Appendix A3
Valuing service improvements

Contents

1. Using a wider range of evidence to understand the value customers place on service improvements

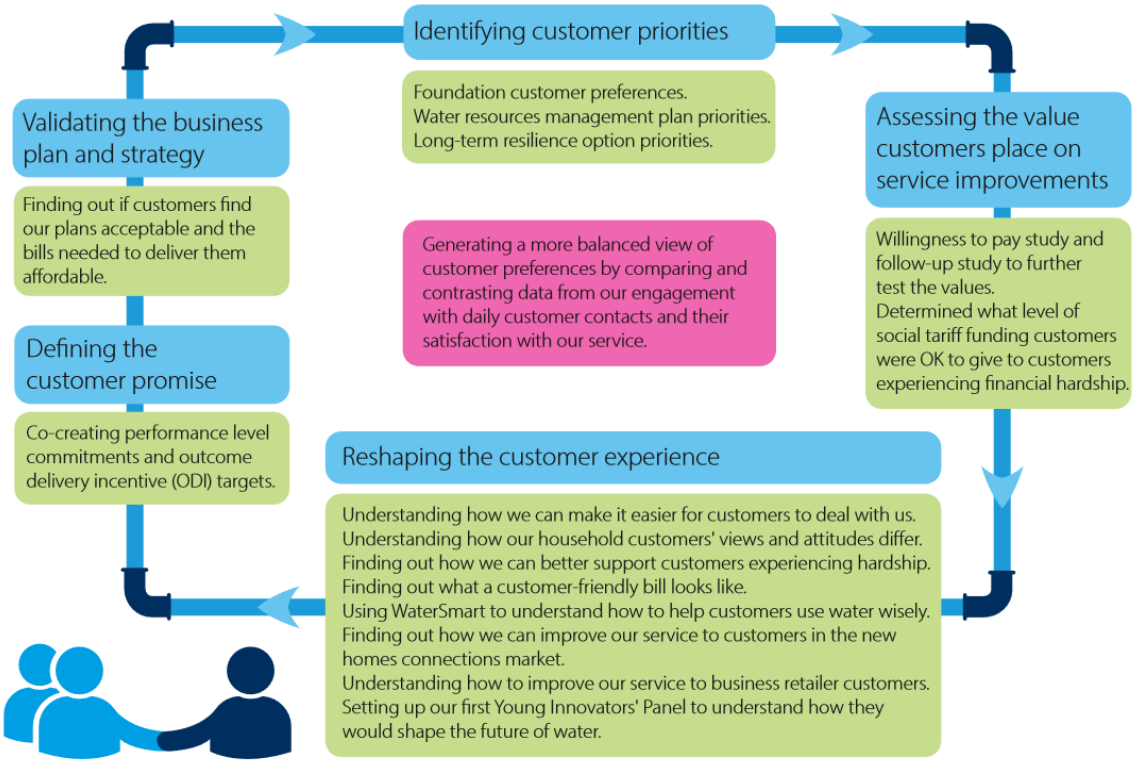
Over the last two years we have fully reviewed how we approach customer engagement to ensure that our customers' priorities are placed at the heart of our business plans. This cultural shift comes from our executive team's view that the customer voice should drive all the key decisions we make, now and in the future.

Our comprehensive customer engagement journey which supports our price review (PR19) business plan has five key elements, which are set out in Figure 1.

We are also committed to continuing with this approach throughout 2020 to 2025 so that we can ensure our customers' views are continually at the heart of our plans.

This report sets out the key customer insights from the second step of our journey, "assessing the value customers place on service improvements". It is important to note that step 1 "identifying customer priorities" sets the foundations for the attributes tested in our two waves of Willingness to Pay (WTP) research drives the customer valuations we have used in our business plans to develop a package of service improvements that we believe truly reflects customers' preferences.

Figure 1: our approach to customer engagement.



An important part of our PR19 customer engagement programme and beyond also focuses on reviewing, comparing and contrasting (or 'triangulating') customer evidence from a wide range of sources. This is central to our journey and ties it all together. We have looked at triangulation in a number of ways to develop an approach that truly puts customers at the heart of our plans:

1. Section 3: we review all the customer insight data form our two waves of WTP research to interpret what customers have said using a 'common sense' judgement approach and to highlight areas where customer views differ; and
2. Section 4: we outline how we developed a robust and proportionate evidence base for customers' willingness to pay (WTP) for service improvements. Following the completion of the two waves of WTP research we worked closely with our independent partners, Accent and PJM Economics to deliver this project which drew on wide range of data sources from our day-to-day contacts data, customer satisfaction surveys, our priorities and WRMP engagement and external WTP studies. The approach and outputs were extensively challenged by our executive board and our independent customer Panel. In addition we had an independent peer review commissioned at the methodology development and final output stages by an academic expert (Giles Atkinson, Professor of Environmental Policy at London School of Economics & Political Science). The scaled and unscaled triangulated WTP values generated by this approach are used within our investment optimiser tool as an input into our Cost Benefit Analysis of investment options and the unscaled values as part of the process of setting our ODI incentive rates;
3. Section 5: we review our customers' views on the contribution level they found acceptable for our social tariff, Assure.

There remain challenges associated with the use of stated preference surveys, mainly the sensitivity of the result to a range of factors. However, we have responded by making a significant investment to developing a major step-change in how we approach WTP studies and triangulation to mitigate these as far as possible given the. For example, we have:

- incorporated datasets from different times and regions and used revealed preference data sources such as customer complaints and satisfaction surveys; and
- used a co-creation approach with customers to develop our WTP survey questions and supporting stimulus material to overcome the challenges raised at PR14 that the surveys were unengaging and not understandable.

The following sections detail the outputs and learnings from our WTP studies and wider triangulation approach.

2. Customer engagement projects supporting our plans

The valuations customers place on service improvements are collated from the wide range of engagement activities we have carried out in preparation to support our business plan submission. Table 1 highlights the engagement activities that are relevant to this section.

It is important to note the following:

- unless otherwise stated, all our customer engagement covers both our supply regions (South Staffs and Cambridge) to allow a robust analysis of the insights;
- the vast majority of our engagement activity was independently carried out by our preferred agency partners and robustly challenged by our independent customer panel (CCG); and
- both waves of our WTP research and our triangulation approach and PR19 data triangulation study have been independently peer reviewed at the start and end of the projects; and
- studies marked with an asterisk (*) in the first column contain robust samples of hard to reach customers. This covers both customers who are experiencing financial and/or other hardships (i.e. vulnerable customers) and future customers who are not bill payers (the majority of these are aged between 18 and 25).

Please refer to the customer engagement journey appendices and the detailed reports provided by our preferred suppliers for full findings and details of the methodologies used.

Table 1: overview of customer engagement workstreams.

