into a highly accurate model, that not only points us to required asset interventions now but helps us to map out a longer-term strategy for mains renewal over the planning period.

Scenarios

53. In total we have generated eight scenarios. One is a baseline (holding leakage at end of AMP7 levels) and is not a viable scenario. The seven other scenarios are credible alternatives designed to test the relative cost vs benefit of levels of stretch and ambition. All scenarios work on the basic premise that we need to continue to reduce leakage with a clear water resources driver to do this as well as customer and other stakeholder desire.

54. Figure 3 provides a summary of all scenarios. There are some key points to note:

(a) In the baseline scenario the cost to maintain leakage at current levels is £21.4m. These costs get progressively more for each of the next four AMPs thereafter on the basis that the population served continues to grow and therefore the number of mains connections also continues to grow;

(b) Scenario 1 is consistent with the draft WRMP which previously modelled it as the medium case. The Water Resource Southeast (WRSE) modelling selected this option as the minimum required intervention on leakage from SES. It is worth noting that since this modelling the governments EIP has been published and this scenario is now no longer compliant with the requirements of that document which state that all companies should achieve a 20% reduction by 2027 and a 30% reduction by 2032. We have therefore now concluded this scenario to be unviable.

(c) Both Scenarios 3 and 5 meet all compliance requirements and have a similar delta cost to the base line of £33m with these costs largely being driven by additional asset renewal needed in AMP8.

(d) All scenarios exclude the enhancement costs for Smart Networks and DMA Asset Health which have been costed and appraised separately using the Copperleaf value framework.

Figure 3: Cost Scenarios as Modelled

	WRMP	Meets EIP
Scenario 0 (Baseline): Current target profile, 2021-22 as BY, 2021-22 as reported (pre MLE), Reducing leakage		
Scenario 1: WRMP as submitted 8% reduction in AMP8 and then 9% in AMP9 & 10 and then 12% in AMP12 assuming a linear annual profile in AMP.	Low	No
Scenario 2: WRMP New Split 8% reduction in AMP8 and then 9% in AMP9 & 10 and then 12% in AMP12 assuming a linear annual profile in AMP.		No
Scenario 3: 15% Stretch 16% reduction in AMP8 and then 14% in AMP9 and then 15% in AMP10 & 11 and then 16% in AMP12 assuming a linear annual profile in AMP.	High	Yes
Scenario 4: 12% Stretch 12% reduction in AMP8 and then 11% in AMP9 and then 12% in AMP9 & 10 and then 13% in AMP12 assuming a linear annual profile in AMP.		No
Scenario 5: Fast start to 50% by 2050 16% reduction in AMP8 and then 14% in AMP9 and then 7% in AMP10 and AMP11 and then 8% in AMP12 assuming a linear annual profile in AMP.	Medium	Yes
Scenario 6:Slow start to 50% by 2050 8% reduction in AMP8 and then 9% in AMP9 and AMP10 and then 12% in AMP11 and AMP12 assuming a linear annual profile in AMP.		No
Scenario 7: 15% Stretch (AR Deferred and replaced by Smart Metering in AMP8) 16% reduction in AMP8 and then 14% in AMP9 and then 15% in AMP10 & 11 and then 16% in AMP12 assuming a linear annual profile in AMP.	High Plus (For Final WRMP)	Yes

Source: Artesia Consulting: Final PR24 Leakage Reduction Scenarios

55. Following extensive modelling set against WRMP requirements, customer expectation, government targets and our own ambition we have selected Scenario 7.

56. Scenario 7 (our preferred scenario) can be summarised as follows:

    (a) An ambitious and stretching long term ambition to outperform the 50% by 2050, where we will actually achieve a 63% reduction by 2050;

    (b) Meets our customers clear expectations for us to do more to reduce leakage;

    (c) Requires an additional £3.6m above base. This includes £0.5m to set up an enhanced CSL function to process smart meter identified leaks;

    (d) Requires a similar level of reduction per AMP (15-16%) to that being delivered in AMP7 and

    (e) Defers asset renewal enhancement expenditure in AMP8 in favour of relying on CSL savings from our planned smart metering roll out programme, see Appendix SES009 – Smart Water Customer Experience.

