

Appendix 8.8.A – Claim WSX04 – Reducing leakage by a further 15%

Wessex Water

September 2018

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1. Summary

This cost adjustment claim relates to the additional costs of reducing our in-year leakage level by a further 15% in the period 2020 - 2025. This is a step change in performance and the costs to achieve this are not reflected in our historic costs or Ofwat's cost baselines. The table below provides a summary of the claim and the following sections provide more detail.

Heading	Summary	
Name of claim	WSX04 Reducing leakage by a further 15%	
Name and identifier of related claim submitted in May 2018	WSX04 Reducing leakage by a further 15%	
Business plan table lines where the totex value of this claim is reported.	£25.3m in Wn6 line B7	
Total value of claim for AMP7	£25.3m	
Total opex of claim for AMP7	£5.5m	
Total capex of claim for AMP7	£ 19.8m	
Depreciation on capex in AMP7 (retail controls only)	n/a	
Remaining capex required after AMP7 to complete construction	£0m	
Whole life totex of claim	£88m	
Do you consider that part of the claim should be covered by our cost baselines? If yes, please provide an estimate	No, we do not consider that your cost baselines will include the significant costs required to deliver a step change in performance.	
Materiality of claim for AMP7 as percentage of business plan (5 year) totex for the relevant controls.	Materiality of the estimated additional cost is 4.3% of the Water network plus totex	
Is the claim likely to feature as a Direct Procurement for Customers (DPC) scheme? (please tick)	Yes	No
		√

Heading	Summary
Need for investment/ expenditure	<p>Achieving this stretching target requires additional active leakage control and pressure management supported by investments in improved network monitoring and data systems, and analysis and decision support tools.</p> <p>The 15% reduction in total leakage (13 % when reported as a three year average) is estimated to be a reduction from 78.16 MI/d in 2019/20 to 66.43 MI/d in 2024/25, made up of:</p> <ul style="list-style-type: none"> • 1.23 MI/d reduction in customer losses from metering (which is not included in this cost adjustment claim) • 10.49 MI/d reduction in distribution losses – which is the subject of this claim.
Need for cost adjustment	<p>We are already an industry leader on leakage when measured against mains length and have achieved the second biggest reduction in leakage since the mid-1990s.</p> <p>The significant additional costs are required to achieve the step change in leakage are not currently reflected in Ofwat's cost baselines.</p>
Outside management control	<p>We have taken action to try to limit the costs. Based on in-depth customer research in 2017, our initial approach was for a smaller reduction in leakage, with lower impact on customers' bills.</p> <p>However, since then, based on feedback from stakeholders and further customer research in 2018, we have revised our approach and our plan includes a 15% reduction.</p>
Best option for customers	<p>A range of options have been assessed to ensure the appropriate mix of activities to achieve the most cost beneficial solution to meet the outcome.</p> <p>We have made a deduction for the cost saved by reduced production volumes.</p>
Robustness and efficiency of claim's costs	<p>Section 8 of the main business plan narrative describes how we have ensured our proposals are efficient across all price controls, as well as explaining how we estimate efficient costs of new projects.</p> <p>Through external benchmarking we have demonstrated that our cost estimates are efficient and competitive compared with the market place.</p>
Customer protection	<p>There is a common performance commitment for leakage.</p>

Heading	Summary
Affordability	<p>The programme of work outlined in the Cost Adjustment Claim was included in our draft business plan that was tested with customers between January and June 2018.</p> <p>The acceptability testing was designed to test customers' acceptance of our overall package of service improvements and bill impacts. Testing has shown that 96% of our customers find our business plan acceptable. Acceptability is above 90% across all demographic subgroups.</p>
Board assurance	<p>The proposals have been subject to our board assurance process, which is described in detail in section 12 of the main business plan narrative and supporting documents 12.1 to 12.8</p>

2. Background

2.1 Historical position and previous customer priorities

Since the mid-1990s we have halved the amount of water that leaks from our network; around 15% more than the industry average reduction over the same period. As shown below we have the second highest reported leakage reduction by mains length in the industry since 1994/95.

Company	Reported Leakage m ³ /km/day		
	1994/95	2016/17	% reduction
Welsh	15.5	6.4	59%
Wessex	12.9	5.7	56%
Yorkshire	19.4	9.3	52%
UU	21.7	10.5	52%
Severn Trent	16.2	9.2	43%
South West	9.5	5.5	42%
Thames	34.7	21.6	38%
Southern	10.2	6.4	37%
Bournemouth	10.2	6.8	33%
Northumbrian	11.5	7.8	32%
South Staffs	17	11.6	32%
Anglian	6.9	4.8	30%
South East	8.7	6.1	30%
Bristol	9	6.9	23%
Portsmouth	10.1	9.1	10%
Weighted Average	16.1	9.1	43%

With over 11,800 km of water mains and 600,000 service pipes we have 8,000,000 pipework joints, so it's inevitable that leaks will occur but our management and investment strategy ensures we respond rapidly and that we are always driving down overall leakage.

We spend over £16m a year of direct costs on managing and reducing leakage and a further £12m each year replacing older water mains.

Every year we mend around 12,000 leaks – our leakage detection team are a highly skilled workforce that utilise a range of modern technologies and analysis methods to accurately identify leaks and schedule their prompt repair.