Engagement work stream	Headline methodology used to engage with customers	Insights collected	Appendix reference
Willingness to Pay Studies to understand customer priorities and preferences for service charges and investments across a range of 17 attributes*	Wave 1: six facilitated, reconvened focus groups with 53 customers to co-create a quantitative survey completed by 1,656 household customers and 343 business customers (covering all key demographic splits and weighted to regional demographics.) Study included a MaxDiff choice exercise to establish customer preferences for service improvements (without bill impact shown) followed by a Discrete Choice Exercise (DCE).	Aug - Nov 2017	A13 (and supporting documents)
	Wave 2: two facilitated focus groups with 18 customers to help further refine a quantitative survey completed by 719 household customers and 263 business customers (covering all key demographic splits and weighted to regional demographics.) Study included two Discrete Choice Exercises (DCE) and a package effect exercise to allow scaling factors to be determined.	Feb – May 2018	A14 (and supporting documents)
Engagement to understand how different groups of	Stage 1: online and telephone interviews with 805 household customers to understand the different views of customers based on their views	Nov 2017 to Mar 2018	A16 (and supporting documents)

customers respond to propositions around water efficiency and other retail services*	and attitudes to water and the wider world (Covering all key demographic splits and weighted to regional demographics.) Stage 2: six facilitated focus groups attended by 50 customers to explore in depth the differing views of the 5 segments identified in stage 1. Stage 3: online and telephone interviews with 420 household customers to understand responses to selected propositions, including social tariff contribution levels (Covering all key demographic splits and weighted to regional demographics.) Additional follow up quantitative survey of 1,079 household customers from an online survey run from our website to test reaction to service propositions. (Random, non-representative sample.)	Jan – Apr 2018	Insights provided where relevant
Customer service tracker to establish customer perceptions of our service performance	Quantitative telephone study covering 300 household and 100 business customers per year. (Household quotas based on age and SEG, in-line with demographics data for regions. Non-household quotas based on business size and industry sector, in-line with market profile.)	Apr 2017 – Mar 2018	A24
Daily customer contact data	Analysis of relevant customer contact data collected via customer call centre, engineer/field teams and other contact points.	2017/18 going back 3 years	Insights provided where relevant
PR19 data triangulation study	Developing a robust and proportionate evidence base for customers' WTP for service improvements. The report draws on • CCWater and ICF - Defining and applying 'triangulation' in the water sector; and • a range of external WTP studies from PR14 and PR19 complied by Accent/PJM - Comparative Review of PR19 WTP Results • other engagement studies run by the company, such as WRMP and Performance commitment engagement	Apr – Jun 2018 Jul 2017 June 2018	A25 (and supporting documents)

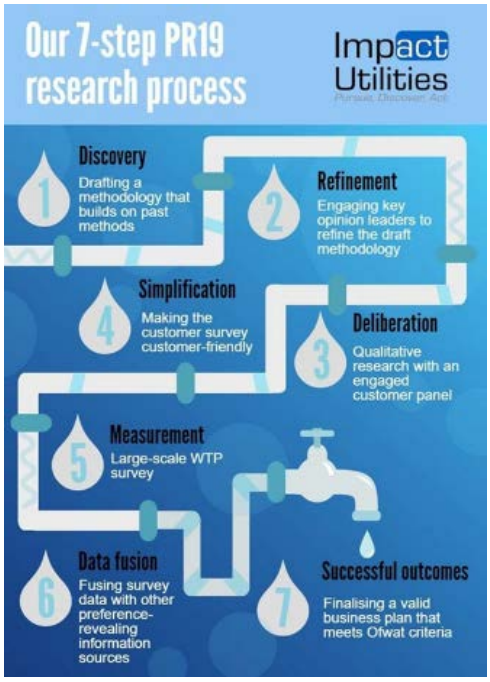
3. An improved approach to WTP research

3.1 Overview of our approach

We have used willingness to pay values to test the level of stretch and ambition our customers have placed on the areas that are most important to them. This has given us a really thorough understanding of the service improvements our customers want and are willing to pay for now and over the long-term. In order to achieve this we have carried out two robust waves of willingness to pay research among household (including robust samples of hard to reach customers) and business customers.

In October 2017, our preferred partner Impact Utilities completed a customer valuation research study for us among almost 2,000 household (over 400 hard to reach) and non-household customers. This is known as Wave 1. Please refer to the main report and associated peer review for full details and findings from this study. See appendix A13 and supporting documents.

Figure 2: Our 7 step WTP approach.



The study followed an innovative, seven step, customer-focused process (see figure 2) that incorporated multiple opportunities for engaging with customers through in-depth qualitative research as well as large scale quantitative research.

Customers were educated about how they can support the delivery of services and were directly involved in the development of a customer-friendly survey measurement tool. This has helped to ensure a thorough understanding of customers' attitudes and behaviours that feeds directly into our investment plans.

In order to support our 2019 price review (PR19) by better understanding some of the higher valuations generated in Wave 1, a 'follow-up' study was conducted by Impact Utilities in 2018.

This research, known as Wave 2, involved research among almost 1,000 household (255 hard to reach) and business customers. Both these large scale quantitative surveys assess customers' Willingness-to-Pay (WTP) for service improvements through Stated Preference (SP) choice experiments.

In Wave 2, a number of factors were sensitivity tested, such as the service attribute definitions and levels and a lower bill start point. We also added in a package choice exercise to allow us to scale the values obtained from the discrete choice experiments (DCE). Please refer to the main report and associated peer review for full details and findings from this study. See appendix A14 and supporting documents.

The independent customer panel provided extensive input and challenge at all stages of both waves of our willingness to pay research. They have been fully supportive of the 7-step approach and the level of investment made to ensure a more customer friendly survey than at PR14. They also extensively challenged the way we used the valuations in our Investment Optimiser (IO) tool.

The Wave 1 methodology statement was reviewed by Dr Ariel Bergmann, Economist, University of Dundee. The outputs of both waves were also independently reviewed by WTP expert Dr Paul Metcalfe of PJM Economics. See supporting documents:

- A13.1: SSC Peer Review WtP Research Methodology by Ariel Bergmann;
- A13.2: SSC WTP Peer Review Wave 1 by PJM; and
- A14.1: SSC WTP Peer Review Wave 2 by PJM.

We have responded to the points raised by our customer Panel and in the peer reviews and integrated these into the final technical reports for both waves of the research.

3.2 Overcoming the challenges from PR14 using a 7-step approach

Table 2 highlights how we have used a new 7-step approach that addresses the challenges raised about WTP surveys at PR14. See appendix A13.3 for the final project methodology statement we followed.

Table 2: Overcoming the challenges raised at PR14 around the use of WTP surveys.

PR14 challenges	Overcoming these in PR19
Hypothetical nature of Stated Preference exercise	Involving customers extensively in design of survey and service attributes for inclusion in the main survey. This was covered off through the use of qualitative reconvened focus groups and an extensive quantitative pilot study. This ensured that all materials were understandable, avoided jargon, and gave enough context to make the options understandable to customers (steps 3 and 4).
Unengaging customer survey	
Lack of customer comprehension	
Use of probability ratios	Piloting of four alternative approaches to measuring customer preferences to understand which customers preferred and which produced the most reliable results (step 4).
Limited engagement with some customer segments	Robust sample frame developed to ensure representation of all customer types, including hard to reach (step 5).
Results from WtP research reviewed in isolation	Review of a range of insight data sources (internal and external) with a specified approach to data triangulation (step 6). Further strengthened by our follow up triangulation approach in partnership with PJM/Accent.