57. Scenarios 1, 3 and 5 were originally modelled in the draft WRMP. As our leakage reduction ambition has become better understood and we have factored in our customer research it became apparent that we needed to create an amended version of the high demand reduction scenario. This was remodelled as 'High Plus' and included the deferral of asset renewal or AMP8.

58. Our preferred scenario was then preferentially selected in Copperleaf and put though the optimiser with all the other initiatives to choose an optimum plan as part of our LTDS modelling.

59. We extensively tested our customers attitudes towards leakage and to our leakage reduction plans. We get strong support from customers for our ambitious plans in this area. Customers also told us they value an uninterrupted supply and so this further supports our case for resilience.

60. Our decision to defer asset renewal in AMP8 is in response to the need to keep bills affordable for our customers. We feel that given other external pressures and the fact that we can meet our leakage and resilience ambitions through other means then this is the right thing to do for AMP8.

Customer Research and Support

61. At PR19 leakage was a priority for our customers, and they showed a willingness to pay more, which was reflected in enhancement funding for this area. It was also seen as an important factor in making the water system more resilient.

62. Research into the WRSE regional plan reinforced that customers expect to see leakage reduction as part of a balanced future plan. Indeed, like our own research, reducing leaks along with removing constraints in the water supply network, was the starting point in ensuring an efficient water system.

63. For this plan our Bespoke 2 research into leakage confirmed it as a priority for customers. When ranked against the other areas of service, it positioned second, behind high quality water. This was consistent with our previous findings and reinforces the importance of addressing it in our PR24 plan and beyond.

64. To understand how ambitious customers expect us to be in reducing leakage, in our Bespoke 2 research we provided choices around that pace at which we could address leakage and the level of leakage reduction we could achieve. This found that of the five investment areas we tested, leakage was ranked as the most important areas to invest in. Nearly all customers (91%) feel that investment in leakage reduction over the next 25 years is important, prior to knowing the potential bill impacts.

65. When presented with bill impacts of different investment choices, 25% of customers chose to achieve the Government's leakage target. 75% of customers chose an option that would deliver additional investment and exceed the Government target – 40% opting to reduce leakage quicker to halve it by 2040 and 35% opting to go further and reduce leakage by 60% by 2050.

66. Using smart technology was seen to be important to help find and fix leaks more quickly. The idea that smart technology could help find problems before they happen was seen to be something that should be progressed wherever possible. Future customers also recognised that reducing leakage was an important factor is SES Water reducing its carbon emissions.

67. Our affordability and acceptability testing (AAT) research showed that almost half of the HHs (households) and three fifths off NHHS (non-households) surveyed (47% of 60%) said that 'investing in reducing leakage by finding and fixing more leaks, managing pressure and finding leaks on customers pipes' for an additional £3.73 (HH) and 1.88% (NHH) a year, was the most important element of the strategic aim of 'delivering a resilient water supply from source to tap'.

68. Further details about our customer research can be found in Appendix SE015 – Customer Insight Synthesis and Triangulation.

E. Cost efficiency

69. In this chapter we demonstrate how we have conducted robust cost modelling to arrive at our costs for each of the scenarios that we have considered. We will explain how these costs have been calculated and what assumptions we have used. We will give confidence that the alternatives selected, and the costs put forward in this case have been rigorously assured and represent best value for our customers.

