Appendix A33
Cost adjustment claim

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Executive summary

Nearly 60% of customers in our South Staffs region receive their water supplies from two water treatment works: Hampton Loade, which was built between 1966 and 1972; and Seedy Mill, which was built in 1949.

Our customers always expect to receive water of the highest quality and reliability from us. Their expectations and standards continue to improve, and although we have invested consistently in both works – including installing UV treatment during this AMP – because they are no longer considered best practice they cannot meet either customer expectations or those of the drinking water quality regulator without substantial investment.

Following engagement with leading industry experts and an extensive review of options, we have concluded that we need to add an extra treatment stage at both works, paired with a programme of cleaning the strategic trunk mains leaving these works so that customers receive the benefits of better water quality and more resilient supplies at the earliest opportunity. These benefits include:

- a material reduction in the incidents of discoloured water;
- the removal of disinfection by-products from the treated water;
- an improved taste and smell of the water we supply to customers; and
- significantly increased resilience by minimising the risk of single points of failure within the treatment process.

This high reliance on a small number of large treatment works gives us a different expenditure profile than other companies. It means that we would expect to see lumpy expenditure timing when significant upgrades are needed, with longer maintenance only periods between these upgrade cycles. Companies that have comparatively more, smaller, treatment works would be more likely see a less lumpy expenditure cycle as across their portfolio as upgrades would be a more regular occurrence.

We are historically efficient in terms of our approach to our costs and the way we manage our assets. We have kept bills low for customers by making sure we invest in the right things at the right time. But our treatment works and trunk mains are at a point in their lifecycle where we now need to invest. The work we are planning to undertake is commonplace within the sector, and is often included within the ‘normal’ spend profiles of larger water companies due to them operating a greater number of works and having a more consistent programme of enhancement. This is an incremental programme of work that will be largely delivered in AMP7, with a modest amount in AMP8. We have the support both of our customers and the Drinking Water Inspectorate for this work, which shares our view that the proposed investment is necessary and timely. Indeed, in acceptance testing four out of five customers supported our proposals in full knowledge of the cost.

We are seeking £63 million (£57 million in capex and £6 million in opex) in AMP7 for the additional treatment stage at both works and the associated trunk mains cleaning. We have used external expertise, which has given us a robust view of these costs and a timeframe for delivery.

This is a significant programme of work for us and a material 'enhancement' investment relative to the size of our business. As such, it would not be captured by the botex cost assessment models. In addition, based on our current understanding, we do not consider that it will be adequately captured by broader totex models under consideration by Ofwat.

As a result, we consider that a cost adjustment claim is the appropriate mechanism through which to present our case, where the investment can be considered on a standalone basis. Our claim has a materiality level of 13.3% when compared to our proposed network plus totex.

We have committed to renovate our Water Treatment Works and we are happy with the progress already made as part of the EU procurement process required to complete this work. We engaged with the market in April 2018 and following a healthy response with interest from over 300 companies, we were able to complete a Pre-Qualifying Questionnaire stage to identify capable candidates resulting in 10 suppliers being successfully selected for the Invitation to Tender Stage which draws out in depth information and detail surrounding proposals for the completion for this important revamp. This stage is anticipated for completion by the end of October with one or more successful suppliers appointed for this project by Spring 2019.

Board assurance statement

The Board confirms that it has approved this cost adjustment claim and has carefully considered the evidence in reaching its conclusions.

1. The Board has reviewed the appraisal of the options available and considers that the proposed option is the best one for customers.

- The decision-making framework and multi-criteria analysis model used consider a wide range of options and include non-financial factors to make a recommendation. The output from this assessment has been reviewed and challenged by the Board.
- Specific customer engagement identified over 80% support for the proposed option, which has also been reviewed and challenged by the independent customer panel.

2. The Board has reviewed the evidence and considers it to be in line with the PR19 methodology and more specifically meets the requirements set out for cost adjustment claims.

3. The Board has considered the investment proposals and is satisfied that they are robust and deliverable.

- The Board has been fully engaged in the development of this proposal and has considered:
  - that the solution is appropriate and delivers the necessary improved quality of water to customers;
  - that the solution is robust as it allows for further improvements over the long term;
  - that costs are built using triangulation of historic cost, bottom-up pricing and supplier quotations; and
  - that estimates consider resilience for the long term.
- Based on this assessment and its own review, the Board is confident that the proposed investment is robust and deliverable.

As a result, the Board firmly believes that the proposed option is in the best interests of customers.

Approved by the Board of Directors on 1 May 2018 and signed on its behalf.

Phil Newland
Managing Director
South Staffordshire Water PLC

1. Overview of our cost adjustment claim

We know that our customers rightly expect water of the very highest quality and reliability from us. Our aim is to meet and exceed this expectation. Based on clear evidence, we have concluded that the age and design of our Hampton Loade and Seedy Mill water treatment works cannot consistently meet these expectations without investment.

We have thoroughly explored a wide range of options and have concluded that we now need to add an extra treatment stage at both works. It is vital that this investment is paired with a programme of targeted cleaning of the strategic trunk mains leaving both works to ensure customers receive the benefits of better water quality and significantly enhanced resilience at the earliest opportunity. This is important, given that these works supply nearly 60% of customers in our South Staffs region.

We have consulted extensively with our customers and know they strongly support our plans. We have also engaged at length with the Drinking Water Inspectorate, which shares our view that this proposed investment is both necessary and timely.

Given the substantial scale of our two water treatment works relative to our size and typical investment programme, we are convinced that a cost adjustment claim is the appropriate mechanism through which to present our case.

This is a significant programme of work for us. Because of its scale and ambition, it represents a step change in investment, which our historic costs do not cover.

We think the atypical, extraordinary nature of the proposed investment compared with our historic costs cannot be captured by Ofwat's modelling as we have not undertaken enhancement work of this scale before. This means Ofwat is unlikely to have a model that could anticipate this level of change. That is why we are making this cost adjustment claim.

1.1 The context for this claim

Over the past five years we have water quality failures from our Hampton Loade and Seedy Mill water treatment works. To ensure we can safeguard our customers, we have installed UV treatment as an additional disinfection stage.

But this does not resolve the challenges we face with the existing, original treatment processes. What was acceptable to customers when these works were originally built, is not acceptable now in terms of their expectations or drinking water quality. Nor are they now considered to be best practice and do not deliver the high-quality water our customers have said is important to them – and to us.

Based on a historic data review at the start of the PR19 process we do not believe there is evidence of any long term deterioration in water quality for either Hampton Loade or

Seedy Mill WTW. Variations in raw water quality tend to be cyclical or seasonal and are reflected in our drinking water safety plans. Our case for change is very much based on making a step change in performance to meet customer and regulatory expectations, rather than seeking to recover from a deteriorating position or to meet new regulatory requirements.

This was explored and discussed with the Drinking Water Inspectorate (DWI) during the PR19 engagement process. The DWI accepted our submission, have provided us with a letter of support and are in the process of finalising Enforcement Notices for our proposed treatment enhancements and associated strategic mains cleaning activity, these are included with this submission as appendices A33.1 and A33.2. The support was based on identified risks from disinfection by-products and customer acceptability contacts. We have submitted draft notices to the DWI for their review and approval and we expect these to be formally issued before the end of the year.

Our understanding is that Hampton Loade WTW is the only works on the River Severn which does not have two separate filtration stages. Seedy Mill WTW has similar surface water quality challenges. A typical surface (river) water treatment works would consist of a clarification stage; two stages of filtration – typically sand/anthracite followed by Granular Activated Carbon (GAC); then a final disinfection stage before going into supply. The treatment enhancements we are proposing are extremely well established and proven across the Industry over a number of years. The first filtration stage serves predominantly to remove particulate material whilst the second filtration stage is predominantly for the removal of organics e.g pesticides. Our current filters utilise GAC media to serve both these functions and although they have served us well over the years we believe we need to make a step change.

This investment will support the delivery of the new water quality measure, the compliance risk index (CRI), a measure which we fully support.

We think that the level of operational resilience of both works is not sufficient, given their strategic importance to our network. This was highlighted by the recent events at Franklaw and more extreme weather experienced in 2018. Following the completion of our proposals, the dual streaming of both treatment works will significantly enhance our operational resilience when dealing with such challenges. This level of investment is required to provide a step change in the benefits we deliver to our customers. This includes:

- a reduction in the incidence of discolouration as a result of removing even more metals from the final water leaving both works and through cleaning the trunk mains network;
- a reduction in disinfection by-products as a result of moving more naturally occurring organic matter from the water at the treatment works;
- further removal of compounds that can give water an undesirable taste and smell; and
- increased resilience by ‘engineering out’ single points of failure from the treatment process and increasing the flexibility of our strategic mains.

We first engaged with Cathryn Ross at Ofwat about identifying the potential need for significant investment in 2015. We set out with her the step change in our approach to reviewing the performance of, and decision making for, these critical assets. We have also engaged extensively, and at a senior level, with other key stakeholders – the Drinking Water Inspectorate, the Environment Agency and the Consumer Council for Water – sharing and discussing our thinking with them. We have remained committed to transparency throughout.

In developing our plans for the next five to ten years and beyond, and to ensure we can deliver the best outcomes for our customers, we are working with credible, leading independent organisations to support us in our analysis.

For example, we worked with industry experts, Arup, and followed best practice from UKWIR, so that we could be sure we made robust and flexible decisions. And in doing so, we challenged ourselves to look much broader than just our treatment works and trunk mains when identifying effective solutions.

Working with Artesia, leading consultants in demand management, we considered different ways of mitigating the level of expenditure required at our treatment works. This included looking at leakage levels across our network and considering ways to help customers use less water. And it included working with our neighbour, Severn Trent Water, to ensure resilience over the long term. We consider these elements would be covered in Ofwat's usual cost allowance process. So, we have not included them within this claim.

We also worked with process scientists from Atkins, together with their infrastructure teams, to consider a number of options for our treatment works – ranging from increasing capacity to undertaking total rebuilds. We also challenge the scale of the investment required by looking at options such as water trading, demand management and leakage reductions to reduce the size of treatment works required. And we made effective use of our own internal expertise. We have been open and transparent with colleagues across the organisation, involving all parts of the business in our decision making.

In addition, we had the support of Hartley McMaster in developing our multi-criteria decision-making support tool, appraising more than 1,000 different investment options over an 80-year timeframe and embedding customers' views at the heart of the process. We tested final solutions with them so that we could make sure our plans were acceptable.

And we asked Costain to carry out a feasibility study and provide us with a robust and accurate estimate of the costs associated with the work to upgrade our treatment works, along with a view of the construction timescales for both schemes.

Our analysis identified that introducing an additional treatment stage at both treatment works coupled with a programme of cleaning the trunk mains leaving the works to be the solution that delivers most effectively for customers across a range of competing objectives now and over the long term.

"You must invest in infrastructure to be able to provide fresh and safe water in the years to come" – South Staffs customer

We have looked at how our two treatment works compare with those of other water companies, in relation to their size and the number of customers they supply. Our two works put us third in the sector in terms of reliance on large works. Only companies that have a single large water treatment works (Bournemouth Water and Bristol Water) show a higher single point reliance than us. Hampton Loade is also one of the largest treatment works in the sector, owned and operated by one of the smaller companies.

This high reliance on a small number of large treatment works gives us a different expenditure profile than other companies. It means that we would expect to see lumpy expenditure timing when significant upgrades are needed, with longer maintenance only periods between these upgrade cycles. Companies that have comparatively more, smaller, treatment works would be more likely see a less lumpy expenditure cycle as across their portfolio as upgrades would be a more regular occurrence.

We think this makes a cost adjustment claim the most appropriate mechanism for us, where the investment can be considered on a standalone basis.

1.2 Delivering the best options for customers – identifying the need for investment

It is essential that we know and understand what customers value and that this is reflected in all our plans. There are some things that are so important that they expect us always to deliver them. These include:

- having clean, high-quality and resilient water supplies;
- having fair, accurate and affordable bills;
- great customer service; and
- reducing leakage.

These are our key customer priorities. They are at the heart of all our business planning.

To help us understand more about our customers' priorities, during the past few years we have significantly improved our approach to customer engagement, using a wide range of qualitative and quantitative techniques. This included asking customers in both regions if they supported investment in our South Staffs region. When set in the context of a likely bill reduction in AMP7, 87% of customers who completed our online quantitative survey accepted our proposals.

We think this new approach has enabled us to develop a clear understanding of the challenges we face and to allow customers to make informed choices and shape our proposals.

We have also looked again at the role of the independent customer panel – being fully transparent to allow effective challenge. This includes making better use of the panel's capital expenditure sub-group, which has reviewed this claim.

An important and innovative feature of our engagement has been co-creation – asking customers to work with us to develop the ideas and solutions that best suit their needs. We wanted to make sure that our customers' priorities are at the heart of all our decision making.

We have also built the functionality in our decision support tools to capture non-financial customer preferences, and have effectively demonstrated trade-offs between a number of competing objectives such as cost, resilience and customer preferences in delivering an optimum solution. This includes schemes that deliver similar reductions in leakage and helping customers to use less water.

Once we had a final portfolio of solutions, we then carried out specific engagement to support our claim. We wanted to know if customers understood and supported our plans to deliver reliable service improvements over the long term. We used this engagement to co-create a specific performance commitment to ensure customers are protected.

We are confident that our new approach to engagement has given us a robust view of our customers' priorities and expectations. This dialogue has really strengthened what we know and understand about the things that really matter to them. We have built this knowledge into all our plans.