Table 3 outlines the 7-step approach we have used for our Wave 1 WTP study. For full details of the learnings gained at each step of the approach please refer to the reports detailed in the 'Outcome' section of the table below.

Table 3: Summary of our 7-step WTP approach.

Step	Objective	Approach	Outcome
Step One: Discovery	Review previous PR14 methods,	Extensive desk research into our learnings of WTP at PR14 and full	A first draft of the formal methodology statement,

	build upon Ofwat's critique. Review SSC current business goals and challenges.	review of all engagement completed by SSC and relevant external reports to help inform the service areas to be tested in the survey.	also detailing the customer engagement plan for PR19.
Step Two: Refinement	To produce a comprehensive methodology statement which has been critiqued by independent bodies representing the customers of SSC.	Methodology statement sent to six external stakeholders for review and one SSC Executive team member. Stakeholders who took part in depth interviews included: • CCWater; • Environment Agency; • Citizens Advice; • RSPB; • Blueprint; and • CEPA. Peer review conducted by Dr Ariel Bergman, Lecturer in Energy Economics at the University of Dundee.	An adapted methodology statement which took into account the feedback on the approach given by the nominated organisations. For example, feedback included the need to ensure sufficient education for customers to understand unfamiliar concepts. For full details see supporting document: A13.3 South Staffs WTP PR19 Method Statement
Step Three: Deliberation	To gather qualitative insights to inform the design of a thorough and comprehensive survey that will maximise the quality of customer responses in the measurement step.	Six reconvened focus groups with representative groups of household and business customers and 10 depth interviews with hard to reach customers. This allowed a co-creation approach covering: • Group 1: Education to the water sector and detailed exploration of the attributes being tested • Group 2: Testing of different approaches to the SP exercises and the on-line survey design.	Recommendations made for changes to the survey which was now ready for piloting. Importantly, this step helped to ensure that the survey questions and supporting stimulus materials were understandable, avoided jargon and gave enough context to make the options understandable. For full details see supporting document: A13.4 SSC technique changes report
Step four: Simplification	To quantitatively test four stated preference survey approaches to identify the preferred approach.	A pilot stage of over 700 face-to-face and online interviews. Included the collection of detailed feedback gathered from interviewers and respondents on how they found the survey experience. Analysis run to test how the	A fully tested survey approach incorporating feedback from all earlier stages ready for main survey launch. For full details of the pilot approach see supporting documents: A13.5 SSC PR19 Pilot

		results performed in the analysis model being used to generate the WTP valuations. Reviewed by economic partner CEPA to ensure all key metrics are included.	Methodology Note
Step five: Measurement	To engage with customers from a wide range of relevant groups to identify and understand their willingness and ability to pay for different service and investment levels for water services for the five year period 2020-2025.	A large scale quantitative survey with 1,573 HH and NHH customers completed at this stage (pilot data included to achieve almost 2,000 completed interviews). Surveys predominantly conducted online allowing use of visuals, completion at convenient time. Face to face and recruit to online techniques used to reach hard to reach household and NHH customers.	Full report provided which detailed customers' priorities and willingness to pay for different service and investment levels for cost benefit analysis. For full details see supporting document: A13 - Willingness to pay - wave 1 - full report
Step six: Data triangulation	To provide further verification to survey results, with consideration given to a range of other sources, both internal and external.	Comparison of values generated with other data including: • SSC PR14 WTP results • Information published by other companies or Ofwat during PR14 • Publicly available information e.g. publications from the Environment Agency, Defra or Ofgem.	Increased confidence in customer valuations on their priorities and WTP for service investments to feed into our PR19 business plans. For full details see supporting documents: A13 - Willingness to pay - wave 1 - full report
Step seven: Successful outcomes	A set of WTP valuations that more accurately reflect customers' preferences.	Report writing and production of data table.	A full technical report and supporting s/sheet of WTP valuations. For full details see supporting documents: A13 - Willingness to pay - wave 1 - full report

Our Wave 2 study followed a similar approach and also drew widely on the key learnings from Wave 1. This helped inform key decisions over the approach and survey design. In particular, we have supplied the following supporting documents to reference the outputs of the Wave 2 approach:

- Discovery & refinement (steps 1 and 2): A14.2 - SSC WTP Wave 2 Method Statement;
- Refining the survey (step 3): A14.3 - SSC technique changes report - wave 2; and

- Simplification and measurement (steps 4 and 5): A14 - Willingness to pay - wave 2 - full report.

Following completion of these studies the WTP results and triangulation work undertaken by Impact were used as the inputs in our wider triangulation approach to produce a robust and proportionate evidence base for customers' (WTP) for service improvements. For more details refer to the main report appendix A25 and supporting peer reviews, A25.2 (methodology) and A25.3 (final report).

3.3 Developing a more robust WTP methodology

To ensure a robust approach to testing our customers' WTP we incorporated a number of different approaches into our Wave 1 qualitative and quantitative pilot testing to inform important decisions before the main survey was launched. This was particularly important to provide a high level of confidence that we have asked the questions put to customers in the right way using reliable, best practice approaches. A summary of these is detailed below:

- we tested a range of variations to the discrete choice exercise survey instrument to explore alternative approaches to that used in our PR14 survey (Eftec-ICS, 2013) to arrive at a better presentation and design from a customer perspective. In total, four alternative approaches were tested, with the 'Future Outcomes' approach indicated as being preferred overall by customers and the modelling work undertaken by Impact. This approach was taken forward to the main survey;
- unlike at PR14 we also incorporated a MaxDiff approach, which presented respondents with all 17 attributes, six at a time, and asks them to indicate which is the most important for investment and which is the lowest. (Bill impacts were not shown in the MaxDiff exercise). The pilot testing tested two approaches, one showing levels of service improvement from current performance and the other just current levels. The pilot analysis revealed that showing different levels of service improvements encourages respondents to consider the attributes in more depth and this approach was taken forward to the main survey;
- we tested five levels of service with customers (-S2) significant deterioration, (-S1) some deterioration, current (S0), some improvement (S1) and significant improvement (S2). Given the view from all our engagement that the vast majority of customers are not willing to accept any reduction in the levels of service, particularly for water quality and reliability of supply attributes, we tested levels S0, S1 and S2 in our main survey. For all 17 attributes we followed best practice by defining a stretching service package as our +2 level and then set the +1 level to lie somewhere approximately half way between base level and the stretch package. The level of stretch was greater for the vast majority of our attributes in our Wave 1 survey compared to Wave 2, so we could assess the impact of changes in service levels on customers' WTP for the improvement;
- we tested the differences by varying the context of how we asked the questions, so that for some respondents there is a public focus (i.e.' this affects 5% of households each year') and for others there is a personal focus (i.e. 'the chance of this happening to your property is 1 in 10 years'). We elected to test both approaches in the main survey to allow us to assess the impact on customers' responses;
- we tested showing incremental bill increases to some customers when presenting them with the options in the DCE and to others, incremental increases combined with statements about their total annual bill. The qualitative groups and pilot results showed that customers' preferred the latter way of presenting the bill impact. We took this approach forward to the main survey; and
- in the up-front qualitative groups we tested the number of attributes that customers said they could realistically trade off at one time. Four appeared to be the preferred limit for the

DCE. We tested this further in our pilot survey, where we split the attributes into three groups: water quality, reliability of supply and environment, with separate choice experiments designed for each group. We felt this was important part of our approach because studies show that survey participants cannot typically trade off more than six or so attributes at a time, so it is not best practice to include all of them into one exercise.