Leakage is an important issue for customers and we welcome the recognition from so many that they can participate in helping us to tackle leakage by reporting leaks that they spot to us. We fix over 75% of these customer reported leaks by the end of the next working day and are targeting 90% by 2025.

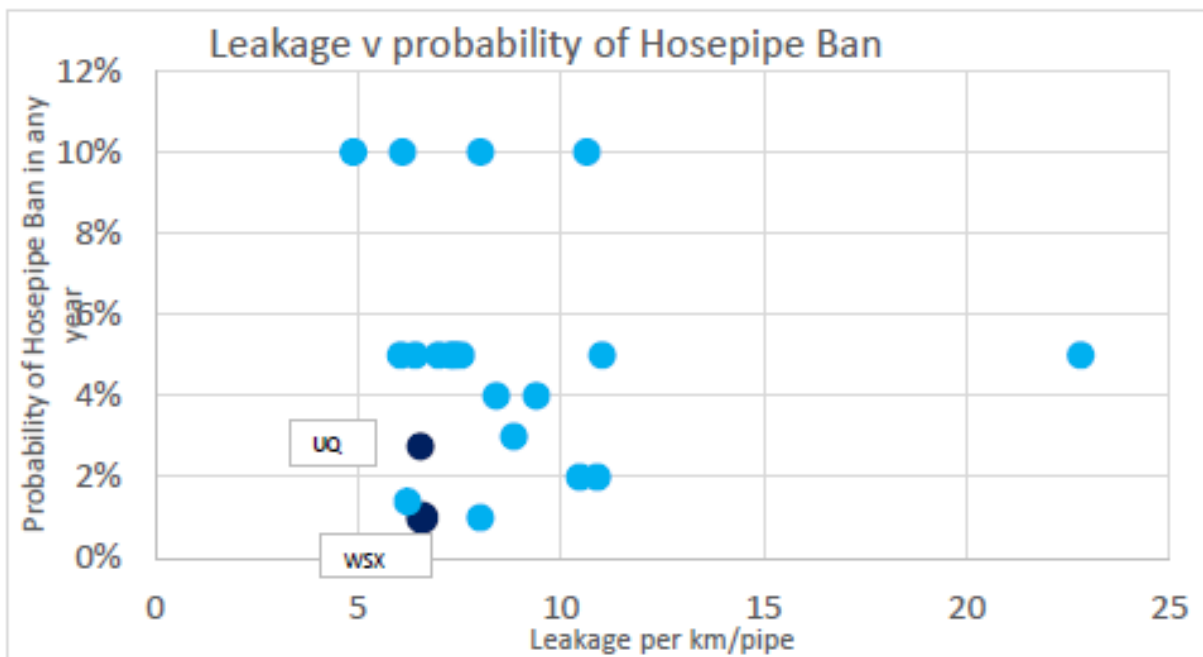
To help us develop our future leakage management strategy in 2017 we undertook in-depth research with our customers and found that:

- leakage has no direct negative impact on customers, many could not recall ever having seen a leak and most have higher water priorities than leakage
- there is little appetite to see us invest to bring about further reductions in leakage over the next 5 years if this means that bills will rise for little overall leak reduction
- most customers are keen to see modest investments in innovation to help bring down leakage in the longer term
- there is interest in investment in education services with children and collaboration with customers to fix plumbing leaks in homes and improve awareness of water efficiency. Many customers recognise the role they can play in helping to manage the amount of water we take from the environment.

Our current level of leakage is significantly below the ‘sustainable economic level of leakage’ meaning that reducing leakage further will cost more than the cost of producing the water, this is in part due to the fact that we have a surplus of resources compared with predicted demand.

We are one of the best performers when leakage is measured per km of pipe. At the same time we have the lowest probability of hosepipe bans in the country at <1% and we have assessed our supplies as resilient to a 1 in 200 year drought, as shown in figure 2-1 below.