1.3 Demonstrating the need for this cost adjustment claim

Our long-term plan is about future-proofing our assets. Our treatment works are critical assets that must be improved and upgraded to ensure customers continue to receive resilient supplies of high-quality water. Not undertaking this work increases the risk of failure.

We are historically efficient in terms of our approach to our costs and the way we manage our assets. We have kept bills low for customers by making sure we invest in the right

things at the right time. But our treatment works and trunk mains are at a point in their lifecycle where we now need to invest. The work we are planning to undertake is commonplace within the sector, and is often included within the 'normal' spend profiles of larger water companies.

We do not think that Ofwat's econometric cost modelling process will allow for the costs of this programme of work as there is unlikely to be a cost driver which can describe adequately the investment we need to undertake, its materiality to us given the scale of our historic costs and its timing.

This submission discusses in more detail the rationale for our claim. It also demonstrates the support we have from customers, and the other work we have carried out to determine why we think it is necessary.

We are seeking £63 million[1] to introduce an additional treatment stage at both water treatment works and clean the trunk mains leaving the works in our South Staffs region – £57 million in capex and £6 million in opex.

This represents a significant step change in investment for us and we have the support both of our customers and the Drinking Water Inspectorate for this.

Without this programme of work, our customers are at greater risk of receiving poor quality water as a result of operational failure. This is a major concern for us – and our customers. They understand the need for this work and want us to ensure high-quality and resilient supplies now and in the future.

[1] All expenditure figures in this submission are in 2017/18 CPIH price base.

2. Background – the challenges facing South Staffs Water

Because of the nature of supply within our South Staffs region, we are reliant on two water treatment works.

While we have managed and maintained these assets effectively, in recent years we have seen a deterioration in the effectiveness of these works to treat the water to the standards our customers have told us they expect and to ensure we comply with drinking water quality regulations.

We now need to invest in our treatment works and carry out a programme of cleaning the trunk mains leaving the works to ensure the quality and acceptability of the water we supply to customers. **These are critically and strategically important assets for us, which we need to continue to improve and upgrade for the long term.**

Having two water treatment works supplying nearly 60% of customers between them puts us third in the sector in terms of reliance on large works. This gives us a different expenditure business profile compared with other companies and circumstances that are beyond management control.

This programme of work is part of our long-term plan to ensure the resilience and quality of the water we supply to customers.

We know that our customers always expect us to deliver clean, high-quality and resilient water supplies. But we also know that our ability to continue to do this depends on us addressing a number of significant challenges that we face now and in the future.

These challenges include the need to make significant investment in our Hampton Loade and Seedy Mill water treatment works over successive AMPs and carry out a programme of targeted cleaning for the strategic trunk mains leaving both works to ensure the resilience, quality and acceptability of the water we supply to customers, and compliance with drinking water quality regulations.

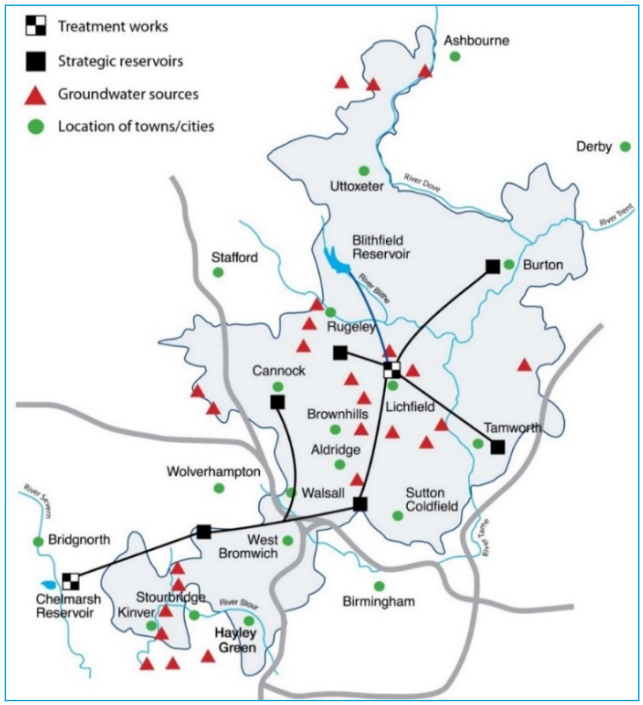
This is a source to tap solution, for which we have the support of the Drinking Water Inspectorate and our customers.

We also need to consider the long-term resilience of our business. This includes taking into account the impact of climate change – with the potential for more extreme droughts, floods or freeze/thaw events – and the effect it could have on the availability and reliability of our water resources. There is more information on how we plan to address the long-term challenges we face in the draft water resources management plans for both our South Staffs[2] and Cambridge[3] regions.

[2] 'South Staffs Water Draft Water Resources Management Plan 2019', South Staffordshire Water plc, March 2018.
[3] 'Cambridge Water Draft Water Resources Management Plan 2019', South Staffordshire Water plc, March 2018.

2.1 Context for this cost adjustment claim

Our South Staffs region covers parts of the West Midlands, Staffordshire and Worcestershire – extending from Ashbourne in the north to Halesowen in the south, and from Burton-upon-Trent in the east to Kinver in the west. It serves approximately 1.3 million people every day.



Much of the water in the region comes from two surface water sources – the River Severn and Blithfield Reservoir. The remainder comes from 26 groundwater sources, situated mainly in the central and southern areas of the region. These take water from the Sherwood Sandstone aquifer. Potable water is provided to customers through 31 service reservoirs and water towers. Average demand for water in the region is about 280 megalitres a day (Ml/d); peak demand is about 400 Ml/d.

Even though the varying topography of the region can make it difficult to move water around, our water sources are linked by an integrated and flexible supply system that we have developed and improved on over time. This means that in cases of a water shortage in one area, we are able to transfer water between service reservoirs across the region to maintain supplies to all our customers.

We have two strategically important water treatment works, which together provide nearly 60% of all the water we supply to customers.

- Hampton Loade is our largest treatment works with a capacity of 210 Ml/d. It supplies approximately 700,000 people in the southern part of the region (including an export to our neighbour, Severn Trent Water). It treats water that we abstract from the River Severn and store in Chelmarsh Reservoir. It is one of the largest treatment works in the sector, and the only one on the River Severn with single-stage filtration. Hampton Loade is a shared resource with Severn Trent Water, which is entitled to take one-third of the water supplied.
- Our treatment works at Seedy Mill has a capacity of 125 Ml/d. It treats a mixture of surface water from Blithfield Reservoir and groundwater from the Trent Valley and Seedy Mill borehole sites. It supplies approximately 200,000 people[4].

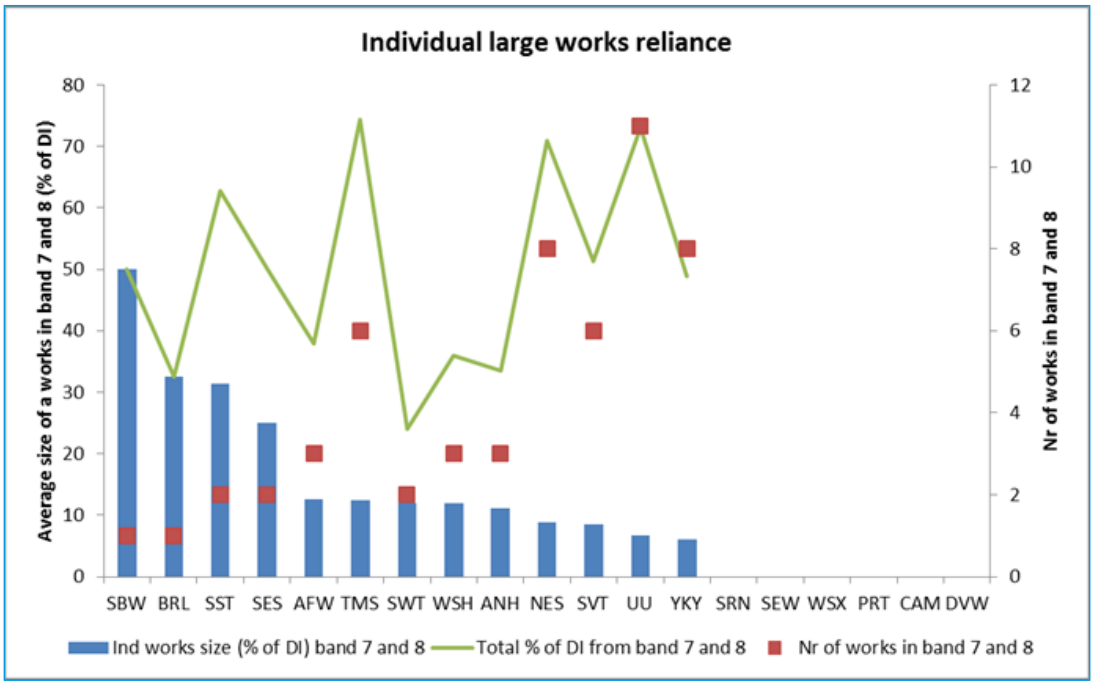
[4] The actual volumes of water supplied by each of these works changes on a daily basis, depending on the supply/demand balance and the strategic network at the time.

These are critically and strategically important assets for us, which we need to improve and upgrade for the long term.

We have looked at how both treatment works compare with those of other water companies, in relation to their size and the number of customers they supply. The size of these works puts us third in the sector in terms of reliance on large works. Only companies that have a single large treatment works (Bournemouth Water and Bristol Water) show a higher single point reliance than us. This is illustrated in the graph below, whereby:

"I strongly support the idea of improving the ageing equipment. Making it better is the icing on the cake too" – South Staffs customer

- the red squares denote the number of large treatment works each company has;
- the green line shows the volume of water provided in total by these works, expressed as a percentage of distribution input (DI); and,
- the blue bars show the average size of the individual works.



Source: Cost assessment data submission, 2017.

This high reliance on a small number of large treatment works gives us different expenditure profile than other companies. It means that we would expect to see lumpy expenditure timing when significant upgrades are needed, with longer maintenance only periods between these upgrade cycles. Companies that have comparatively more, smaller, treatment works would be more likely see a less lumpy expenditure cycle as across their portfolio as upgrades would be a more regular occurrence. So, as well as being outside of management control, it limits our ability to carry out this programme of work any other way.

3. Delivering the best options for customers – identifying the need for investment

Our customers' priorities are at the heart of all our business planning. We know from our ongoing engagement during AMP6 that they expect us to continue to invest in our network now and over the long term. This includes our programme of work to introduce an additional treatment stage at our treatment works and clean the trunk mains leaving both works.

The Drinking Water Inspectorate has previously expressed concern about the performance of these critical assets. A letter of support is included with this claim, and a notice will be issued this year.

So that our customers receive the benefit of the investment at our treatment works at the earliest opportunity, we need to ensure the strategic mains network that supplies them is thoroughly cleaned. This is to reduce the risk of discolouration and water quality failures, which we know is unacceptable to customers.

We think that ongoing, two-way engagement is the best way to understand what our customers want. During AMP6 we have made a step change in our approach to customer engagement, using a wide range of qualitative and quantitative techniques to understand their views. This change of approach has required a significant cultural shift within our business.

An important feature of our engagement during AMP6 has been co-creation – asking customers to work with us to develop the ideas and solutions that are most suited to their own needs. We also carried out specific engagement to support this claim.

We have used this dialogue with customers to help us develop a plan for investment that focuses on the long-term supply capabilities of our network. This has meant evaluating all our existing operations to identify the most appropriate mix of investment options going forward. We have also worked with credible, leading independent experts to help us develop our thinking and shape our plans.

As well as being robust and flexible, this new approach represents a step change for us in the way we consider investing in services and resources. It has also given us a more rounded view that represents the best plan for our customers.

We know from our engagement (both qualitative and quantitative) that there are some things that are so important to our customers that they expect us to always deliver them. These are:

- having clean and high-quality water supplies;
- having resilient supplies – being sure that water will always come out of the tap when they need it;
- bills being fair, accurate and affordable;

- receiving great customer service; and
- ensuring we continue to invest in our network so that we can reduce leakage levels.

"The water needs the treatment so customers will benefit. This is something that has to be done" – Cambridge customer

These are key customer priorities, and they are at the heart of all our business planning.

Over the past five years, we have seen a number of water quality failures from both treatment works. To ensure we safeguard our customers, we have installed UV treatment at Seedy Mill as an additional disinfection stage, and will have completed installation at Hampton Loade by autumn 2018. But this does not resolve the challenges with the original existing treatment processes, which are no longer considered to be best practice and do not deliver the quality of water our customers have said is important to them – and to us.

We also consider the level of operational resilience of these works is not sufficient, given that they supply water to nearly 60% of customers in our South Staffs region.

We need to make significant investment in these assets, primarily to improve the quality and appearance of the water these works supply, and – as a result – the acceptability of the water we supply to our customers. We also want to improve the resilience of our treatment works by 'dual streaming' the processes within both works to mitigate the volumetric impact of a single point of failure.

This will deliver a number of benefits to our customers, including:

- a reduction in the incidence of discolouration as a result of removing even more metals from the final water leaving both works and through cleaning the trunk mains network – we believe we will see a 30% reduction in contact on completion of the second stage filtration and a further 20% once we have systematically cleaned the trunk mains;
- a reduction in disinfection by-products as a result of moving more naturally occurring organic matter from the water at the treatment works; we anticipate our final water THM concentrations to drop by >60% to approximately 12 µg/l
- further removal of compounds that can give water an undesirable taste and smell;
- increased resilience by 'engineering out' single points of failure from the treatment process and additional flexibility with from our strategic mains.