We believe that this robust approach to testing, refining and then testing again before launching the main survey has been an important part in ensuring a higher level of confidence in the outputs. In particular, the significant effort we put in up-front to co-create the survey with customers proved vital in delivering a survey that the majority of customers agreed was a good overall experience and allowed them to provide considered responses and express their preferences for paying for service investments.

We asked customers at the end of the on-line survey in both Waves of the study about their experiences of the survey and Table 4 shows the number of people who agreed with the statements provided. It is important to note that between 15% - 30% of people gave a neutral rating in Wave 1 and Wave 2.

The survey length attracted the most negative scores, but this was only from 13% of people in Wave 1. The scores for the Wave 2 noticeably improved when we removed the MaxDiff exercise and other questions to reduce the overall survey length.

In all areas we measured the agreement scores improved in Wave 2 compared to the original Wave 1 pilot as we built in improvements based on customers' feedback.

Table 4: Willingness to pay survey feedback - % agreement with statement

Engagement workstream	Wave 1 pilot	Wave 1	Wave 2	Typical comments
Overall survey experience was good	65%	74%	75%	"It was interesting to me. I found out information that I didn't know about."
Ability to express my true opinion	65%	70%	71%	"Easy to give my opinion and allowed me to say what I wanted."
Ease of survey completion	63%	73%	78%	"Easy to complete and help was available when needed."
Length of survey	50%	57%	64%	"Very long and complex." "Too long, too boring."

3.4 Overview of the main survey methodology

The questionnaire of the Wave 1 main surveys covered:

- household respondents being asked a range of up-front profiling questions around age, gender, background, socio-economic group and whether they or a member of their household were in need of any extra support;
- business respondents were also asked profiling questions about the sector, size of their organisation and whether it was water dependant;
- details about the respondent's property, whether they had a water meter and their current level of water bill;

- the level of contact with the company and whether they have experienced any service issues;
- the current level of satisfaction they had with their water company;
- how appealing they find a greywater water recycling system, using a contingency valuation approach;
- a MaxDiff SP exercise involving 17 attributes being shown in blocks of five, rotated over a number of screens (see example of figure 2). Improvement against current service levels were shown, but bill impacts were not provided at this stage;
- a DCE SP approach with customers shown blocks of four attributes from one of three distinct groupings (see table 5). Respondents were informed of the current level of service as part of the description of the attribute and then given two options to select their preference (see example in figure 3) with bill impacts to deliver the service improvements shown in £ for household (HH) customers and in % change terms for non-household customers (NHH). A number of the options showed no change from the current service level;
- revealed preference questions on the use of water softening devices and whether the respondent drink bottled water or not; and
- questions on how satisfied respondents were on various aspects of the survey.

Importantly, the attributes tested in our WTP Wave 1 study were identified through extensive engagement with customers about the areas that are most important to them in our earlier foundations research. These attributes are marked with a *. This list was further supplemented by an extensive review of the areas where we needed to determine customers' WTP for service improvements in specific areas to:

- help set our ODI rates;
- use as inputs in our Optimiser tool investment for scenario planning; and
- support the development of our WRMPs.

Table 5: 17 attributes tested in three blocks in the DCE of out WTP study

Attribute grouping	Attribute
Water quality	• taste and smell of your tap water* • discolouration of your tap water* • water not safe to drink* • lead pipes • water hardness
Secure and reliable supply	• unexpected temporary loss of water supply* • temporary use ban • drought restrictions* • low water pressure • traffic disruption • flooding from a burst pipe*
Commitment to the environment	• leakage levels* • water metering (HH only) • giving customers control of their water usage (HH only)* • protecting wildlife habitats* • managing impacts on rivers & streams* • use of renewable energy*

Figure 2: Example MaxDiff exercise screen shown to respondents in the Wave 1 on-line survey.

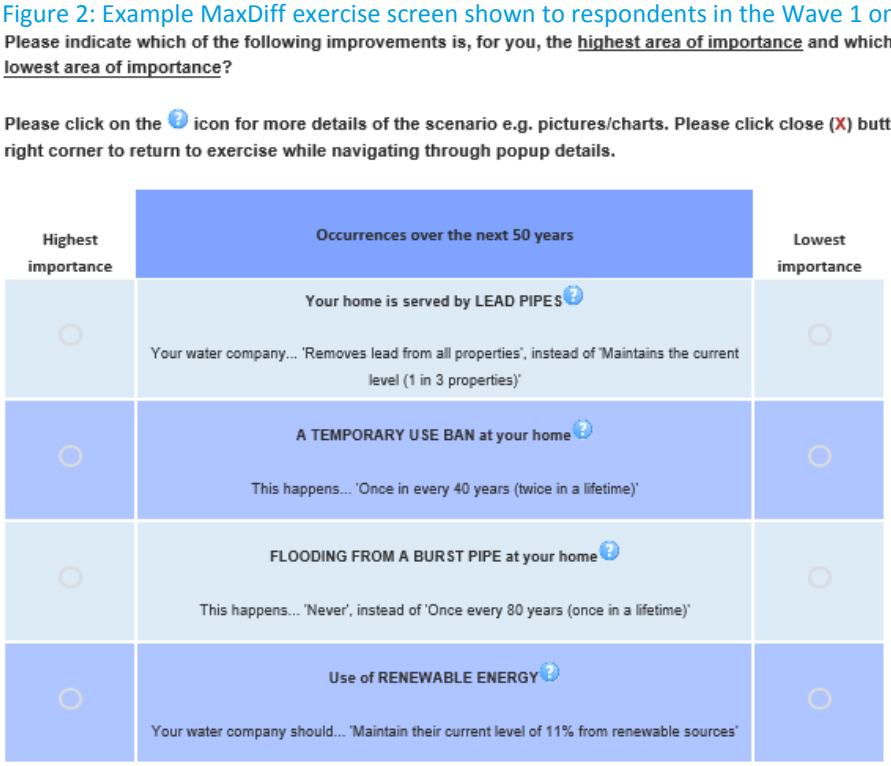


Figure 3: Example of a DCE screen shown in the Wave 1 on-line survey. An example of a supporting pop-up is also shown, which provided further visually engaging details and comparative information about the attribute to help people make their choices. These pop-ups appeared when the (?) icon was clicked.

3.5 WTP Wave 1 summary results

The sections below details the key findings from our WTP Wave 1 study. Please refer to appendix A13 for the full details of the study.