Figure 2-1: Leakage and hosepipe bans comparison

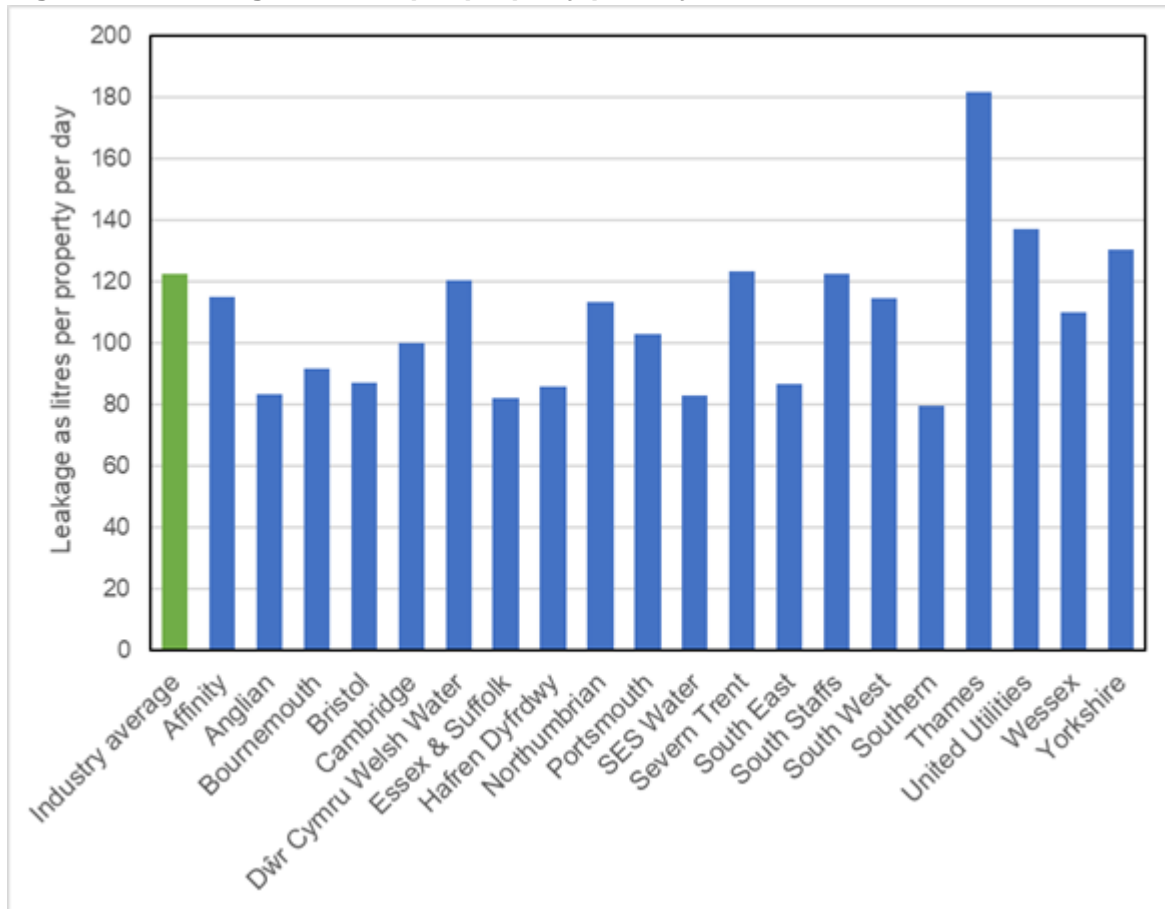


As detailed in our Water Resources Management Plan we have a surplus of resources over demand for at least the next 25 years.

The following Figure shows that we are below the industry average level of leakage as litres per property per day in 2017/18 as per the company reported data to Discover Water. It should be noted that this data in the context of companies' current reporting methodology and leakage targets. We recognise that there are a number of companies with a lower

leakage per property than us, however, this is because we are a very rural company with a long length of main and a relatively low number of customers and no metropolitan areas.

Figure 2-2: Leakage as litres per property per day, 2017/18 Discover Water



The minimum level of achievable leakage is the lowest possible level of leakage with current technology and infinite resources (both financial and human). In our WRMP19 calculation of the Sustainable Economic Level of Leakage (SELL) we estimated the minimum level of leakage achievable using the UK-specific definition of UARL at 32.8 MI/d.

Cost benefit analysis based on current valuations indicates that leakage reduction beyond 15% would not be cost beneficial. Our aspiration is to see further reductions in the future as per our long term leakage reduction forecast included in our Water Resources Management Plan, we envisage these will become cost beneficial as new technology and innovation become available.

2.2 Regulatory expectations

Despite our surplus and a leakage level that is currently below the sustainable economic level of leakage (SELL), there is an expectation from regulators, Ofwat and the Environment Agency, that we will reduce our leakage significantly over the next 5 years, and continue to reduce leakage thereafter.

The expectation from regulators is that companies should set ambitious service levels for leakage. Companies should justify their proposed performance commitment levels against the following approaches and justify why they have not adopted them:

- Companies should commit to achieving at least the forecast 2024-25 upper quartile levels of performance on leakage per property per day and leakage per km of main per day.
- Companies should commit to achieving reductions of at least: a 15% reduction and / or the largest actual percentage reduction achieved by a company since PR14
- Companies should justify their performance commitments relative to the minimum level of leakage achievable (Unavoidable Annual Real Losses).

2.3 Latest customer priorities

Given the importance of leakage we have carried out further research in 2018. The findings of this research were that, once leakage was set in the context of all the other service improvements we were proposing and the overall bill impact, customers were willing to pay for further leakage reductions. Final acceptability testing has shown that customers support our proposals to reduce leakage by 15%.

We have reflected this revised customer support in our plan. We are proposing to reduce our leakage level by 15% on an in-year basis over the five-year PR19 business period 2020 - 2025. To support the change we have revised our draft Water Resources Management Plan in response to feedback from Defra and the EA to include the 15% reduction.

2.4 Proposed leakage reductions

Leakage in 2017/18 reported using the consistent methodology was 79.7 MI/d and it is estimated that our leakage level in 2019/20 will be a 78.16 MI/d. To achieve a 15% in-year leakage reduction, we would need to reduce our leakage by 11.72 MI/d to 66.43 MI/d by 2025.

The 11.72MI/d reduction in total leakage is made up of a 1.23 MI/d reduction in customer losses from metering (which is not included in this cost adjustment claim) and a 10.49 MI/d reduction in distribution losses.