Expected improvements to benchmark parameters at Hampton Loade and Seedy Mill are shown in the table below. The future final water parameters have been estimated based on a combination of collaboration with other water companies who utilise water from the River Severn, published papers and our internal process science expertise.

We anticipate that the improvement to water quality entering the network, in association with strategic mains cleaning, will deliver a corresponding reduction in customer acceptability contacts for discolouration and taste/odour. Although our existing improvement plans have allowed us to gain a 15% year on year improvement we are limited in terms of the benefits we can continue to achieve with our current source and network arrangements.

Hampton Loade WTW

Parameter		Raw water	Current final water	Future final water
Total organic carbon	ave	5.0	2.7	<2
(mg/l)	max	11.9	5.6	<3
Colour	ave	23.3	2.4	<2
(Hazen)	max	54.5	8.2	<5
Turbidity	ave	4.9	0.2	0.1
(FTU)	max	27.6	0.8	<0.4
Aluminium (ug/l)	ave	169.7	30.0	18
	max	3670.0	192.0	43
Iron	ave	283.6	5.8	<2
(ug/l)	max	3060.0	18.8	10
Manganese	ave	37.8	3.1	<1.5
(ug/l)	max	370.0	13.0	6
THMs	ave	-	36.3	12
(ug/l)	max	-	89.1	57

Seedy Mill WTW

Parameter		Raw water	Current final water	Future final water
Total organic carbon	ave	8.8	3.6	<2
(mg/l)	max	9.9	4.6	<3
Colour	ave	23.1	2.1	<2
(Hazen)	max	42.0	4.3	<3
Turbidity	ave	6.9	0.1	0.1
(FTU)	max	35.1	0.4	<0.3
Aluminium (ug/l)	ave	203.0	18.2	11
	Max	862.0	46.6	21
Iron	ave	297.1	4.4	<2
(ug/l)	max	1550.0	12.1	7
Manganese	ave	287.7	7.0	<1.5
(ug/l)	max	1610.0	38.3	6
THMs	ave	–	36.7	12
(ug/l)	max	–	48.5	31

To ensure we identified an optimum plan for our customers, we carried out a thorough review of all the options available to us. This included reviewing our existing supply-side options and also new ones – such as groundwater and trades (for example, a trade with Severn Trent Water at Perry Barr).

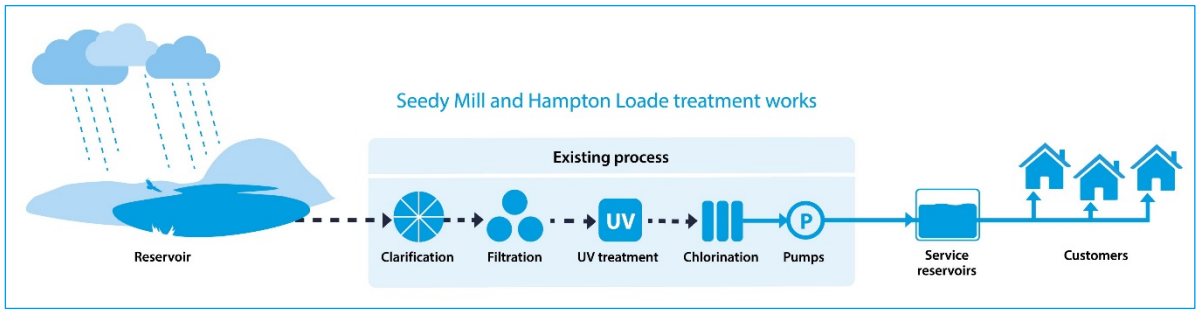
In addition, we looked to mitigate the scale of investment by further managing demand, both through leakage reduction and by helping customers to use less water. We did not consider that reviewing the treatment works in isolation was in the best interests of our customers, and wanted to be sure we could demonstrate the robustness of our decision making and subsequent investment choices now and in the future.

This analysis, which we discuss in more detail in chapter 4, concluded that we need to introduce an additional treatment stage at both our treatment works. This is a more resilient, cost-effective solution for customers.

The Drinking Water Inspectorate has previously expressed concern about the performance of these works. While installing UV treatment at Seedy Mill has mitigated some of the primary risks by providing a bacteriological barrier, the Inspectorate's concerns about discolouration, disinfection by-products and resilience remain and need resolving.

We have continued to work closely with the Inspectorate to agree the phasing and scope of the longer-term investments detailed in this submission. The Inspectorate is supportive of these works and we will receive a formal Enforcement Notice in 2018.

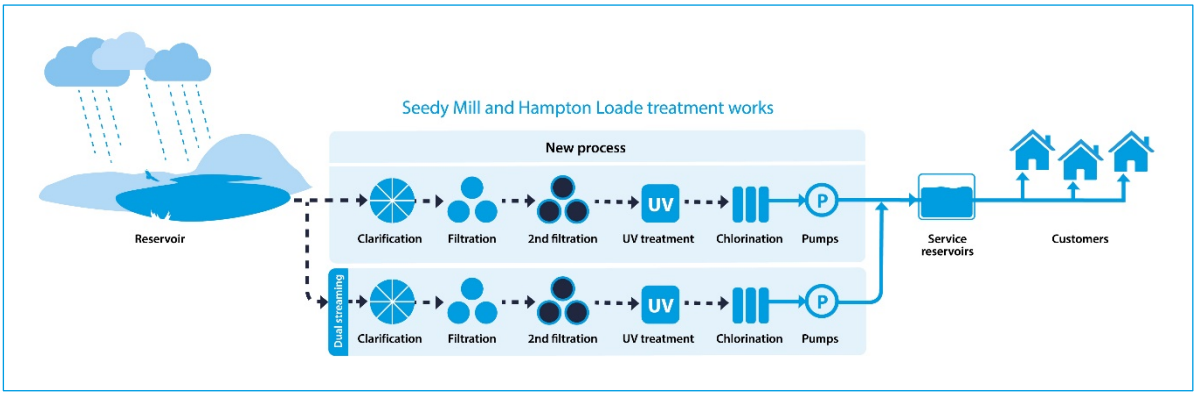
Originally constructed in two phases between 1966 and 1972, Hampton Loade treats surface water from the River Severn using the conventional treatment processes of clarification, filtration and disinfection. Seedy Mill was built in 1949; it also uses the conventional treatment processes used at Hampton Loade, with the addition of UV treatment.



The treatment processes used at Seedy Mill water treatment works. We will have installed UV treatment at Hampton Loade by autumn 2018.

The raw surface water at both sites has a high organic matter content. And while the levels of disinfection by-products (THMs) are currently compliant, we are mindful of the regulatory requirement on us from the Drinking Water Inspectorate to minimise these levels now and in the future so that we can maintain the acceptability of the water we supply to our customers.

Our long-term plan is to introduce second-stage filtration in AMP7 and enhance the clarification stage at both works during AMP8. While undertaking this work, we will implement dual streaming of the treatment processes to reduce any single points of failure. We consider that when complete, it will align these critical assets with the best practice observed across the sector.



A graphic representation of the additional filtration stage and dual streaming that we intend to implement at Hampton Loade and Seedy Mill water treatment works over AMP7 and AMP8.

So that our customers receive the benefit of the investment at our treatment works at the earliest opportunity, we need to ensure the strategic trunk mains network that supplies them is thoroughly cleaned.

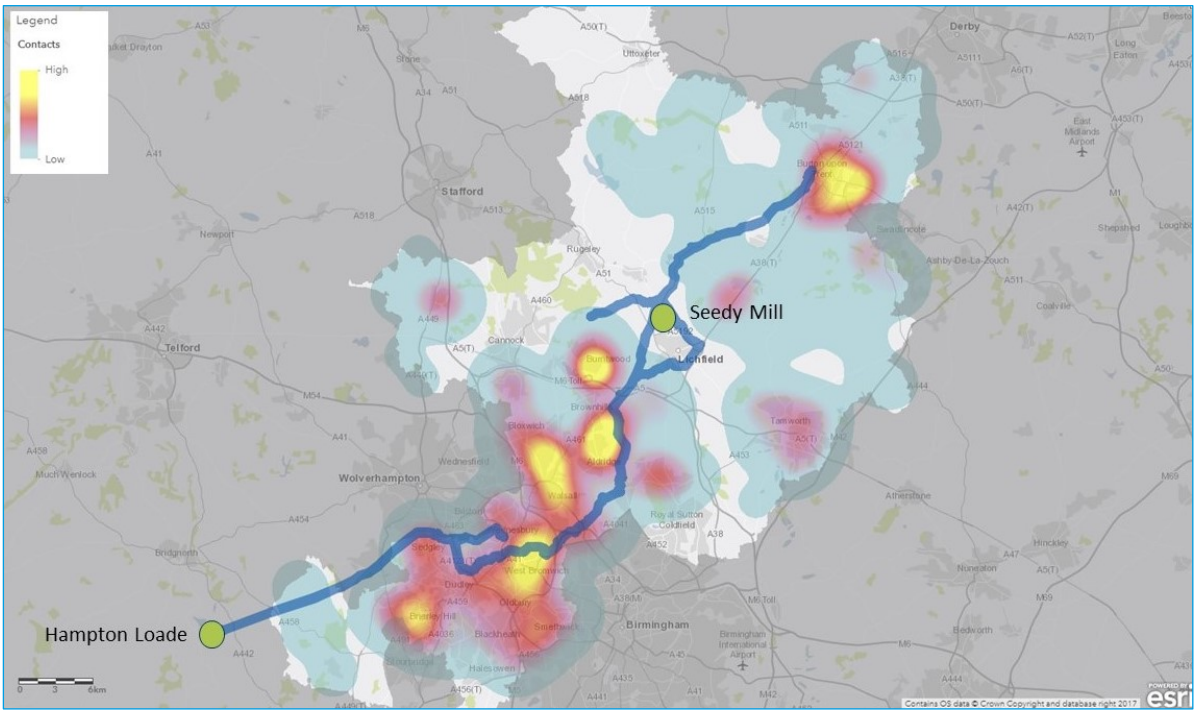
We currently use a technique called mains conditioning. This is a less intrusive technique that lifts the sediment naturally by increasing the flow through the mains gradually and monitoring the network to mitigate any risk of discolouration. But, we consider that in some cases a more aggressive cleaning technique is required to ensure our customers get the maximum benefit from our proposed investment.

Adding a filtration stage will enhance the ability of both treatment works to remove manganese, iron and aluminium, which, over a period of time, create deposits on the internal surfaces of our network and are often the root cause of discolouration experienced by customers.

So, there is a benefit in removing all of the historic deposition of built-up particulate matter and sediment in our trunk mains as this can lead to discolouration. We know from our engagement that this is unacceptable to customers.

Also, the additional filtration stage will remove a greater proportion of the naturally occurring organic material from the water, which causes a build-up of disinfection by-products in that water after it has passed through the disinfection process.

The diagram below shows the customer contacts that are attributable to the water that comes from both treatment works. In 2017, these accounted for 77% of the total number of contacts from customers about discolouration. We have overlaid the trunk mains leaving the works that require cleaning to ensure the benefits of introducing the additional treatment stage are received by customers at the earliest opportunity.



Geographical representation of customer contacts for discolouration from 2016.

We have considered a number of options and think that a range of techniques will be required – from taking the mains out of commission and cleaning them through to using industry-standard techniques such as ice pigging and air scouring. We are currently working with our supply chain to identify the most cost-effective and innovative techniques. Our current plans include cleaning up to 100 km of trunk mains at a totex cost of £4 million.

Our forecast is a reduction in appearance, taste and smell contacts of approximately 30% as we complete parts of our programme, rising to 50% when the work is fully completed and we have had time to fully realise the benefits of the improvements in our network. The table below shows how this performance improvement will be reflected in our related performance commitment, customer contact about water quality (performance commitment reference D6).

Table 1 – forecast customer contact about appearance, taste and smell from customers linked to our Hampton Loade and Seedy Mill treatment works

Year	Number of contacts from customers about appearance, taste and odour linked to our HL and SM treatment works	Company level performance commitment impact (as rate per 1000 population)*
2017/18 baseline	1,475	1.42
By 2023/24 (part	1,033 (-30% from baseline)	1.15 (-0.27 or 19% reduction baseline)

completion)		
By 2024/25 (full completion)	738 (-50% from baseline)	0.97 (-0.45 or 32% reduction from baseline)

Benefits for customers

*Note that our total business plan forecast for this performance commitment includes continued operational improvements as well as the impact of these major schemes.

3.1 Engaging effectively with customers

We believe that ongoing, two-way engagement is the most effective way of understanding our customers' changing needs and requirements over time. During AMP6 we have made a step change in our approach to customer engagement. This has required a significant cultural shift within our business, with us focusing our attention and resources on engaging in meaningful dialogue with our customers so that we can have a clear understanding of what they want and incorporate their views in our plans.

An important and innovative feature of our engagement during AMP6 has been co-creation – asking household and business customers to work with us to develop the ideas and solutions that are most suited to their own needs.

For example, as part of the engagement we commissioned from Community Research on investment options for our long-term plan, we used a 'Top Trumps'-style game[5] where customers were given information about a range of supply-side and demand management options, along with volume and cost targets, and asked to co-develop a plan (see appendix A33.4).

One of the cards we used with customers as part of our 'Top Trumps'-style game.