3.5.1 Customer satisfaction and contact

- Around 50% of customers in both waves claimed to have never needed to contact us within the last 5 years;
- Around 50% of customers in both waves claimed to have experienced an issue with their water service. The most regularly mentioned issues were:
    - South Staffs: water hardness, discolouration and low pressure (HH)
    - Cambridge: water hardness, billing queries and traffic disruption; and
- Overall customer satisfaction was high in both waves. The number of household customers rating their satisfaction at 8 or higher out of 10:
    - Household: 77% in Wave 1 and 78% in Wave 2; and
    - Business: 67% in Wave 1 and 80% in Wave 2.

3.5.2 Priorities for service improvement

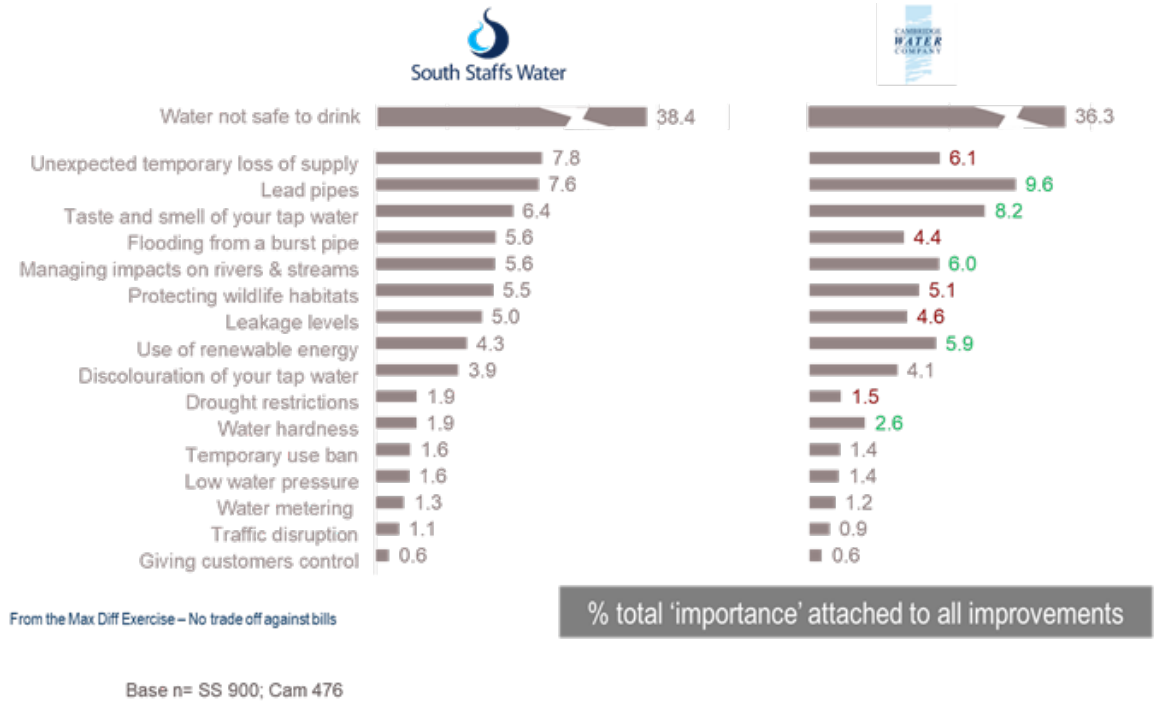
The MaxDiff exercise element of the survey required customers to initially indicate their choices of the highest and lowest priority among different sets of potential service improvements. These were shown five at a time from a total of 17 different service measures (15 for business customers). No bill impact information was given to customers during the MaxDiff exercise, as this exercise was to identify their priorities away from the impact on their bills. We do not know if people were considering potential costs in their heads when giving their responses.

Customers were given key information through interactive pop-ups to explain the service measures and also comparative data of our performance vs other companies in the industry, where appropriate. These materials were co-created in up-front qualitative groups with customers to ensure they were user friendly and clear as to what customers were commenting on. This steps helps gives us more confidence that customers where giving us considered responses.

Figure 4 shows an index summarising the relative priority given to each service improvement by household customers in the quantitative study, with the sum of the index equal to 100. Significant differences between our two supply regions are highlighted in green (higher in Cambridge) and red (higher in South Staffs).

‘Water not safe to drink’ stood out as the top priority in both regions, accounting for over a third of the total priority for improvement. This illustrates the often observed research outcome of a particularly severe event raising strong concerns for individuals, even though the likelihood of such an event is very low. This result, however, mirrored the findings from our foundation qualitative and quantitative priorities research confirming that it is a core “hygiene factor” for our customers.

Figure 4: Household customer priority index – MaxDiff exercise.



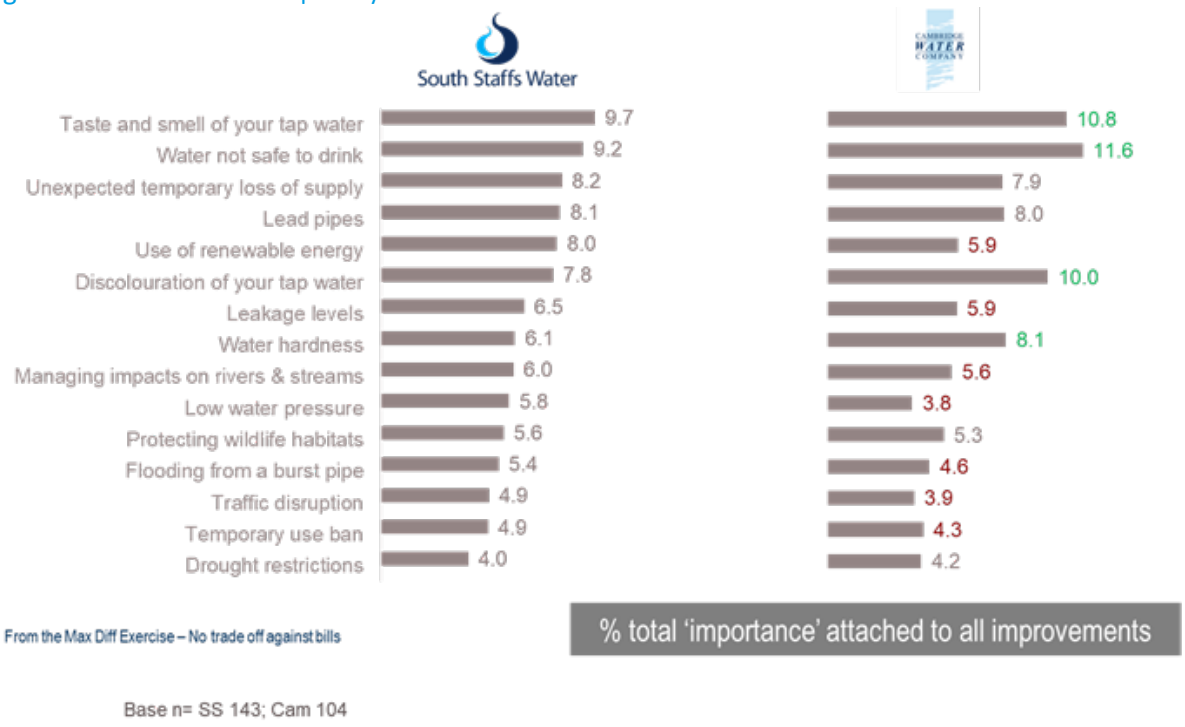
This was followed by 'loss of supply' 'taste & smell' and 'lead pipes', again highlighting the importance of water quality and secure, reliable supplies to customers. Lead pipes did not emerge as a priority from the initial foundation qualitative research, highlighting that it is often an 'out of sight' area for customers and that they do attach a higher level of importance to it when informed.