This a significant step change in performance compared with the recent past when leakage has been reducing slowly year by year. The proposed leakage level is significantly lower than the calculated SELL of 104 MI/d.

2.5 Summary of business plan proposals

Our proposals are summarised in section 5 of the main business plan narrative, as reproduced below.

What we will be doing to 2025

We undertook in-depth research with our customers in June 2017 on the core issue of leakage and efficient water use, and found that:

- leakage has no direct negative impact on customers. Many could not recall ever having seen a leak and most have higher water priorities than leakage
- there is little appetite to see us invest to bring about further reductions in leakage over the next five years if this means that bills will rise for little overall leak reduction
- most customers are keen to see modest investments in innovation to help bring down leakage in the longer term
- there is interest in investment in education services with children and collaboration with customers to fix plumbing leaks in homes and improve awareness of water efficiency. Many customers recognise the role they can play in helping to manage the amount of water we take from the environment.

Our quantitative research techniques however suggested that there is customer willingness to pay for leakage reduction with a 15% reduction close to being cost beneficial.

Government and regulators (Defra, Ofwat and the EA) have since set an expectation that companies will reduce leakage by 15% by 2025 and continue to reduce leakage thereafter.

In 2018 we have undertaken further research to gauge our customers' priorities. We found that, once leakage was set in the context of all the other service improvements we were proposing and the overall bill impact, customers accepted paying for further leakage reductions.

While we are ourselves in a surplus position for water resources it is clear from recently published Water Resources Management Plans that neighbouring companies would value this water more highly. Continued leakage reduction should enable greater resource to be traded with these companies in future, and this could help reduce bills for our own customers, further improving the cost-benefit ratio.

Taking all of this into account we will therefore reduce leakage by 15% by 2025.

This will require a step change in our activities, as well as innovation and continued customer support and engagement. Our proposals include:

- reducing losses from our distribution network through additional active leakage control, improved data collection and analytics, further sub-division of district meter areas, innovative pressure management
- reducing losses from customers' pipes through our enhanced metering programme as it is easier to identify leaks on properties that are metered
- promoting ways in which customers can contact us to report a leak via our leak stoppers telephone hotline or our website.

In common with our approach to other performance commitments we have set the 15% reduction as a central target. Given that we have been a leading performer for leakage reduction (only Welsh Water has reduced leakage by a greater percentage

since 1995) we accompany this with a cost adjustment claim for the cost-beneficial expenditure required.

3. Need for cost adjustment

In this section we provide evidence that the cost claim is not included in Ofwat’s modelled baseline; and, that the allowances would, in the round, be insufficient to accommodate special factors without a claim.

This claim concerns an increase in cost due to the step change in service with the additional costs not reflected in historic costs and unlikely to be reflected in Ofwat’s baselines, given:

- our historical leakage reduction of over 50% since the mid-1990s
- our industry leading leakage level by mains length, that best reflects our performance as a rural company.

Since the mid-1990s we have halved the amount of water that leaks from our network; around 15% more than the industry average reduction over the same period. We have the second highest reported leakage reduction by mains length in the industry since 1994/95. However, leakage reduction levels for all companies has slowed in recent years – our performance is shown in the table below (a 3% reduction in seven years) – and we consider that it is not likely that Ofwat’s models can accurately predict the cost associated with a large reduction in PR19.

Unit	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
MI/d (in year)	83.1	81.1	80.6	81.6	80.7	80.4	80.4

Our current level of leakage is significantly below the ‘sustainable economic level of leakage’ of 104MI/d, meaning that reducing leakage further will cost more than the cost of producing the water. This is in part because we have a surplus of resources compared with predicted demand.

Achieving a further 15% reduction over just 5 years will require a major step change in investment that is not allowed for in our historic costs or in Ofwat’s baselines.

To achieve the step change in leakage we require additional capital and operational investment; it is estimated that the additional totex expenditure required over the 2020-2025 period is £25.3m (net) which is a significant increase on our current expenditure.

Our total water network plus totex for AMP7 is forecast to be circa £590m. The special cost claim as a proportion of totex is just over 4% - i.e. greater than the 1% materiality threshold that Ofwat set out in its final methodology.

4. Management control

In this section we demonstrate that the cost is driven by factors beyond management control; and, that we have taken all reasonable steps to control the cost.

As mentioned previously, in order to develop our future leakage strategy, we undertook in-depth customer research in 2017, which indicated that there was little appetite from customers for significant leakage reductions if it meant that bills would rise. This was particularly the case because we have already reduced leakage significantly, our region is in surplus and there is a very low risk of hosepipe bans.

In total, our leakage target will lead to a 62% reduction in leakage since the mid-1990s, which is far in excess of any reduction achieved by any other company to date.

The combination of these factors drives the cost requirement.

We will ensure that costs are limited as far as possible by using innovative approaches to tackling leakage. The proposed leakage reduction activities and investment proposals are described in section 6 below.

5. Need for investment

In this section we set out the incremental improvement that the proposal will deliver; provide the evidence that the investment is required; and show how we have engaged with customers and our customer challenge group.

The proposed investment will deliver a 15% in-year reduction in leakage. This is equivalent to a 13% when reported on the basis of a three-year average.