We fed the results of this engagement, which was supported by an online survey, directly into our multi-criteria analysis model. We subsequently triangulated these results with further customer engagement. This was one of the key reasons for moving away from a least cost plan. Customers had very strong views and preferences for reducing leakage and enhanced levels of water efficiency.

Another feature has been the wide range of qualitative and quantitative techniques we have used to understand our customers' views more fully. This includes:

- phone interviews and surveys;
- short and in-depth online surveys;
- business as usual events and community activities;
- one-to-one in-depth interviews;

[5] 'Top Trumps' is a game played with a series of cards, each of which contains a list of numerical data. The aim of the game is to compare these values to try to win an opponent's card (that is, to 'trump' the opponent by having better numerical data). In our qualitative workshop engagement with our customers we used a variation of this approach by giving informed customers a volume and cost target and asking them to assess the different options to develop their preferred solution based on their priorities and views. In the quantitative online survey that followed, customers compared the different options to allow them to express whether they supported their use in our plans. This allowed us to put customers' priorities at the heart of our plans.

- roundtable meetings;
- focus groups; and
- all-day and half-day workshops.

And we have learned from best practice – for example, the approach taken by the Consumer Council for Water when it carried out acceptability testing for water companies' social tariffs[6].

We think this has given us an excellent understanding of our customers' priorities and the value they place on different levels of service improvement.

We have also looked again at the role of the independent customer panel (the Customer Challenge Group). We have been fully transparent to allow effective challenge by the panel. We have also made better use of sub-groups of the panel – particularly the capital expenditure sub-group, which has reviewed this cost adjustment claim. Referring to our approach, Simon Sperryn, Chair of the independent customer panel said:

"The Company has been fully transparent with the Customer Panel in respect of the proposed Cost Adjustment Claim, and our CapEx Sub-group has reviewed the approach to the development of this proposal in detail. The Company has engaged widely with its customers, via both qualitative and quantitative methods, to seek input into the development of options and to seek confirmation of the acceptability of this proposal. The Company is proposing to introduce a Performance Commitment to protect its customers, and has accepted our challenge, which is backed by insight gained from the customer research, to target the PC on completion in full measure as well as on time. On this basis the Panel believes the Company has taken adequate steps to ensure that the Cost Adjustment Claim reflects the views of customers."

Our starting point was the engagement we carried out while developing our draft 25-year water resources management plans. We commissioned Accent Research to carry out a qualitative study to help us better understand our household and business customers' priorities for service delivery now and over the longer term.

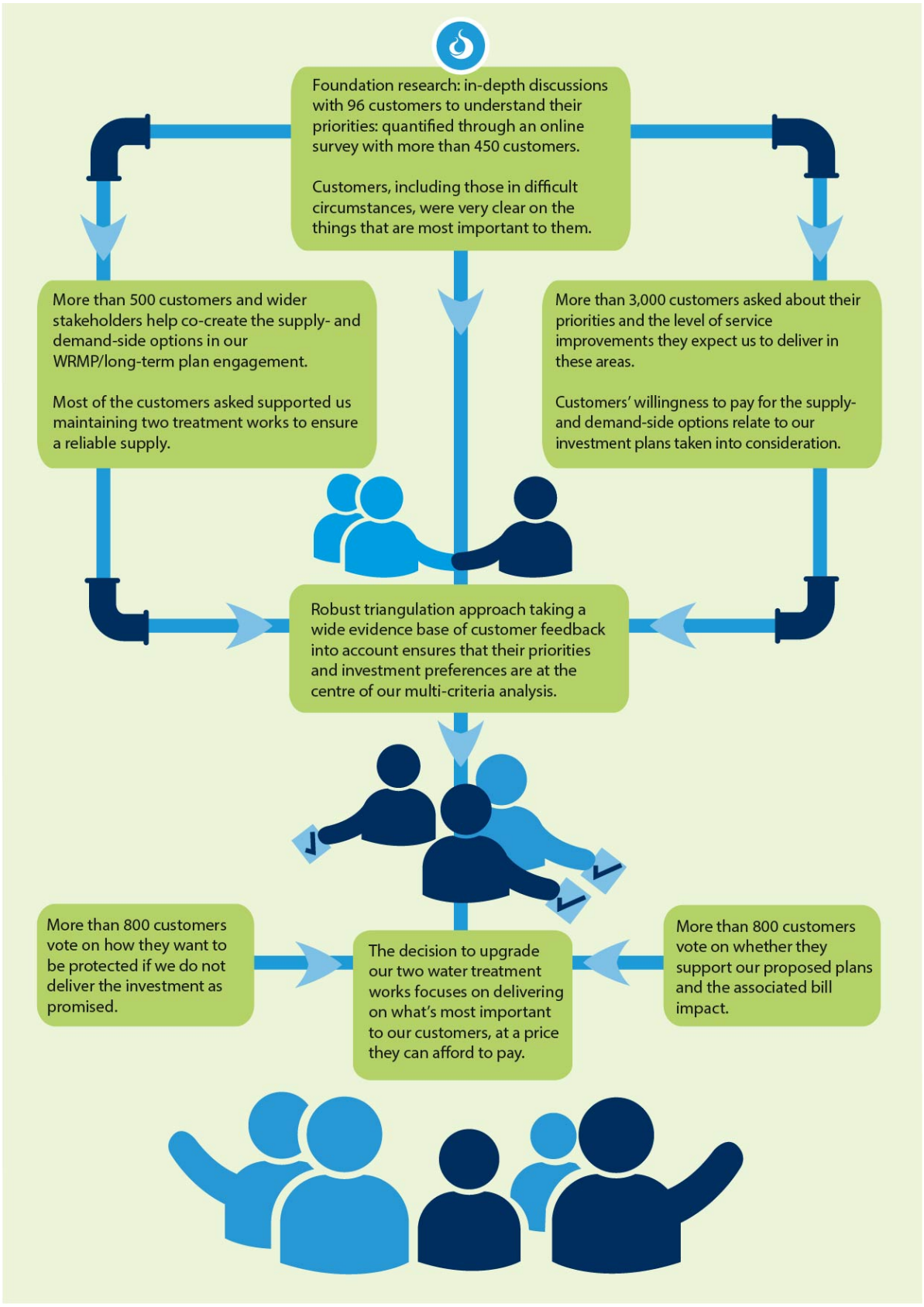
This research reaffirmed for us the things our customers value (the key priorities outlined at the start of this chapter) – both in terms of the services they want and their broader expectations. It demonstrated for us the emphasis our customers place on the need to reduce wastage through education, technology and investment in infrastructure, as well as the need to ensure that our current and future investment plans consider the affordability of their bills in an economically uncertain future.

It also demonstrated a consistency in responses across different customer groups – household by age, life stage, social grade; and by company size and sector for small and medium-sized business customers.

[6] Blue Marble-Gill Fox James (2015) 'Post PR14 Customer Engagement, Communications and Education', UKWIR Report Ref. 15/CU/03/1.

In addition, we commissioned Community Research to run a comprehensive programme of qualitative and quantitative engagement with a wide range of household and business customers and other stakeholders to understand their views on areas specific to our long-term water resources management plans, including:

- levels of service;
- leakage;
- water efficiency;
- metering; and
- the environmental impact of our activities.



The customer engagement we have undertaken in support of our cost adjustment claim.

Again, the results of this research were broadly consistent in terms of the priorities our customers consider to be most important to them. In particular, there was a clear preference among our South Staffs customers (86% of those asked) for us to maintain two 'fit for purpose' water treatment works rather than replace them with one large one – the former being seen as the more resilient and reliable option overall.

"A small increase over time is nothing compared to the risk of not having clean water. Yes, invest!" – South Staffs customer

As part of our more rounded approach to customer engagement during AMP6, we also carried out specific engagement to support this claim. We wanted to know if customers understood and supported the concept of our investment plans in terms of delivering long-term, resilient service improvements.

We did this by asking Explain Market Research to test the level of acceptability that our proposed investment represented the best value for them, and asked whether they approved of the plans for our water treatment works (see appendix A33.6). We also asked if they thought they would be able to afford the bill impact of our proposed investment plans in AMP7 and beyond.

Assuming CPIH inflation of 2%, population growth (consistent with forecasts used in our draft water resources management plan) and a WACC of 2.3% (real RPI terms), we asked customers if an average £3 annual increase on household bills in the next five years, and a potential further annual increase of £5 in the following five years (assuming additional capex of £39 million and opex of £5 million), would be acceptable to them. This is set within the context of lower overall bills for AMP7.

We asked our Cambridge customers specifically if they supported investment in our South Staffs region as they will be paying for this investment through their bills.

At the initial all-day workshops we held in both our South Staffs and Cambridge regions, our team talked customers though our proposed plans in detail using visually engaging slides and we then held a vote to ask if they supported them. We then presented them with two clearly defined options to see if they still supported our investment plans when the bill impact was introduced:

- We could just continue with the current level of maintenance for the two treatment works, which would have no impact on their bills over the next 10 years; or
- We could proceed with the investment, but clearly explaining that this would add £3 each year to their bill during the AMP7 period and then £5 each year during the AMP8 period (the additional £2 is based on view of the works required in AMP8 and is based on desktop feasibility – this will be refined over the next planning period)

The voting showed that 83% of customers who attended said that they supported our plans and associated bill impact over the 10 year period. We used the feedback from the

workshop discussions held after each round of voting to help shape the materials for the quantitative study that followed, to ensure clarity. We also asked our independent customers panel to extensively user test the interactive on-line survey we developed, to ensure that the two options presented were clear to customers and that they could make a considered vote on whether they found our plans and the bill impact acceptable.

The interactive on-line survey we developed reached over 800 customers from across both our supply regions, with the results weighted to reflect the demographics in each area. As we were engaging on a complex topic we used a video with a voiceover to provide the same detailed information presented at the workshop in a customer friendly way. When presented with the same two options, the quantitative results were the same as those from the workshops, with 83% supporting the investment plans and associated bill impact.

When customers who had not supported the plan and bill impact were then asked the same question, but in the context of a £8 bill reduction in 2020, the level of acceptance in our online survey increased to 86%. We found that 29% of the 74 customers now voted 'Yes' with a further 13% still undecided about whether our plan was acceptable.

Of the 35 customers in our Cambridge region who voted against the investment, 20% changed their response to fully support it when they were informed about the likely benefit from significant future investment in their region that would be part-funded by South Staffs customers. A further 55% (of the 20%) continued to not support our plans, while the rest were undecided.

We are confident that our new approach to customer engagement has given us a robust view of our customers' priorities and the services they expect us to deliver now and over the long term. It has also given us an extended reach of targeted customer engagement – with more than 40,000 customers to date engaged with directly across both regions since April 2017.

Household and business customers at workshops in our South Staffs and Cambridge regions on our cost adjustment claim.

3.2 Looking to AMP7 and beyond – the decision-making framework and multi-criteria analysis modelling

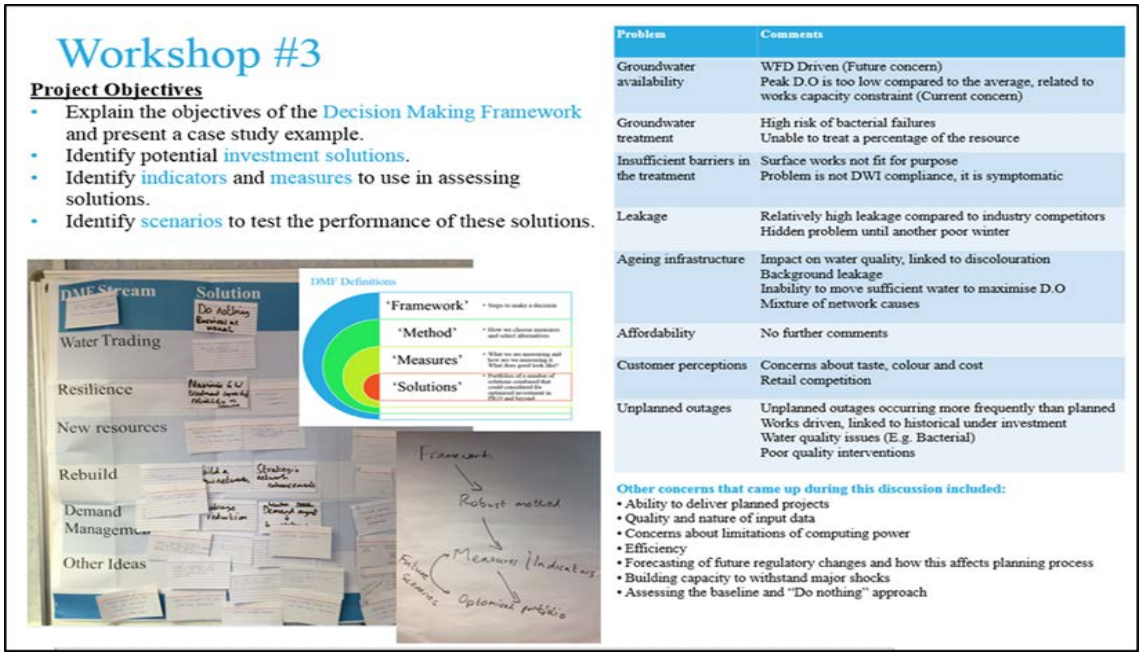
We took a holistic approach when reviewing our water resources management and asset management plans. Using the decision-making framework and the multi criteria model, we looked not only at any potential supply/demand challenges, but also considered our wider asset base to ensure that we had an optimum asset portfolio delivering what our customers have said they want.