'Giving customers more control of their water supply through increased meter reads', 'water metering' and 'traffic disruption' rated as the "bottom 3" in both regions, highlighting that in this exercise they are not often perceived to be the top priority areas for service improvements.

Whilst chosen as a priority area for investment in all six of the up-front qualitative groups, 'Drought restrictions' only received a mid-ranked rating in the MaxDiff. Our conclusion for this is down to the fact that as the event happens so infrequently and does not cover the same level of immediate risk to health as 'water not safe to drink', so many customers do not view it as the top priority area.

In contrast, we found that business customers (working for companies of all sizes and industries) take a more balanced view, with water safety one of a range of top priorities. We have found throughout our engagement that business customers tend to have a more rounded view of priorities given their mind-set. This is shown in Figure 5.

Figure 5: Business customer priority index – MaxDiff exercise.



3.5.3 Willingness to Pay results

Figure 6 summarises the average increases in annual bills that HH customers are willing to pay for significant service improvements across the 17 attributes tested in the research. Water quality issues dominate, but 'water not safe to drink', which stood out in the initial order of priorities, now appears among a number of other priorities such as 'lead pipes' and 'water hardness'.

This suggests that when improvements are presented in the context of what it might cost to implement them, HH customers adopt a more balanced approach to assessing their priorities for investment.

It should be noted that adding all these separate values together is useful as a way to compare the relative investment priorities, but the overall values (i.e. £60 and £63) for implementing all the improvements are likely to be an over-estimate of the absolute willingness to pay (WTP). This is because each customer will have some 'budget' limit operating behind their WTP.

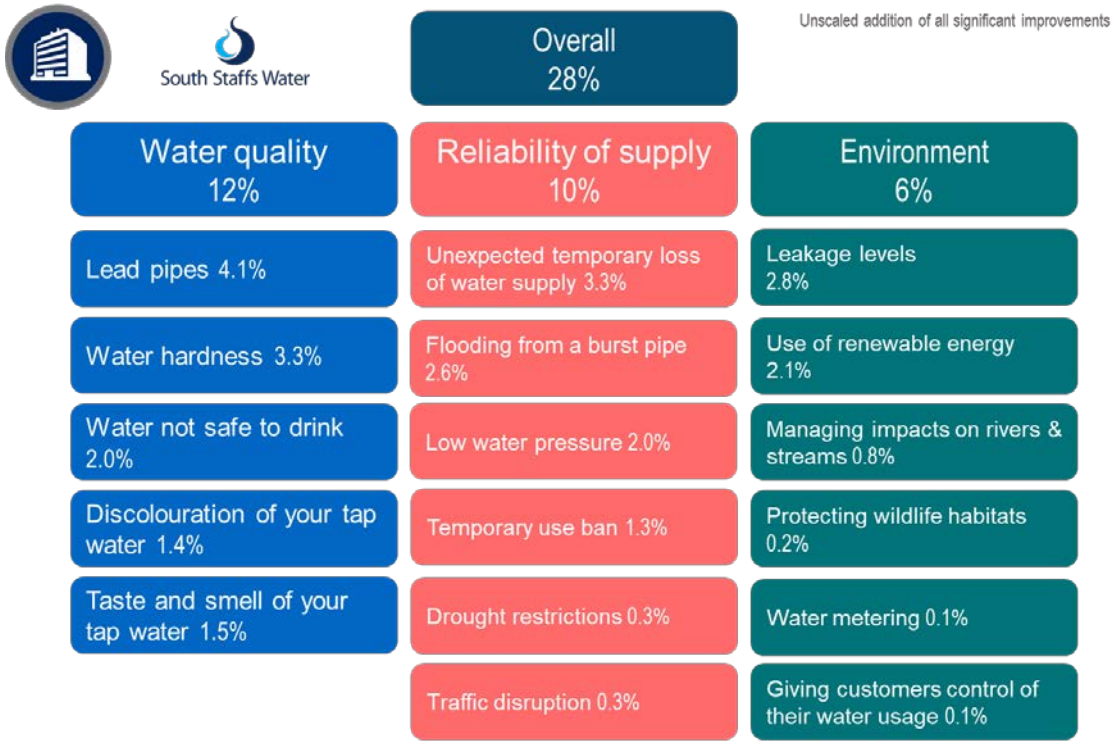
Survey respondents saw only four attributes at a time in any one trade-off scenario, and if confronted with all 17 attributes, may not have shown much higher willingness to pay overall[1]. For this reason we tested the package effects for a bundle of service improvements in Wave 2 of our WTP research.

[1] Research for SSW for the PR14 submission indicated a significant 'packaging effect' when all improvements were presented in one go to customers. This is an issue that can be explored in subsequent research planned by SSW in early 2018.

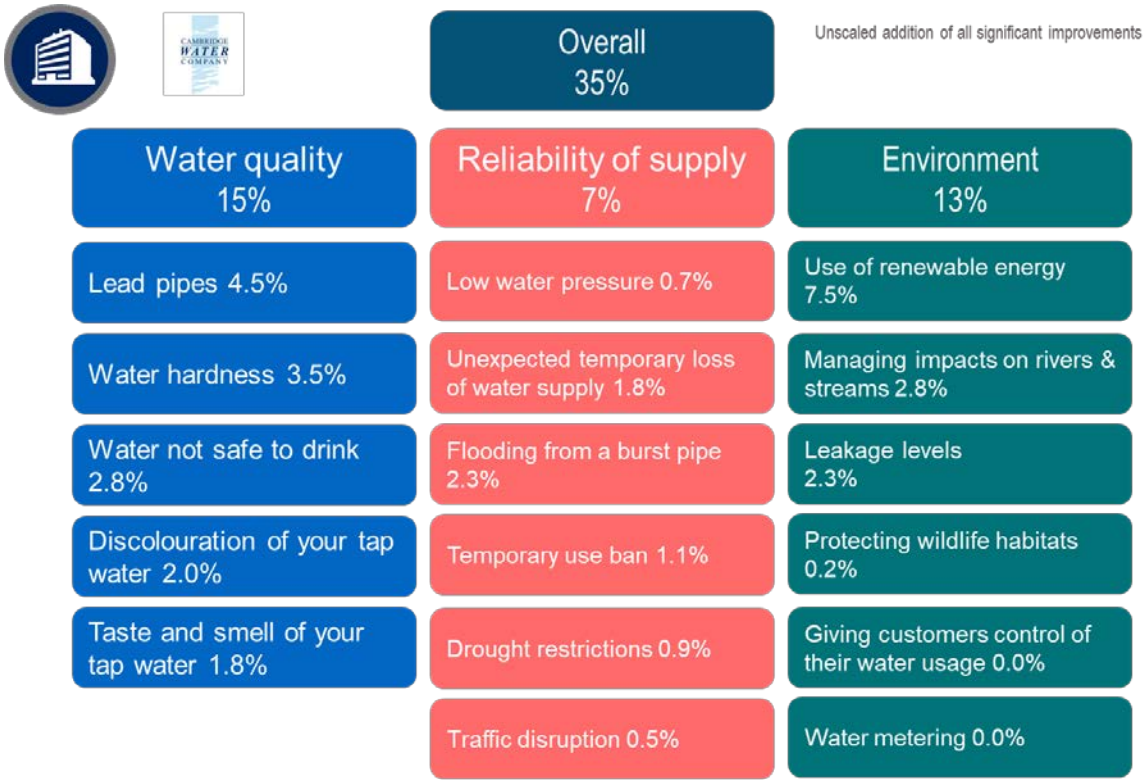
Figure 6: Maximum WTP values for South Staffs household customers