Such a step change cannot be achieved without significant additional capital and operational investment. The additional totex expenditure required over the 2020-2025 period is £25.3m which is a significant increase on our current expenditure.

We are one of the best performers when leakage is measured per km of pipe. At the same time, we have the lowest probability of hosepipe bans in the country at <1% (see Figure 2-1) and we have assessed our supplies as resilient to a 1 in 200-year drought.

As detailed in our Water Resources Management Plan we have a surplus of resources over demand for at least the next 25 years.

While we are ourselves in a surplus position for water resources it is clear from recently published Water Resources Management plans that neighbouring companies would value this water more highly. Continued leakage reduction should enable greater resource to be traded with these companies in future, and this could help reduce bills for our own customers, further improving the cost-benefit ratio.

As mentioned above, we have engaged with customers, who are supportive of our overall approach. The need for the investment and the evidence from our research for this cost adjustment claim has been discussed with and assured by our customer challenge group, the Wessex Water Partnership. The detail of our customer research and supporting evidence can be seen in section 1 of our main narrative and the associated supporting documents.

6. Best option for customers

In this section we demonstrate how we have selected the best option for customers, including how the proposal delivers outcomes that reflect customers' priorities, identified through customer engagement; and the assurance from our customer challenge group. We also describe the optioneering process that we have followed including consideration of alternative options, risk and impact on the environment.

6.1 Options

As detailed in our Water Resources Management Plan and summarised in the table below we have looked at a wide range of leakage reduction options and calculated the Average Incremental Cost (AIC) of each option in accordance with the WRMP guidelines.

Table 1 - leakage options considered

Option	Description	AIC (p/m3)
ALC1	Innovation and optimisation of existing Active Leakage Control	-9.4
ALC3	ALC Optimisation through better data	70
ALC2a	Increased Active Leakage Control activity (2MI/d)	90
AM2	Better DMAs	96
PM1	Pressure management optimisation	107
ALC2b	Increased Active Leakage Control activity (5MI/d)	138
AM1a	Leakage driven asset renewal (2MI/d)	190
AM1b	Leakage driven asset renewal (4MI/d)	214
AM1c	Leakage driven asset renewal (9MI/d)	272
AM3	Near real time monitoring and decision support	280

6.1.1 Options ALC1 - Innovation and optimisation of existing Active Leakage Control

Our leakage management strategy is based on an active leakage control policy, with continuous monitoring, pressure management, together with asset repair and replacement.

Our network is growing each year by around 5,000 new customers and 40 km of new mains. This together with the ageing of our distribution network over time puts an upward pressure on leakage.

Our business as usual approach has always included the adoption of new and innovative technology to improve the efficiency and effectiveness of our active leakage control policy, and continuous monitoring and pressure management to enable us to meet leakage targets at the least cost to our customers.

We assume that a 1 MI/d reduction in distribution losses should be achievable in 2020 -2025 with no increase in base operating total leakage expenditure based on our established track record of innovation and efficiency improvements. This will not be delivered by any one

specific strategy, but rather by a number of small evolutionary improvements across our active leakage control, and continuous monitoring and pressure management activities.

There is significant uncertainty over a number of factors affecting leakage volumes and leakage management total expenditure costs including:

- Underlying deterioration of the pipe network
- Repair and maintenance costs increasing above the rate of inflation
- Higher expenditure needed to maintain leakage lower levels – having continued to drive leakage down over the last decade we need to spend more than we have historically to hold our current position
- Innovation and new technology can have uncertain benefits and costs

This option is assessed as low risk and uncertainties when compared to other options.

There's no additional costs associated with this option as the premise is that the benefits are achieved using the existing resources being more efficient and more effective

6.1.2 Options ALC2 - Increased Active Leakage Control activity

We have looked at 2 specific ALC options to reduce leakage by differing amounts of water

- Option ALC2a - Additional active leakage control to save 2 MI/day
- Option ALC2b - Additional active leakage control to save 5 MI/day

At present we have 73 active leakage staff made up of:

- 1 Regional Leakage Planning Manager
- 1 Regional Active Leakage & Control Manager
- 4 leakage engineers/supervisors
- 3 Division leakage managers
- 55 leakage inspectors and technicians
- 1 pressure control manager
- 8 pressure control technicians

Our detection staff typically find between 4,000 to 5,000 leaks every year. Our Natural Rate of Rise detected (NRRd) which is the amount leakage would increase if we did not undertake detection work is around 45MI/d.

The options is based on employing more ALC staff who could carry out a period of increased leakage activity (the transition period) to drive leakage down to the target level followed by a continuous increase in activity that would then be required to maintain the reduced leakage level albeit at a lower level of activity and cost than that required to provide the leakage reduction.

ALC marginal cost curves have been derived to assess the impact of additional front line staff on reducing leakage and the associated marginal cost of repairing more leaks more quickly.

6.1.3 Options ALC3 – ALC Optimisation through better data

As part of our business as usual approach to adopting new and innovative technology to improve the efficiency and effectiveness of our leakage management we undertook a review in AMP6 of longer term options which could be implemented in AMP7 and beyond. This started with an idea generation phase, followed by initial quantitative assessment. From this we identified the most beneficial option for a significant step forward in ALC optimisation.