While we appraised the asset base as a whole, this claim relates specifically to the optimum water treatment works options that provide a significant part of our deployable output and the trunk mains cleaning programme.

Our approach in taking a long-term view of the resilience and supply capabilities of our network has meant engaging in dialogue with our customers to understand what they really want and are willing to pay for. It has also meant us using credible, leading independent experts to collaborate with us and each other to help us shape our plans. We have done this for two reasons.

- We recognise the importance of looking beyond Ofwat's five-year regulatory cycle in favour of considering both our immediate and long-term planning and investment needs.
- Using more co-creation with customers, we want to identify whether alternative investment approaches might deliver greater benefits to them now and in the future.

As part of a wide ranging review process, the initial planning period of our DMF saw engagement with subject matter experts across all areas of the business as part of the initial 'assessment of need'. Through a series of workshops we were clear that we were not limiting ourselves in our consideration of potential investment options.



Example of outputs of workshop

We did not constrain our thinking in the assessment of potential investment options, we looked not only at more capital intensive schemes such as full rebuilds of our existing treatment works, but also at trading, new sources and demand management – thinking that these may minimise the level of spend required i.e. mitigate growth.

	Support	Unconstrained	Streamlined	DMF
WTW Refurb/Rebuild	Atkins	112	21	24
Resource & Trading	Atkins	98	23	23
Demand Management	Artesia	190	40	10

Summary of options and workstreams

The DMF allowed us to clearly identify short and longer term risks and allow us to set priorities as we looked to best address the questions we were asking ourselves around our supply capability

Crucially, the approach promotes the understanding around factors such as timing of investment, the utilisation of options in relation to their overall capacity and the critical dependencies between options. In context, this gives us confidence around our decisions being ones that best reflect no-regrets decision making. We consider that sensitivity analysis within our MCA model, for example in varying resource yields across the modelled period, allows us to understand the point at which the 'best' option changes. Further, scenario modelling of changing futures gives us the ability to reduce uncertainty around our chosen options, that is, those that perform best under a range of given scenarios.

The approach is further discussed in the Decision Making Framework report from Arup in appendix A33.2

And we have drawn on significant internal expertise across all areas of the business, reviewing and evaluating all of our existing operations across the water resources, looking at our overall resilience to ensure the long-term serviceability of our network. Considering our operations in the round this way has enabled us to identify the most appropriate mix of investment options across our South Staffs region going forward.

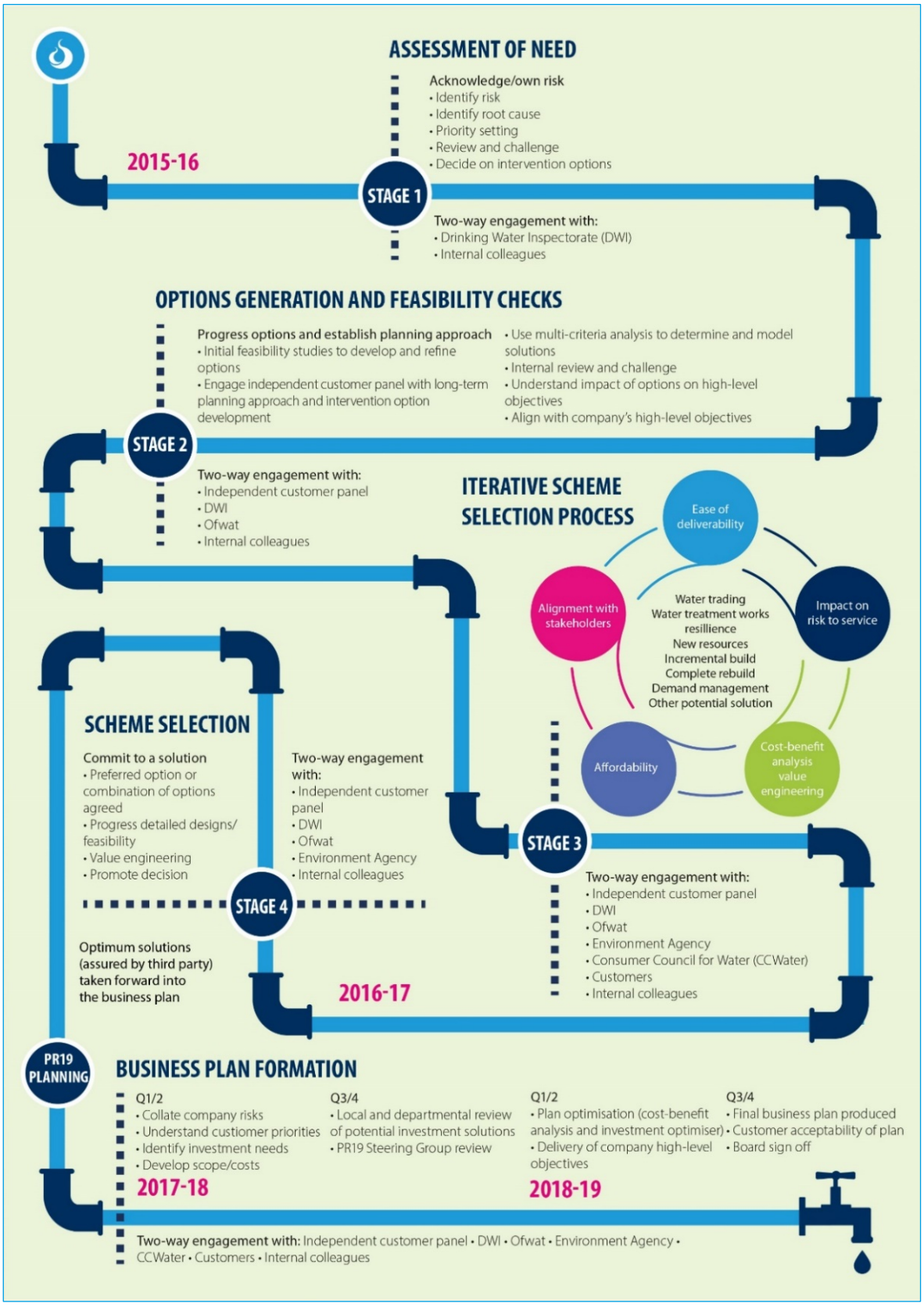
As part of this, we appointed Arup to help us develop a robust and flexible decision-making framework that would guide our long-term planning investment strategy, and to help us compare and select the optimum portfolio of investment options that form the basis of our business plan for PR19 (see appendix A33.2). It is from this optimised portfolio that we have chosen the treatment works options and strategic trunk mains cleaning that form the basis of this cost adjustment claim.

We also followed water sector best practice by taking into account UKWIR's guidance on decision making for companies' long-term water resources management plans[7].

Throughout the process, we have engaged continually with all of our stakeholders – including our customers, regulators, neighbouring water companies and the independent customer panel – to ensure a transparent approach.

The main stages of our decision-making framework are set out below.

[7] 'WRMP 2019 Methods – Decision Making Process: Guidance', UKWIR, May 2016.



Our decision-making framework.

"Clearly, you take your duty to reliably provide safe water … very seriously. You have identified the need to invest in infrastructure now, and explained the financial costs to customers. I fully support you" – Cambridge customer

Our decision-making framework moves away from a 'one size, fits all' approach and recognises that least-cost options are not the only ones we should consider. It has meant combining our approach to asset management with our long-term water resources management plans – as such, it represents a move towards considering the whole asset portfolio rather than appraising only the supply/demand balance gap, enabling us to quantify a range of objectives, including customer preferences and resilience. It is also aligned with Ofwat's preferred approach of considering 'real options'.

This allows a wide range of scenarios to be assessed, giving us the flexibility to adapt to a changing future and subsequently choose an alternative optimum path in later years. This form of decision making is the most robust in terms of addressing future vulnerability in changing scenarios – such as changes in demand or climate. It also encourages greater engagement with stakeholders and gives us more flexibility to decide the schemes that add up to a best plan for our customers and our business.

This new approach goes further than the cost-benefit analysis we have used with previous business plan submissions. This is because the outputs from the decision-making framework feed into an innovative multi-criteria analysis model, developed in conjunction with Hartley McMaster, to derive a range of solutions to solve both a supply/demand balance and asset management challenge, while incorporating customer preferences at the same time (see appendix A33.3).

While more complex, this approach has given us a better informed evaluation of the decisions we have taken as we have been able to weight different criteria to reflect the importance to both our customers and the business of the investment options we have considered. It also follows UKWIR's guidance, in terms of being the most effective and appropriate method of decision making for the scale and complexity of our challenge.

The breadth of options is wide-ranging – in total, we have appraised more than 1,000 different investment options over an 80-year timeframe. This has enabled us to generate an optimised portfolio of investment options, based on what our customers have told us they want, and in the context of our particular operational circumstances.

This new approach represents a step change for us in the way we consider investing in services and resources. It has also enabled us to consider a wide range of options in the areas of:

- water resources and water trading;
- demand management;
- refurbishing or rebuilding our major assets; and
- groundwater supplies.

As well as being robust and flexible, it considers the size of the problem for each option and how difficult it is to solve. It is also innovative because it considers options under a range of scenarios and factors that cannot be quantified in monetary terms, and assesses them in terms of:

- their operational resilience, to ensure a stable, high-quality water supply for customers now and over the long term. This includes:
  - their flexibility, to ensure an integrated network that enables us to switch easily between different water sources as and when required;
  - their reliability, to ensure our critical assets are available as and when they are needed; and
  - their diversity, so that we have enough water sources available to help us deal with normal year annual average, dry year annual average and dry year critical period drought scenarios;
- their environmental sustainability, to minimise the impact of our business on the environment;
- their deliverability, or how the option will be delivered and over what period of time; and
- customer preference, to ensure that we are delivering what our customers have said they want, and which we asked Accent Research to triangulate against other data sources to ensure a transparent and robust process.

This scenario modelling combined a focus on stress testing the demands or available yields of the options with optimisation across the range of competing objectives. We also worked closely with Severn Trent Water to understand both its current and future needs regarding Hampton Loade, including this analysis within our scenario modelling.

As well as understanding the whole life totex, we scored all the options that were appraised within the optimisation process against the above criteria. We developed a maturity matrix with Arup and internal colleagues to ensure that we applied a consistent approach for each of the criteria. These scores were subject to scrutiny and governance by both internal and external stakeholders, including the independent customer panel.

This new approach has given us a more rounded view that represents the best plan for our customers – and one that is robust, flexible and responsive to their changing needs and requirements over time.

We then triangulated and refined the list of options by:

- consulting with stakeholders;
- modelling different scenarios; and
- carrying out sensitivity analysis.

We also tested everything with our Board and the independent customer panel, referring back to what our customers said they wanted. This gave us an optimised portfolio of investment options to take forward in our business plan for AMP7 and beyond. The expenditure that drives our claim, which is required to enable us to install an additional stage of treatment so that we can continue to deliver the water quality our customers expect, is a significant proportion of this optimum portfolio.

We wanted to challenge ourselves that the outputs of our analysis was right for our customers and our business – and that we could justify such a step change in enhancement expenditure.

We also engaged with other key stakeholders – particularly the Environment Agency and Drinking Water Inspectorate, which both support our long-term plan.

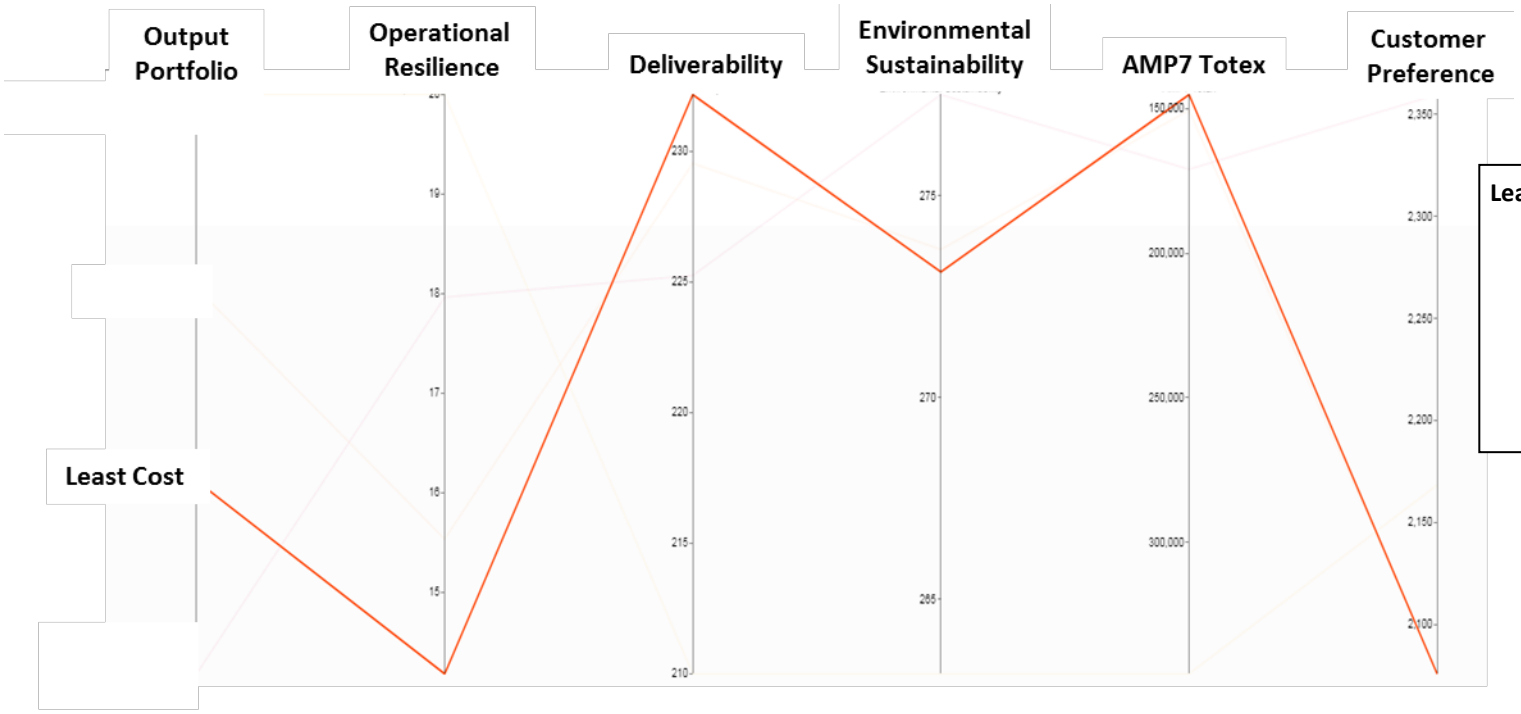
Further detail concerning our extensive options appraisal, modelling and portfolio selection process is outlined in appendix A29 'Capital Investment to deliver a class leading service, specifically the sub-appendix to that document – A29.1 'WRMP 2019 – Deciding on future options'.