70. Cost modelling for the leakage and resilience interventions that feed into this enhancement case fall into three categories:

(a) Leakage reduction costs - includes the three intervention types as modelled at PR19 of ALC, pressure optimisation and asset renewal. These have been modelled in a consistent way to our PR19 method using SELL and cost curve analysis at their heart. Support has been provided by Artesia Consulting for this element of our modelling;

(b) Smart Supply Network – following the successful implementation of the first phase of our smart network in AMP7 we have a much clearer understanding of costs and the options available to us for further enhancement in this area. We have therefore modelled options for this intervention outside of the core leakage cost model and as part of our Copperleaf optimisation process. Benefits have been calculated in terms of both leakage reduction and wider network resilience. Inputs for costs have come from framework rates with our current suppliers and smart network partners; and

(c) DMA Asset Health – Similarly to the smart network, our considerable experience with this project has allowed us to put forward well-defined and credible alternatives which we have chosen to model separately as part of our Copperleaf optimisation process. Benefits have been calculated in terms of both leakage reduction and wider network resilience. Inputs for costs have come from framework rates with our current suppliers and DMA Asset Health partners.

71. Leakage Reduction costs as modelled are shown in Table 8. They show the range of totex outputs and how much enhancement expenditure is required for each scenario. The chosen alternative is highlighted red and shows that it offers good value from an enhancement perspective compared to some of the other options. It should be noted that the cost of smart metering is captured elsewhere in Appendix SES009 – Enhancement Case: Smart Water Customer Experience..

Table 8: Leakage Reduction Cost Modelling Outputs

Scenario	Meets Ambition, WRMP and EIP (Y/N)	AMP8 Totex cost (£m)	AMP8 Enhancement cost (£m)
Scenario 0 (Baseline)	N	21.4	0.0
Scenario 1: WRMP as draft submission	N	37.8	16.4
Scenario 2: WRMP New Split	N	35.2	13.9
Scenario 3: 15% Stretch	Y	54.5	33.1
Scenario 4: 12% Stretch	N	39.3	17.9
Scenario 5: Fast start to 50% by 2050	Y	54.9	33.5

Scenario 6: Slow start to 50% by 2050	N	35.6	14.2
Scenario 7: 15% Stretch (AR Deferred and replaced by Smart Metering in AMP8)	Y	25.4	3.6

Source: Artesia Consulting: Final PR24 Leakage Reduction Scenarios

72. Smart network costs as modelled are shown in Table 9. The chosen alternative is highlighted in Red.

73. The Copperleaf optimiser selected the Enhanced 1 option. Whilst it did not drive the most value in term of leakage or resilience benefits it has been calculated to offer the best value for money within the constraints of affordability.

Table 9: Smart Network Cost Modelling Outputs

Scenario	Description	AMP8 Totex cost (£m)	AMP8 Enhancement cost (£m)
Maintain Current	The cost to maintain our current smart network including all sensor renewal and maintenance and all software maintenance costs. To include a replacement hydraulic model and software upgrades.	0.8	0
Enhanced 1	As maintain plus the partial expansion to include burst find in up to 50% of all suitable DMAs across AMPs 8 and 9.	1.7	1.1
Enhanced 2	As maintain plus a more expansive expansion to include burst find in up to 100% of all suitable DMAs in AMP8.	2.6	1.7
Enhanced 3	As enhanced 2 plus digital twin creation, multiple sensor types to street level, fully integrated front end.	3.1	2.0

Source: SES Water: LTDS Copperleaf Outputs_Core Pathway_For BP tables

74. DMA Asset Health costs as modelled are shown in Table 10. The chosen alternative is highlighted in Red.

75. The Copperleaf optimiser selected the AH Enhanced Slow option. Whilst it did not drive the most value in terms of leakage or resilience benefits it has been calculated to offer the best value for money within the constraints of affordability in AMP8. It offers greater value above the base option because it enables us to start building deterioration models in AMP8 that will inform our AMP9 renewal programme.