Figure 7 summarises WTP for NHH customers, where results are expressed as a percentage of the annual bill, in recognition of the wide range of bill values. The order is broadly similar to HH customers, although renewable energy among NHH customers in Cambridge attracts a noticeably higher valuation. We beileve this is driven by the higher level of enviromental awareness in Cambridge.

Figure7: Maximum WTP values for non-household customers



Base n= Total: 503, Quality: 168, Reliability of supply: 155, Environment: 180



Base n= Total: 106, Quality: 33, Reliability of supply: 32, Environment: 41

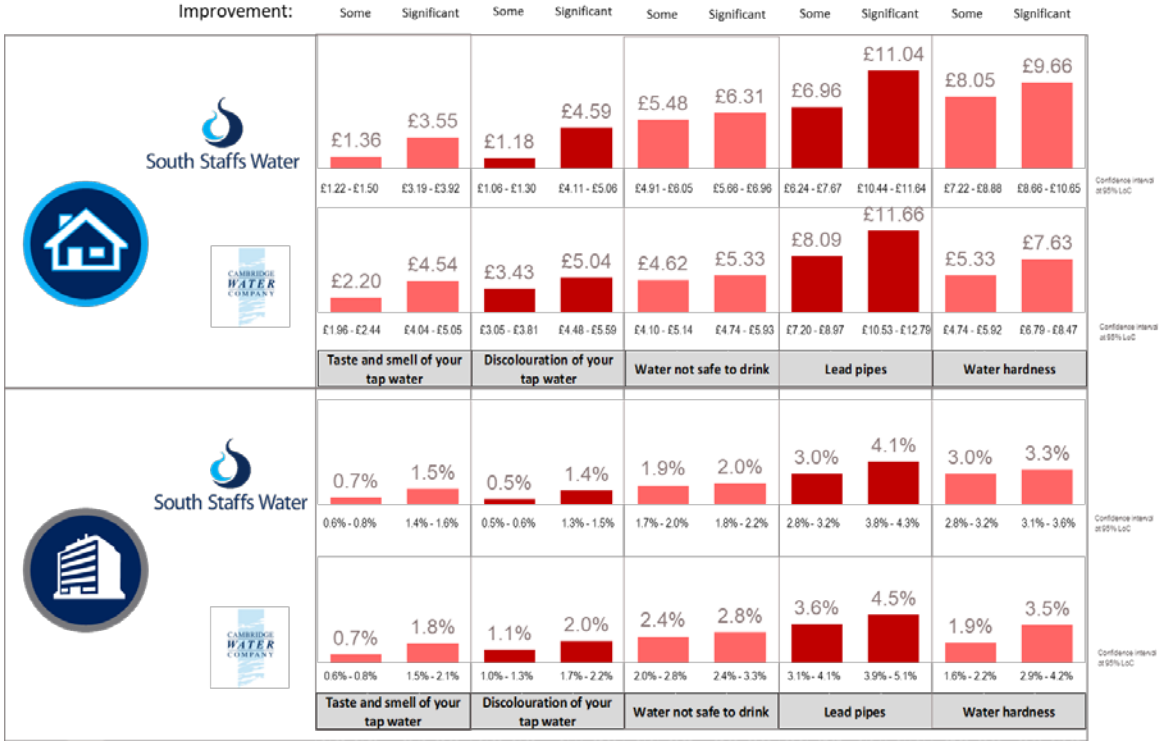
3.5.4 Levels of Improvement

Each attribute tested in the WTP research was presented in terms of two possible levels of improvement from the current level; 'some improvement' and 'significant improvement'. Figures 8 to 10 summarise the values for each of these levels, together with the 'confidence intervals' around the average values reported[2].

In these results we see some variation in the way the values progress across the different levels of improvement:

- some show that most of the value is achieved at the 'some improvement' level, such as water not safe to drink', water hardness' and flooding from a burst pipe'; and
- other attributes show a step-change when moving to the 'significant improvement' level, such as 'unexpected loss of water supply', likely driven by customers wanting to remove all risk of the event occurring.

Figure 8: WTP values for each level of Water Quality Improvement



The results in Figure 8 show in both regions that water quality comes out top for attracting the highest WTP valuations. Removal of water hardness and lead pipes come out top among both household and business customers. The potentially emotive wording used in the descriptions is likely to have help drive this higher WTP value. Water not safe to drink was ranked closely behind, showing that they want to avoid the situation of not being able to drink the water at their property due to a contamination. Avoiding discolouration and bad tasting or smelling water attract lower values, but higher than many of those for the environmental attributes tested.

[2] The confidence interval represents the range in which the actual value for the population is likely to fall, given that our findings are based on a sample. It suggests that if the study was repeated 100 times, in 95 of those studies the result would fall in the range indicated.

The WTP valuations showed that there were two particularly surprising results given the earlier engagement work. There were the high valuations received for lead pipes and water hardness. Due to our robust sample bases we were able to pull out differences among different customer segments to identify the differences.