To enable us to effectively demonstrate the outputs of our multi-criteria approach, we developed parallel co-ordinate plots that display the relative impact of a range of portfolios upon each of the modelled objectives described above. These visuals allowed us to compare the outputs of each of the modelled scenarios. We were then able to interrogate the portfolios to understand the individual investment options that were driving the best balance across the objectives.

Each portfolio comprises a range of investment options across the entire asset base – it is important to note that while every output portfolio shown impacts differently against the range of objectives in the graphs, they all deliver against an 80-year demand profile that includes forecast AMP7 WINEP reductions and provide the quality of water our customers have said they want.

While we ran many different scenarios and sensitivity checks on these outputs, we consider the graphs below illustrate most effectively our approach in defining the optimum portfolio in terms of delivering the water quality improvements that are necessary.

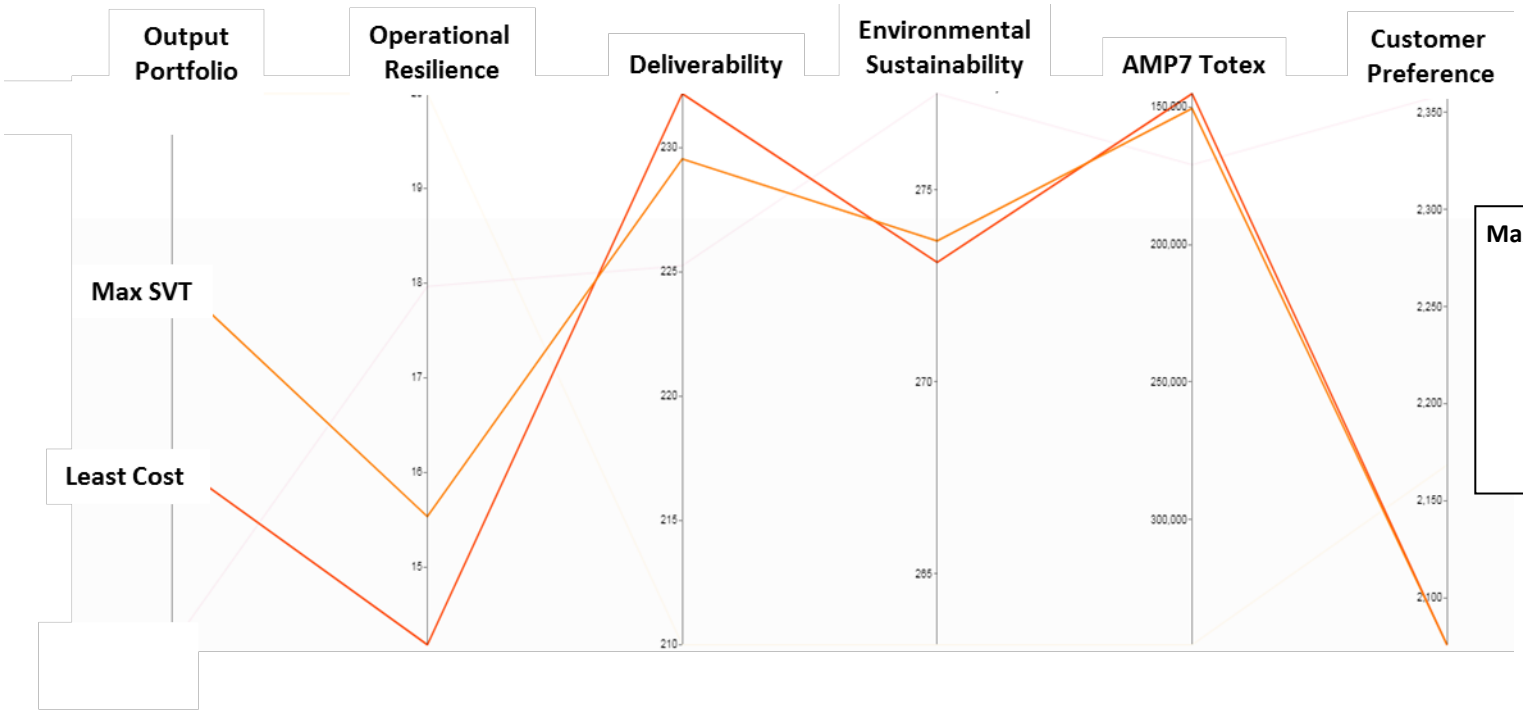
Graph 1 shows the performance of a least cost portfolio (red line) – as our starting position, we wanted to understand those investment options being selected when the only constraint applied was that of minimising whole life totex to meet the demand and quality targets. The graph clearly demonstrates that despite meeting these targets, it scored relatively unfavourably on resilience and customer preference.



Least cost portfolio includes:

- 210 Ml/d at Hampton Loade refurbishment
- 105 Ml/d at Seedy Mill (inc TV BH) phased upgrade and refurb
- 12 Ml/d leakage reduction
- All groundwater sources

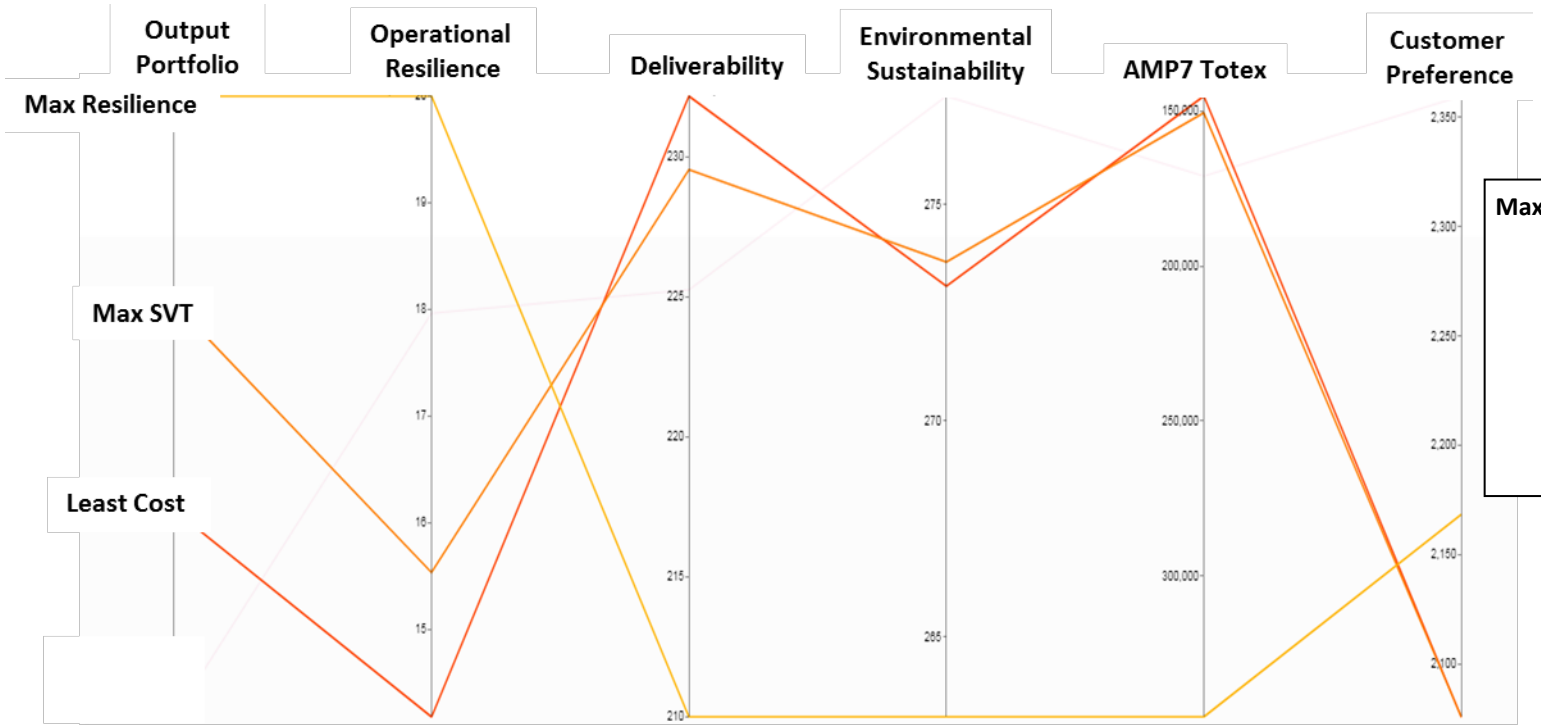
Having obtained the least cost portfolio outputs, we then looked at sensitivity around demand – specifcally an increased Severn Trent Water's utilisation at Hampton Loade. The least cost portfolio was demonstrated to be no longer sufficient to resolve this new demand profile. Instead, the model outputs indicated the below portfolio in graph 2 (orange line) as the lowest cost way in which it could be achieved.



Max Severn Trent portfolio includes:

- 210 Ml/d at Hampton Loade refurbishment
- 125 Ml/d at Seedy Mill (inc TV BH) phased upgrade and refurb
- 12 Ml/d leakage reduction
- All groundwater sources

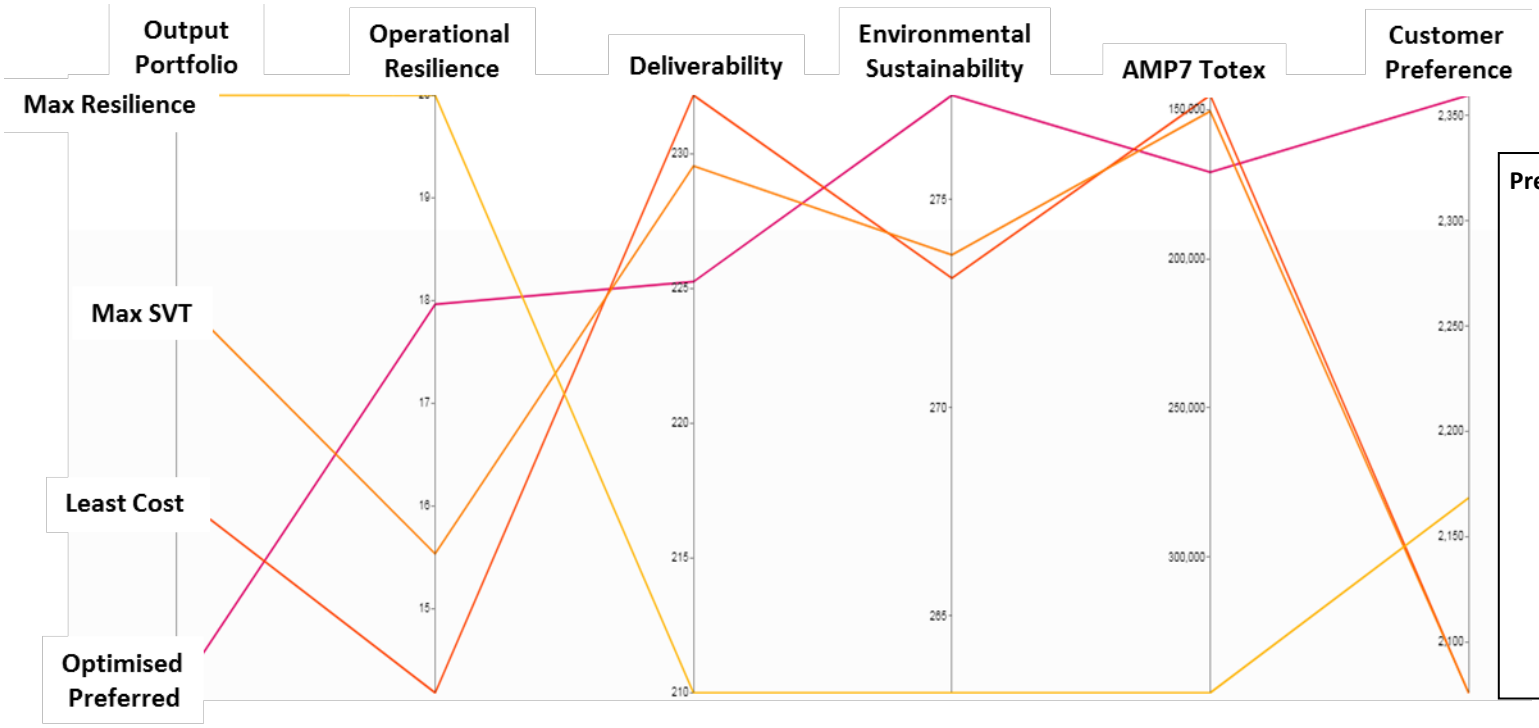
Graph 3 overlays the result of a maximum resilience portfolio (yellow line) – this shows the output from an optimisation that looks to achieve the demand and quality targets in a way that includes those investment options scored as most resilient over the long term. Because of this, the associated scores against deliverability and the overall AMP7 totex value rank lower in comparison to other portfolios.