This option differs from ALC1, which is just the gradual incremental optimisation of existing strategies. This option is defined as “a significant step forward” by adopting new technology and processes to fundamentally change the way we prioritise our ALC activity. Key elements of this option include the following

- Better understanding of background leakage

A more rigorous and detailed understanding of background leakage in DMAs is no small undertaking. It would require significant data cleansing and improvement and new analytical technique. However, the potential benefit of being able to differentiate between uneconomic background leakage from leakage breakout which is cost effective to repair is significant.

- DMA and pipe classification

Allied to the above is more rigorous and detailed understanding of DMA and pipe classification including not just asset type and age, ground conditions and surface loading, but also operating and transient pressures and pipe level deterioration modelling

- Data analytics

A “big data” approach to analyse this data is also required to find any significant changes in the data suggesting leakage changes.

- Data visualisation

Data visualisation in the field is key to delivering tangible benefits from this approach as it needs to enable front line staff on the ground to reduce the time to find the harder to find larger volume leaks in a dynamic and real-time environment.

This option is assessed as high risk and uncertainties when compared to other options.

6.1.4 Options AM1: Leakage driven asset renewal

We have reviewed 3 different network renewal options to reduce leakage

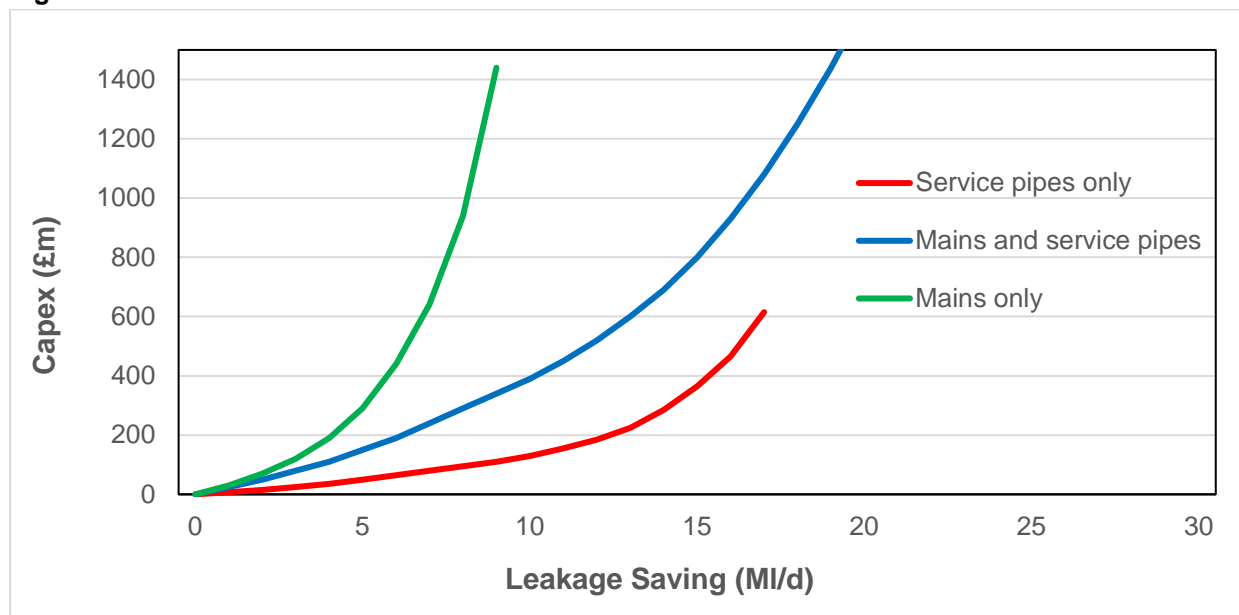
- Option AM1a: Replacement of service pipes to save 2 MI/day at lowest cost
- Option AM1b: Replacement of the next best service pipes to save a further 2 MI/d
- Option AM1c: Replacement of the next best service pipes to save a further 5 MI/d

We have investigated the benefits of more extensive leakage driven asset renewal strategies for distribution mains, communication pipes and customer supply pipes, and various combinations of these.

This analysis was based on looking at leakage at a DMA level, disaggregated between assets in proportion to the leak numbers and average flow rates for mains and supply pipe leaks, as determined as part of the calculations for the Natural Rate of Rise (NRR). From this information the costs and potential water savings in each DMA were determined, taking into account the effectiveness of renewal for each type of asset in terms of the assumed proportion of leakage removed. The costs and leakage savings for each DMA were calculated and ranked by cost per unit leakage saved.

Cost curves for three main approaches are presented below, and as clearly shown whole service pipe replacement is by far the most cost beneficial strategy.

Figure 1: - Leak driven asset renewal



The risks and uncertainties associated with this option are principally:

- The relationship between asset renewal and savings in leakage, and hence the extent of renewal to achieve the target saving
- The NRR on the existing and renewed assets and its rate of change.

The constraints on the option relate to the cost effectiveness of the replacement and the public tolerance for the extent of disruption demanded by a restrictive programme of construction.

This option has relatively high risk and uncertainties when compared to some options.

6.1.5 Options AM2 – Optimisation of district meter areas (DMAs)

The purpose of this option is to improve the efficiency and effectiveness of our ALC activity by optimising the size of the DMAs.