Table 10: DMA Asset Health Cost Modelling Outputs

Scenario	Description	AMP8 Totex cost (£m)	AMP8 Enhancement cost (£m)
AH - Maintain AMP7	Complete all eligible mains and DMAs in AMP8.	5.7	5.7
AH - Enhanced Slow	Complete all eligible mains and DMAs in AMP8. Retesting up to 10% of eligible mains to create deterioration curves in AMP9.	6.3	6.3
AH - Enhanced Fast	Complete all eligible mains and DMAs by Y3 of AMP8. Retesting up to 10% of eligible mains to create deterioration curves in Yrs 4/5 of AMP8.	7.4	7.4
AH - Super Enhanced	Complete all eligible mains and DMAs by Y3 of AMP8. Retesting up to 20% of eligible mains to create deterioration curves in Yrs 4/5 of AMP8 and 1/2 AMP9.	8.3	8.3

Source: SES Water: LTDS Copperleaf Outputs_Core Pathway_For BP tables

76. We are confident that through robust modelling we have selected the best combination of alternative options to help us to achieve our leakage reduction and network resilience ambitions. To ensure quality our cost assessments have:

    (a) Included robust costings using our own consistent data sets. Having implemented both the Smart Network and DMA projects throughout AMP7 we have made use of the accurate costs and benefits data that we have collected;

    (b) Used SELL Modelling for leakage reduction based on best practice, performed by industry specialist consultants Artesia Consulting (co-authors of the Leakage Routemap work);

    (c) Included the calculation of value in our decision support tool Copperleaf which uses the six capitals model; and

    (d) Been subject to internal and third-party scrutiny as part of our assurance process.

77. Table 11 shows the total enhancement costs split out per investment type and cost modelling group. Our total enhancement requirements as part of this enhancement case sum to £10.5m. This represents 32% of the total cost being put forward for leakage management. We are confident that these costs are a fair reflection of what is needed to drive leakage down by 16% in AMP8. Without this funding above base we will not be able to meet our performance commitments.

Table 11: Combined Cost Modelling Outputs

Cost Modelling Group	Description	AMP8 Totex cost (£m)	AMP8 Enhancement cost (£m)
Leakage Cost Reduction	Active Leakage Control	22.8	1.1

Leakage Reduction Cost	Active Leakage Control – Enhanced CSL function	0.5	0.5
Leakage Cost Reduction	Network Optimisation	2.1	2.1
Leakage Cost Reduction	Asset Renewal	0	0
Smart Networks	Smart Network – Enhanced 1	1.7	1.1
DMA Asset Health	AH – Enhanced Slow	6.3	6.3
Total		**33.4**	**11.0**

Source: SES Water: LTDS Copperleaf Outputs_Core Pathway_For BP tables

F. Customer protection

78. We have assessed the degree of customer protection that is afforded by the various mechanisms in place across the regulatory frameworks applying to this scope of works and conclude the following as providing requisite customer protection required for these programmes of works.

79. We are confident that our investment will help us to deliver our targets in leakage, supply interruptions and mains repairs. If we do fall short, we fully expect to receive Outcome Delivery Incentive (ODI) penalties.

80. Should we not deliver on our promises to our customers we will be penalised though the ODI mechanism. Our enhancement investment requirements have been calculated alongside the ODI rates proposed, to ensure that they are proportionate and hold us to account for failure to perform where specific enhancement funding has been granted.

81. We recognise the importance of incentivisation and so we have also set our ODI rates at levels which allow us to aspire and aim for outperformance. Outperformance will be achieved in the event of us being able to make best use of our enhancement funding.

82. We have not proposed a bespoke PC for these enhancement works as we believe the aspects of the programme are adequately addressed via the three common PCs and associated ODI mechanisms attached to them.

83. We have not proposed a Price Control Deliverable (PCD) for these works for the reasons set out in Appendix SES063 – Price Control Deliverables and Additional Reporting Metrics. Whilst meeting the materiality threshold for a PCD, as stated above, we believe the common PCs and associated ODI mechanism provides adequate protection for our customers.

84. By virtue of the nature of this work, third party funding options are not deemed suitable or realistic. We assess there to be no third-party funding risks.

85. We believe that the above arrangements provide adequate protection for our customers in the event of late or non-delivery of these schemes.