Max resilience portfolio includes:

- 230 Ml/d at Hampton Loade refurbishment
- 140 Ml/d at Seedy Mill (inc TV BH) phased upgrade and refurb
- 12 Ml/d leakage reduction
- All groundwater sources

Graph 4 brings in our preferred portfolio (purple line) – this represents an optimisation deemed to deliver a resilient portfolio, at relatively low cost and that is scored highly by our customers in terms of their preferred options. Tested with a range of stakeholders, it represents an optimum balance across the objectives.



Preferred optimum portfolio includes:

- 210 Ml/d at Hampton Loade refurbishment
- 125 Ml/d at Seedy Mill (inc TV BH) phased upgrade and refurb
- 12 Ml/d leakage reduction
- Introduction of a live network
- All groundwater sources
- Increased demand management activities around metering and water efficiency
- Trade with Severn Trent to support resilience

We followed this by asking Arup to carry out traditional and thorough cost-benefit analysis on a number of options relating specifically to the proposed investment in our treatment works. Our approach to cost benefit analysis was to appraise the difference between the most viable options identified through the multi-criteria analysis. We only valued a number of key measures across these options – we did not value the service of water to those supplied by the works as we had already done this within the multi-criteria. The analysis supported our proposal and this option was the least negative (see appendix A33.7). We further refined these options, enabling them to progress forward into our wider PR19 investment optimisation, demonstrating their relative merit against other proposed investment requirements across the wider business.

The whole life totex of this programme of work is just above £100 million, although at an individual site level they are well below this amount. So, we have considered its suitability under Ofwat's new Direct Procurement for Customers (DPC) mechanism, using the criteria set out in KPMG's technical review[8].

The report highlights that projects that may not be suitable for DPC are those where the asset materially contributes towards a company meeting its statutory obligations. Together, our treatment works, which are 27 miles apart, supply nearly 60% of the water delivered to customers in our South Staffs region. This makes the work critical in ensuring we meet our licence obligations.

We have also considered other criteria which make the project less suitable for DPC. These are as follows.

- The proposed investment at both works is to install an additional stage of filtration in the existing treatment processes. The second stage of filtration is one element of the whole treatment process and will be fully integrated with the rest of the assets at each works.
- Both water treatment works have significant, complex and frequent interactions with the network and each other. As such, they are deeply integrated within our operations, providing material economies of scale and scope with the rest of our network system compared to if they were being operated on a standalone basis under the DPC approach.
- We have considered the likely customer benefits of DPC. We have concluded that the financing cost benefits are likely to be small as the initial capital investment in AMP7 is only £57 million. It is also not expected that any significant operating cost efficiencies would be generated through DPC, as these primarily relate to additional power costs, which will already be covered within our overall electricity contract where the unit price benefits from the scale of the electricity used.

Among other things, our preferred portfolio of investment options for our South Staffs region includes undertaking work incrementally at our treatment works over AMP7 and AMP8, and the associated cleaning programme of the trunk mains leaving both works to

[8] 'Direct Procurement for Customers: Technical Review', KPMG, December 2017.

ensure that the water we supply to customers is consistently of the high quality they expect, and to realise the benefits of the work to refurbish our treatment works at the earliest opportunity.

4. Demonstrating the need for a cost adjustment claim

The work we are planning to undertake at our water treatment works in AMP7 has been driven by the benefits we can deliver to customers, as well as by the need to ensure that we can continue to meet our statutory obligations. Coupled with the programme to clean the trunk mains leaving both works it is a source to tap solution for our customers.

It also represents a step change in investment, which our historic costs do not cover. It is atypical expenditure for which we have not been funded previously. The scale of the investment compared with our historic costs means that sector-level econometric models would still not reflect the scale of the costs we need in one go to deliver this work.

We have been looking for cost efficiencies in our plans to enhance our treatment processes by installing an additional treatment stage at our water treatment works. We will also continue to seek efficiencies across all our operations in AMP7.

We are also mindful of the need to protect customers if we fail to deliver our plans in any way. So, we have asked them to co-create a performance commitment that focuses on the delivery of the planned work at our water treatment works.

In the previous chapter, we set out the reasons for why we need to undertake this programme of works incrementally over successive AMPs, and the benefits to customers of us doing so.

We consider that we need to make a claim for this investment because we do not expect the modelled cost allowance to be able to allow for it at PR19. This is because the investment represents a significant step change in our costs compared with our typical cost levels, and we are not aware of a modelled cost driver that can explain the complex, underlying need.

So, without a claim, it is clear that the cost allowances at PR19 would not be sufficient to enable us to deliver this significant enhancement programme.

It is part of our long-term plan to ensure we deliver the services our customers want. The work we are planning to undertake at both treatment works in AMP7 has been driven by the benefits we can deliver to customers, as well as by the need to ensure that we can continue to meet our statutory obligations now and over the long term.

Coupled with our programmes of cleaning the trunk mains leaving both treatment works, it is a source to tap solution for customers.

The upgrade work we need to undertake is an atypically large investment for us. There are a number of reasons for this.

- These assets have reached a point in their long lifecycle where significant work is needed to further enhance the treatment process.
- These are large treatment works that supply a significant number of customers, and the work to upgrade them represents a significant enhancement. Accordingly, this means that there is also a significant step change in costs compared with our historic levels expenditure.
- It is optimal to deliver the upgrade programme in a short period of time (that is, two to three years for each works), which means the costs are incurred within a short timeframe.
- It is optimal to deliver the upgrade programme for both works at the same time to maximise cost efficiency and benefit delivery across our interconnected network.

In recent years, our investment programme at these works has focused on maintenance, delivering service standards at minimal cost, with long term regard to asset health and supply reliability for the existing configuration. We have not undertaken any significant treatment process upgrade since AMP3 (2000/05).

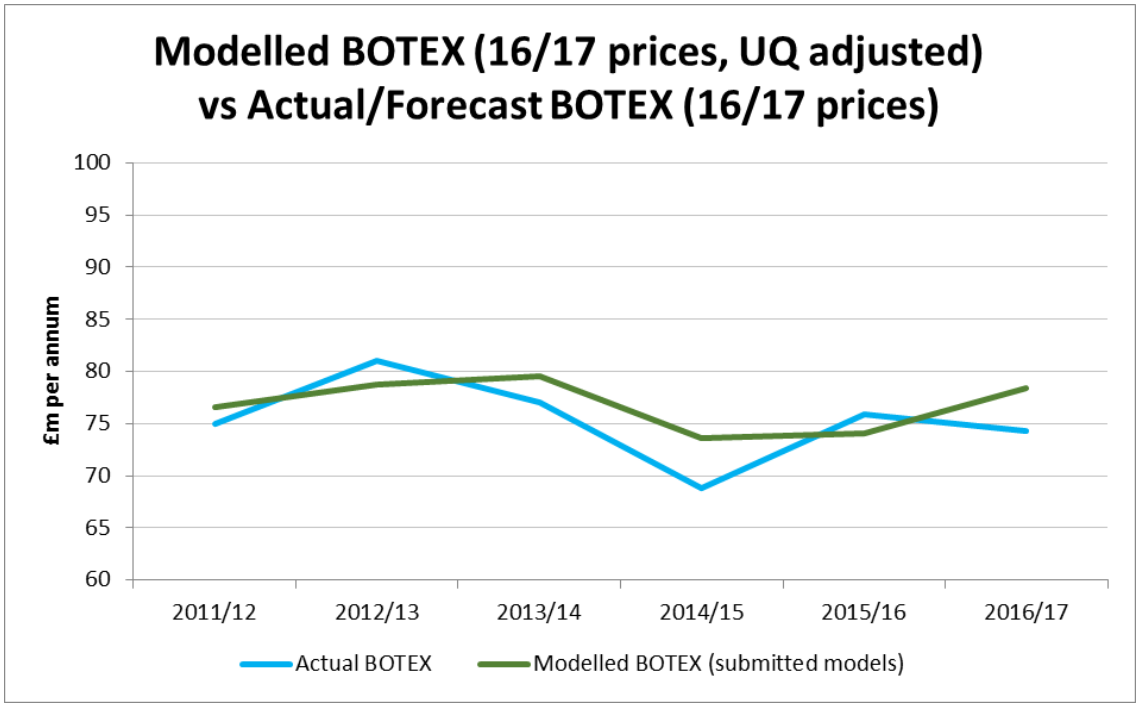
"…without continuing investment, water quality will deteriorate, and I do not find this acceptable" – South Staffs customer

Other companies, particularly larger companies, will have undertaken treatment works upgrade programmes. Where a larger company has an upgrade programme covering many water treatment works over a longer period of time, it is more 'business as usual' with significantly less financial impact compared with their larger programmes. They are also more likely to be built in, at least in some way, to modelled cost allowances.

For us, the programme represents a significant step change in scale of activity and cost, when compared with what we have done in recent years. For this reason, we do not consider that cost models based on our recent cost history would allow for the material step change in costs that we need, at this point in time, to deliver these upgrade works.

In developing our overall plan, we have considered a wide range of trade-offs with other areas of expenditure, both in botex and totex, to reduce the impact of the proposed expenditure on customers, while ensuring that other important assets in our network are still maintained appropriately and are able to deliver what is important to our customers. We have also offset costs by undertaking enhancement work on our water treatment works during this AMP – specifically on installing UV treatment – that we will not need funding for in the next AMP.

We consider our botex costs, which are independent of this claim, to be efficient. We were pleased to have been able to develop robust botex models, working with Oxera, to submit to Ofwat in response to its recent cost modelling consultation. These models demonstrate that our botex costs are efficient when compared against an upper quartile adjusted position.



We are continually looking at ways to push our efficiency further.

In our work with Oxera, and to repeat our views put forward in the cost modelling consultation, we were unable to develop robust totex models that could capture the broad range of enhancement expenditure across water companies. In addition, we were unable to identify any modellable cost driver that could appropriately capture the need for this upgrade programme at this point in time, and that would allow for the step change in the costs required given the lumpy nature of the timing and the scale of the work compared with our historical totex level.

4.1 How we will protect customers

We are mindful of the need to mitigate any potential impact on customers of our proposals for AMP7 and beyond. As described in more detail in chapter 2 above, our more rounded approach to customer engagement during this AMP has enabled us to test and re-test a range of investment options with:

- customers in both our South Staffs and Cambridge regions;
- the independent customer panel; and
- our Board.

We have also triangulated our engagement with other data sources, drawing all the insight together and challenging it. This has given us confidence and assurance that our preferred approach is going to deliver the high-quality water and resilient services that our customers have said they want and are willing to pay for now and over the long term.

Our co-creation work with customers during this AMP has been particularly important in this respect. By asking customers to help us develop ideas and solutions that best fit their requirements, we have been able to develop plans for the future that:

- are easy for our customers to understand;
- have our customers' priorities at the heart of them;
- have the ambition and stretch that Ofwat is expecting to see in our business plan submission; and
- are affordable.

We have also asked our customers to help us co-create performance commitments. These are our promises about the services we will deliver for them now and over the long term. This has been a really important part of our engagement and demonstrates that we are incorporating the need to protect customers' interests within all of our plans.

Whilst the benefit of the enhancements at both the treatments works will be delivered to customers and measured through how acceptable customers find their water, and the targets we have set ourselves in conjunction with our customers reflect the step-change the additional treatment will bring. We are mindful that with such a level of investment we should provide additional measures to ensure our customers are protected.

We co-created with our customers an "on time in full" measure – we tested with them with them when they considered a penalty for delays should be applied, whilst the results were mixed, on average, in the qualitative stage, where customers fully understood the engineering challenge, the preference was for penalties to be applied was if delays were greater than a year. We agree with this, and consider it is fair and reflects the complexity of the enhancements we are proposing. The value of the penalty will be based on the time value of money received from customer, with a percentage uplift to ensure we are incentivised to deliver.

There are three components to the claim, each having capex and opex costs associated.

For each component, we will give back the Capex as an RCV adjustment, and the opex as a revenue adjustment, in full, if the project is not delivered at all.

For each component, for each year of delay, we will give back the time value of the money collected by the deadline date, as a revenue adjustment.

For the delay components, we discussed that we should uplift the time value of money rate to ensure it acts as a penalty, rather than just a refund. As the water quality performance commitments incentivise the benefits of delivery, we might not need to do this uplift (assumption is we'll miss our targets and incur a penalty if we don't do the work on time, because the targets are tied into the timing of scheme delivery). If we do want to scale still, what factor do we want to use for this? I have used a 100% multiplier in the numbers below.