We have just over 600 fully functional DMAs within the Wessex Water network. Of these, 67 have more than 2000 properties, and 56 have more than 40 km of mains. Analysis of these DMAs have identified 100 where it would be possible to subdivide in 200 DMAs without incurring excessive cost and where the background leakage and NRR data suggests the greatest leakage reduction benefits should be found.

The main benefit will be better night flow analysis, the ability to identify cost effective leakage breakout within smaller discrete areas which currently is masked by the larger night flows measured in these bigger DMAs.

The cost of DMA subdivision will comprise a combination of reconfiguration of pipework and valving, installation of new meters and PRVs, line valves and washouts at boundaries, and new continuous monitoring equipment.

Waternet has been used to analyse the leakage savings from these DMAs, calibrated against actual savings made in the past where DMAs have been subdivided.

There is significant uncertainty and risk associated with this option. Costs to subdivide these DMA may be considerably higher, or lower, than estimated, as only a desk top study have been completed. There is even more uncertainty over the leakage savings.

This option has relatively medium risk and uncertainties when compared to some options

6.1.6 Options AM3 - Near real-time monitoring and decision support

Over the last 20 years our continuous monitoring strategy has developed from DMA meters with loggers manually downloaded once a month by someone visiting each site, to loggers which transfer data weekly via SMS, to loggers transmitting data every 15 minutes via GPRS. During this time the number of flow and pressure data points sending back data has also increased.

However it is only relatively recently that software systems have been introduced that allow more sophisticated “big data” analytics, and this market is still in its infancy. The ability to use the data is also hampered by IT infrastructure constraints, and more significantly a lack of decision support tools (and the corporatized network knowledge on which they are predicated), and the data visualisation needed to deliver the potential benefits from near real-time monitoring.

It is anticipated that this is an area that will undergo significant innovation over the next 15 years, with new technology not currently visible on the horizon further increasing the benefits in the longer term.

However the option as described below is based on likely costs and benefits for systems that can be delivered within the AMP7 timeframe:

- More meters
- More pressure points
- More acoustic points
- IT data infrastructure
- Big data analytics
- Knowledge management
- Decision support
- Data visualisation

This option has relatively high risk and uncertainties across the board: costs, benefits, deliverability.

6.1.7 Options PM1 - Pressure management optimisation

Our business as usual approach has always included the adoption of new and innovative technology to improve the efficiency and effectiveness of our active leakage control policy, and continuous monitoring and pressure management to enable us to meet leakage targets at the least cost to our customers.

At present we have just under 1000 active pressure management areas, with around 1300 PRVs of which around 200 are standby. We have a mix of fixed outlet and modulated controllers. We have done significant work to optimise our pressure management over the last three years including ensuring every pressure managed area has a 15 minute transmitting critical point monitor, and upgrading 200 controllers to the latest specification. In addition, we created four new positions in our pressure management team, 2 new PRV maintenance technicians, a pressure management coordinator and data technician role with the intention of ensuring our existing pressure management was maintained close to the optimal 24/7/365. This is based on the minimum possible pressure at the critical point to avoid unwanted customer contacts about low pressure, which is usually around 20m.

This option is based on further optimisation of existing pressure management as above with the possible inclusion of closed loop control together with new installations, often tackling small areas without active pressure control or dividing existing PMAs into smaller units for better optimisation.

Supply network pressure is linked to leakage / burst occurrence. We have been introducing calm network operation training for field personnel, and have been carrying out small scale transient monitoring assessments. Implementing a full pressure transient monitoring and resolution strategy would contribute to a reduction of leakage reoccurrence.

In addition this option includes some trunk main pressure management which has not been explored in the past due to the higher complexity and difficulty in implementation but should provide some further leakage benefits.

There is some uncertainty over both the reduction in average and night pressures, and the reduction in leakage that will be achieved but this option is assessed as low risk and uncertainties when compared to other options.

To deliver the step change the mix of options is required to optimise the risk and minimise the overall cost to achieve the desired target.

6.2 Optimum strategy and proposed costs

The most cost efficient and effective options were chosen to meet the required performance outcome of reducing leakage by 15%.

Ranking these options by their AIC allowed us to identify the optimal mix of schemes to achieve the required 15% target reduction in the most cost-effective manner as summarised in the table below and detailed in the following sections.

Option	Cumulative Yield MI/d	Cumulative Capex £m	Cumulative Opex £m/yr
ALC1	1	0	0
ALC3	3	1.8	0.30
ALC2a	5	3.6	0.59
AM2	7	9.3	0.94
PM1	9	17.9	1.51
ALC2b	10.5	19.8	1.83

The total transitional totex of £25.3m is based on £19.8m capex plus opex rising evenly over the five year period from £0.37m in Year 1 to £1.83m in Year 5.

We have deducted the cost saved by reduced production volumes on the basis of the volume of water saved over five years (12,500 MI) multiplied by the short run marginal cost (£97 per MI). Thus, the costs set out in the table above are net costs.

6.3 Stakeholder consultation

As mentioned above our proposed approach is in response to feedback for Defra and the Environment Agency.

Our customer challenge group have been briefed on the Water Resources Management Plan, our leakage customer research and our proposed strategy that leads to this cost adjustment claim.

6.4 Cost-benefit analysis

Our methodology and the results of cost benefit analysis are described in supporting document 3.3 Cost-benefit analysis.

For leakage reduction, it shows that, based on current customer valuations, a 15% reduction is just cost beneficial, with a benefit cost ratio of 1.04 and net benefits of £3.4m. Greater reductions appear to be not cost beneficial.

7. Robust and efficient costs

Section 8 of the main business plan narrative describes how we have ensured our proposals are efficient across all price controls, as well as explaining how we estimate efficient costs of new projects.

Through external benchmarking we have demonstrated that our cost estimates are efficient and competitive compared with the market place.

Our overall approach to developing the investment programme is to identify the lowest whole life cost option for individual projects or programmes of work on a totex basis.

We have challenged the proposals internally and externally and are satisfied the strategy includes the right mix of activities. The costs have a significant level of uncertainty as they assume that there will be benefits of increased technological efficiency and benefits of improved data analysis tools.

Costs were estimated a number of ways.

- costs were built up from first principles based on additional labour, installation of additional equipment and costs to modify and alter the existing network
- costs were estimated using cost curves derived from current work
- costs were based upon past trends or known unit rates for existing activities.

The key elements of cost comprise:

- Technology such as loggers. We have framework agreement for loggers with Technolog, which was tendered in 2014 and lasts for five years. We carry out regular reviews of performance and benchmarking against the market place. Over the past three years we have procured £2.4m of loggers through this framework agreement. Tendering and regular benchmarking demonstrates that the costs of this element are efficient.
- Active leakage control staff. Our approach is to use in-house staff wherever possible, which should be lower cost than using contractors. We have an ambitious apprentices programme to bring younger people through into the in-house team.
- Management. We manage the leakage programme in-house benefiting from lower overheads than if we used contractors.

8. Customer protection

In this section we set out how customers are protected if the performance outcome is not achieved.

Following consultation with customers and stakeholders and development of our 25-year Strategic Plan, we are proposing eight outcomes across the five price controls for PR19.

These eight outcomes have 41 associated performance commitments. In addition, we will continue to measure and report performance against other statutory and regulatory obligations. These will be included in management reporting and exceptions reported in our Annual Performance Report.

8.1 Performance commitment on leakage

Leakage is a common performance commitment that measures the amount of water lost from companies' water supply systems. This will be reported using the methodology defined by UKWIR guidance: Consistency in Reporting of Performance Measures.

The definition of performance commitment is the percentage reduction in leakage. If the leakage outcome is not achieved we will be subject to underperformance payments which are part of the agreed ODI for leakage. This means that for every percentage point we miss our target by, we would pay an underperformance payment of £260,000 – calculated using the standard Ofwat methodology. Should our performance drop to the industry lower quartile, we have introduced enhanced underperformance payments of £1,100,000 per percentage point beyond that level.

If we were to delay, cancel or reduce the expenditure associated with this claim, we would not be able to meet our target and would incur these underperformance payments.

We also have outperformance payments associated with leakage of £170,000 per percentage point beyond our target and enhanced outperformance payments of £740,000 per percentage point should we reach a 27% reduction.

9. Affordability

This section outlines the measures we have undertaken to consider the impact of the proposed programme on customer affordability and bills in PR19.

The outcome of the costs described in this supporting document was included in our draft business plan that was tested with customers in June 2018.

The customer research is designed to test whether customers find the plan acceptable and affordable. The stimulus material covered our overall package of service improvements, statutory enhancements and bill impacts. We tested our plan with household customers, business customers, retailers, those in vulnerable circumstances and industry stakeholders. Results were triangulated across a variety of qualitative and quantitative methodologies to maximise the robustness of both the sample and conclusions.

Testing has shown that 96% of our customers find our business plan acceptable. Acceptability is above 80% across all demographic subgroups. Those in vulnerable circumstances were slightly less accepting of the plan than other groups, but still at a very high level.

A large majority of household customers (92%) consider our plans, that include this investment, are affordable for them. Affordability amongst business customers was also very high at 96%. Vulnerable customers also found the plan acceptable and affordable and were positive about the assistance that we provide to this group.

Full details of our acceptability testing can be found in supporting document 1.1 and details of how we address affordability and vulnerability are included in supporting document 2.1.

10. Board assurance

The proposals have been subject to our board assurance process, which is described in detail in section 12 of the main business plan narrative and supporting documents 12.1 to 12.8.

Section 12 of the main business plan narrative includes the following statements that are relevant to this supporting document:

The full Board confirms that, in our view, the proposals within the Business Plan are consistent with and should allow the company to deliver against its statutory obligations, now and up to 2025.

We, the Board of Wessex Water, understand our accountability for this Business Plan. We are unequivocal in our assurance that the Plan is both high-quality and deliverable. We also confirm that it is consistent with our long-term vision for the company and our strategy.

The Board assures that this plan is informed by customer engagement and the views of the Wessex Water Partnership (WWP), and that the performance commitments contained within it reflect customer priorities, are stretching and reporting is robust.

The Board confirms that the expenditure projections contained within this Business Plan are robust and efficient, and that large investments are deliverable and best for customers.