Here is how this looks in monetary terms:

Scheme	Fail to deliver	Late delivery natural rate	Late delivery scaled rate
Seedy Mill	£31.4m RCV adjustment	£127k per year delay	£254k per year delay
	£1m revenue adjustment		
Hampton Loade	£25.6m RCV adjustment	£141k per year delay	£282k per year delay
	£2m revenue adjustment		
Mains cleaning	£1m RCV adjustment	£102k per year delay	£204k per year delay
	£3m revenue adjustment		

Proposed incentive mechanism for Performance Commitment

We also think that undertaking this work incrementally over two successive AMPs, we will minimise the impact on our customers – both in terms of the bills they pay and the quality of the water they receive. The detailed project plan is included in appendix A33.8. Throughout this process, we have paid particular attention to the need for our customers' bills to remain affordable now and in the future. We think that our proposals represent good value for money for our customers.

5. Ensuring robust and efficient costs – Costain market testing study

Because the scale of investment needed to install an additional treatment stage at our water treatment works goes beyond that of previous AMPs, we asked Costain to give us a robust estimate of the costs of this scheme and a timeframe for delivery.

We are mindful of the need for the assets to be constructed in such a way that the existing assets can be taken out of commission without impacting on the quality and volume of water we supply to our customers.

The scale of the investment we need to bring our treatment works at Hampton Loade and Seedy Mill up to the standards we require and our customers expect goes far beyond the routine capital renewal programmes that we have undertaken in previous AMPs.

Because of this, we asked Costain, a credible, independent water industry contractor with experience of constructing such assets, to carry out a feasibility study and provide us with a robust and accurate estimate of the costs associated with this work, along with a view of the construction timescales for both schemes (see appendix A33.5 and the accompanying Costain appendices A33.5.1, A33.5.2 and A33.5.3). It should be noted that the costs for this work are net of the contribution Severn Trent Water makes for its share of Hampton Loade.

Because of the limited space available at both sites, we are mindful of the necessity for the new assets to be constructed in parallel so that the quality or the volume of the water we deliver to customers can be maintained. Both Costain and the Drinking Water Inspectorate are comfortable with this approach.

We also asked Costain to comment on our preferred approach of two-stage filtration at both treatment works.

"It is worth investing money now for a more secure infrastructure and better quality water" – South Staffs customer

Costain considered that implementing second-stage filtration at both treatment works was appropriate because it is a conventional treatment solution that will further improve the quality of the water we supply to our customers. As we explained on page 13, it will also deliver a number of other benefits.

More importantly, Costain considered it a robust solution for the long term and one that would enable us to further develop the assets in the future. In particular, Costain considered that it would enable us to look at more ambitious and innovative solutions in future AMPs – particularly in the areas of advanced oxidation and low footprint clarification processes.

Costain used a combination of historic outturn project costs and bottom-up pricing, cost curves and supplier budget quotations where necessary to generate estimates for the engineering solutions described in sections 5.2 and 5.3 below.

It also considered indirect costs such as:

- large plant items;
- labour costs;
- site accommodation;
- IT equipment;
- traffic management;
- insurance costs;
- environmental surveys;
- planning permission; and
- detailed design.

More detail about the specific costs for this work can be found in the supporting information.

5.1 Taking a long-term view of resilience

In the water sector, resilience is defined as:

"… the ability [of companies' assets] to cope with, and recover from, disruption, and anticipate trends and variability in order to maintain services for people and protect the natural environment now and in the future."[9]

So, as part of its work to estimate the costs associated with developing our water treatment works, Costain considered the factors that can influence the resilience of an asset. These include:

- loss of power, chemicals or fuel supply;
- flooding or fire;
- contamination of water supplies;
- critical asset failure;
- the impact of population growth on water usage;
- not having the right resources available at the right time;
- cyber and physical security;
- interconnectivity and/or storage to maintain sufficient supplies to customers; and
- the impact of a civil emergency.

[9] 'Reliable services for customers – consultation on Ofwat's role on resilience', Ofwat, July 2015.

The aim was for Costain to develop a more rounded view of our requirements and the priorities that are important for our customers, and to consider the long-term cost of failure of the project versus the cost of investment.

5.2 Our proposals for Hampton Loade

We consciously gave Costain a blank sheet of paper with regards to the future design of the works, this was to ensure we could capitalise on their experience from across the sector. Costain's proposals for our Hampton Loade water treatment works are as follows.

A new process stage of primary rapid gravity filters (RGFs) is to be built on land north of the existing clarifiers. These will be fed by intercepting the existing clarified water outlet mains from each of the clarifiers where they pass under the road between the clarifiers and the existing filter blocks.

A new main is to be installed that passes water from the new primary RGFs to the inlet main to the existing RGFs. This is to enable the two-stage filtration.

Once the new RGFs have been constructed and commissioned, the existing RGFs will be refurbished and converted into GAC adsorbers (and so become a second stage of filtration downstream of the new RGFs). All the necessary power supplies and controls for the new equipment will be installed.

For more resilience and to future-proof the works, Costain has recommended that additional RGF and sludge washwater storage of at least 1,000m^3 is required for AMP7, with a possibility for a further extension in AMP8 and beyond.

Costain has also recommended installing additional sludge holding capacity of 250m^3 in AMP7, and that the existing centrifuges are reviewed for optimisation. If we decide to

develop a new clarification stream in AMP8, then the existing centrifuges may need to be replaced.

While undertaking this work, the intention is to implement dual streaming of flows to reduce any single points of failure, which will enhance our operational resilience.

5.3 Our proposals for Seedy Mill

We consciously gave Costain a blank sheet of paper with regards to the future design of the works, this was to ensure we could capitalise on their experience from across the sector. Costain's proposals for our Seedy Mill water treatment works are as follows.

The redundant existing industrial unit on the site is to be demolished, and a new process stage of eight primary RGFs is to be built in its place. The new RGFs will be fed from existing clarifiers using a new inter-stage pumping station (IPS). Once the new RGFs have been brought into commission, all of the existing RGFs will be refurbished and converted into GAC adsorbers (and so become a second stage of filtration downstream of the RGFs). Building new RGF will turn the existing ones into a second stage of filtration.

Dual streaming is to be added to the site in AMP8 to mitigate the risk of single points of failure. The existing clarifiers will be decommissioned and demolished, enabling a new contact tank to be constructed.

For more resilience and to future-proof the works, Costain has recommended that additional washwater storage of 500m^3 is required for AMP7. This may need to be extended further in AMP8 and beyond.

Costain considers that while it appears that the existing thickened sludge holding tank has sufficient sludge loads in AMP7, the asset should be designed in such a way to enable additional capacity to be added in a future AMP. This includes installing further washwater storage in addition to the 500m^3 outlined above.

And while Costain considers that the existing centrifuges have sufficient capacity, it has recommended that we review our existing dewatering system to identify opportunities for optimisation in AMP7. Costain has also recommended that we provide an additional 400m^3 of sludge balancing storage, which will give us more flexibility to use existing thickeners and centrifuges, and consider installing an extended washwater plant in AMP8.

While undertaking this work, the intention is to implement dual streaming of flows to reduce any single points of failure, which will enhance our operational resilience.

Below, we set out our long-term plan for the proposed investments at Hampton Loade and Seedy Mill water treatment works.

(£m – 17/18 pricebase)	2020/21	2021/22	2022/23	2023/24	2024/25	Net Total (gross)
Seedy Mill Treatment Works						
SMTW – 2nd Stage Filtration capex	10	10	10			30
SMTW Additional opex due to increase pumping head			0.33	0.33	0.33	1
Hampton Loade Treatment Works						
HLTW – 2nd Stage Filtration capex	8.5 (12)	8.5 (12)	8.5 (12)			25.5 (36)
SMTW Additional opex due to increase pumping head			0.66	0.66	0.66	2
Trunk Mains cleaning						
Enabling works capex	0.4	0.4	0.4			1.2
Cleaning - opex			1	1	1	3
Contributions						
Total Contribution	3.5	3.5	3.5			10.5
Net Totals						
Total Capex	18.9	18.9	18.9			56.7
Total Opex			2	2	2	6

Long-term plan for water quality-based investment at Hampton Loade and Seedy Mill.

5.4 Operating Costs

We also know we will need to increase the operating costs of these two critical sites. This is because these sites currently both operate on water flowing under the head generated by the elevation of the source reservoirs above the treatment works. Adding an additional

filtration stage at each treatment works will require new pumping systems to lift the water into the filters.

Our analysis, supported by Costain suggested

- At Hampton Loade, three additional pumps at 200kW (average load) each will be required to operate 24/7, an annual consumption of 5,256 MWh. Furthermore in order to backwash the filters an estimated 269MWh of electrical energy will be required. This will require additional OPEX of £671,000 per annum.

- At Seedy Mill, two additional pumps at 150kW (average load) each will be required to operate 24/7, an annual consumption of 2,628 MWh. Furthermore in order to backwash the filters an estimated 259MWh of electrical energy will be required. This will cost an estimated total of £363,000 per annum.

Across the two sites, additional OPEX of £1,034,000 per annum is required to operate the new filtration systems. An estimated electricity price of 11p/kWh is assumed.

5.5 Trunk Mains Costs

We have worked with the supply chain to understand the costs of our proposed strategic mains cleaning programme, which is detailed in the table below.

The costs are based on discussion with the supply chain and a desktop engineering feasibility study. We have considered a number of techniques, from PODDS through to more aggressive cleaning techniques. The application of these techniques will be based on either age, sediment levels or water quality samples – coupled with pipe condition analysis. At this stage we believe that we can clean the majority of our strategic mains by either ice pigging or jetting, our current view of costs for AMP7 is £3m – we consider this to be a one off operating cost, as once cleaned we will be able us business as usual techniques such as PODDs to maintain them.

To facilitate successful cleaning we know that we will need to carry out a number of enabling works to ensure we can achieve required flow rates, monitor flows and dispose of the water in safe environmentally friendly way. Therefore we have included £1m of capex within the claim.

Location	Main (diam.)	Distance (km)	Mains (material/ year)	Comments
Seedy Mill to Barr Beacon Reservoir	36”	19.25	Steel/cast iron/1951	Part of PODDS (see below), but single direction conditioning. Requires physical cleaning to maximise operational function, particularly for drought plan and to recharge Blithfield Reservoir.

Location	Main (diam.)	Distance (km)	Mains (material/ year)	Comments
Seedy Mill to Gentleshaw Reservoir	600 mm	6.2	Ductile iron/ 1992 and 2009	
Seedy Mill to Outwoods Reservoir	21”	18.2	Cast iron/1969	Excludes A38 mains to Burton-upon-Trent because of accessibility/traffic management.
Seedy Mill to Pipehill Station	700 mm	6.9	Ductile iron/2004	Part of PODDS. Continue to actively manage risks.
Seedy Mill to Trent Valley Station	500 mm	5.3	Ductile iron/2002	Part of PODDS. Continue to manage risks through conditioning strategy as the maximum flow matches maximum pumping capability (pressure limits).
Trent Valley Station to Crickets Lane	18”	2.2	Cast iron/1885	As above.
Pipehill Station to Sandfields/Lichfield	400 mm	3.1	Ductile iron/1995	As above. Duplication will reduce risk (reduced flow).
Hampton Loade to Chamber 6	1,200 mm and 45”	9.8 each	Steel/1974 and 1964	Part of PODDS. But loss of 1,200 mm main would reduce Hampton Loade to 105 Ml/d (PODDS flow single main). Maximum pumping capability (pressure) is 165 Ml/d, which means potential loss of 60 Ml/d distribution input.
Chamber 6 to Sedgley Reservoir	45” and 800 mm	9.45 each	Steel/1964 and ductile iron/ 2004	Part of PODDS (see above).
Sedgley Reservoir to Childs Avenue	45”	1.6	Steel/1965	Part of primary trunk main artery.
Childs Avenue to Patent Drive	1,000 mm	4.8	Steel/1982	Age of main.
Patent Drive to Bannister Road/ Leabrook Road	600 mm	0.9	Ductile iron/ 1982	Age of main.
Sedgley Reservoir to Baker Street	45”	5.6	Steel/1954 and 1965	Part of primary trunk main artery.
Baker Street to The Shrubbery public	36”	2.4	Steel/1965	Part of primary trunk main artery.

Location	Main (diam.)	Distance (km)	Mains (material/ year)	Comments
house				
The Shrubbery public house to West Bromwich Booster	45”	5.4	Steel/1970	Part of primary trunk main artery.
West Bromwich Booster to Barr Beacon Reservoir	1,000 mm	7.2	Steel/1975	Planned PODDS as part of two-pump running scheme. Continue to manage risks through conditioning strategy.
Total length of mains cleaned		97.2 km		

Proposed Strategic Mains Cleaning Programme for AMP7.

6. Conclusion

We need to make significant investment and enhance the treatment process in our two critically and strategically important water treatment works, and in a programme of cleaning our strategic mains in our South Staffs region. This is so that we can continue to deliver the high-quality and resilient water supplies that our customers expect now and in the future.

Because this is significant work for us in terms of scale and ambition, we have used the expertise of credible, leading external organisations to help us develop an approach that will ensure we deliver what our customers have said they want. This has enabled us to put together a preferred portfolio of investment options that is about ensuring the long-term serviceability of our assets – and the resilience of our business.

It is also about being mindful of the need to mitigate any potential impact on customers on our proposals for AMP7 and beyond. As well as testing and re-testing a range of investment options, we have asked customers to help us co-create the commitments they want us to deliver from source to tap, now and over the long term. We think our proposals to deliver the best plan for our customers represents good value for money.

The total value of this claim is £63 million (£57 million capex and £6 million opex). We have the support of the Drinking Water Inspectorate and our customers for this work.