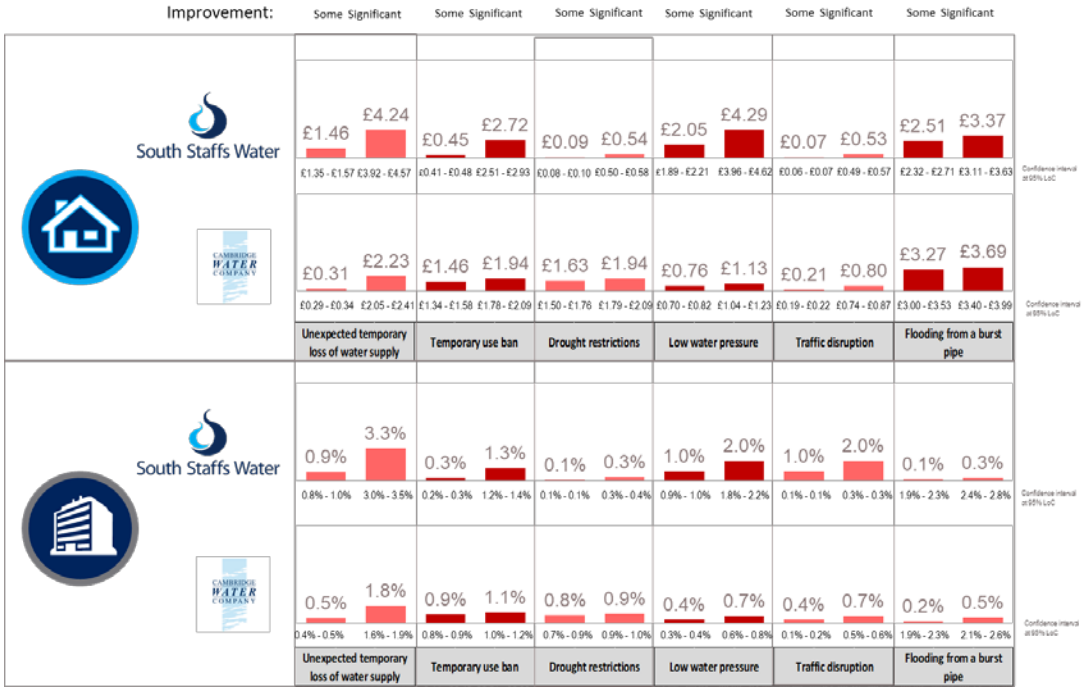
For water hardness we found that the high valuations were mainly being driven by customers who:

- are more affluent;
- already softening their water in the South Staffs region; and
- who are water reliant (business customers).

For lead pipes we found that the high valuations were mainly being driven by customers who:

- are more affluent; and
- have experienced an issue with their water quality in the past (Cambridge).

Figure 9: WTP values for each level of reliability of supply improvement



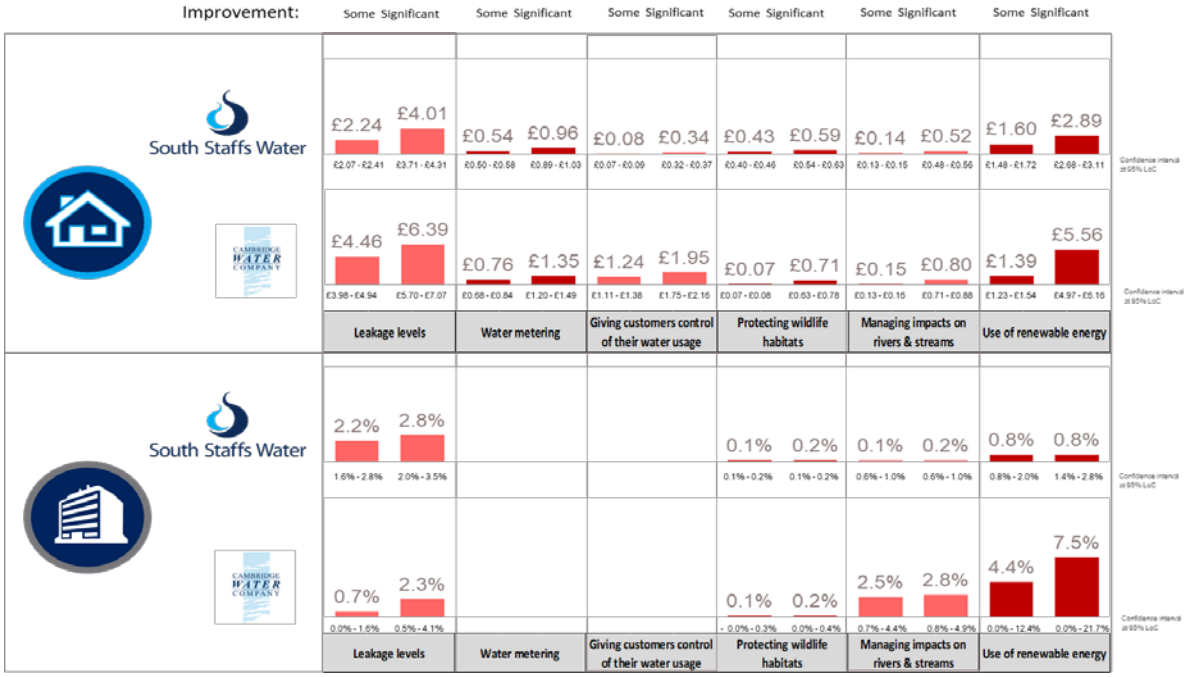
The results in Figure 9 for reliability of supply attributes show that one of the highest WTP valuations is given for avoiding an unexpected loss of supply, among both household and business customers. This reflects the high priority to avoid this situation that has been expressed throughout our engagement.

Low water pressure and flooding from a burst pipe, also attracted higher valuations among household customers. Business customers put a lower valuation on the ground floor of their place of work being flooded. This could be likely linked to the fact that people do not have to live at their place of work.

Reducing the risk of temporary use bans and severe drought restrictions from occurring attract lower valuations. The qualitative insights point to the fact that many customers are happy with the current levels of service offered because they have never experienced one and that they happen so infrequently.

Except for business customers in the South Staffs region, traffic disruption attracts the lowest valuation among household customers. This potentially suggests that people experience traffic works all the time and they part of life and so do not want to pay through their water bill to reduce the number. This was mentioned as a reason in our up-front qualitative groups.

Figure 10: WTP values for each level of environmental improvement



The results in Figure 10 for environmental attributes shows that, with the exception of Cambridge business customers, that leakage attracts the highest valuations. This makes it an overall higher ranked attribute where customers are more willing to pay for service improvements. This links closely to how emotive customers find the thought of losing large volumes of water through leaking pipes. A consistent theme throughout our engagement work.

Increasing the amount of renewable energy we buy to power our operations also attracted a high valuation, particularly among Cambridge business customers. The small group of larger business customers gave this attribute a particularly high valuation, suggesting they value this environmentally focused initiative more highly.

The other environmental attributes (metering, more meter readings, protecting habitats and rivers) all received much lower valuations relative to others, suggesting that many customers do not want to have their bills increased to improve on the initiatives we already have in place.

We have throughout observed that customers, as they did at PR14, place a higher WTP valuation on reducing the risk of an event occurring than they do for investing in improvements to that service. Our pilot study also showed that they place a higher WTP valuation to prevent a service from deteriorating than they do for further improvements. This is consistent with behavioural economics that people fear the loss of something, more than improvements to something they already have and that they perceive to already offer them a good service.

In addition, the high level of overall satisfaction given by customers is a key reason why we find that, depending on the service areas, between 65% – 85% of household customers are below the 'mean utility' for service improvements. Whilst utility values only represent the relative importance of each service improvement as a driver of preference, they do provide an indication of the degree of variation in the importance that customers attach to a particular service improvement. It is clear for

a number of reasons that many customers do not want their bill to go up as they consider the current service levels to meet their expectations. From reviewing the qualitative reasons behind customers' choices the majority relate to either:

- affordability issues around a bill increase; and
- not perceiving the value of a service improvement, as they have never experienced one before or perceive the risk of it occurring to be too low to justify paying to avoid it.

3.5.5 Public and private WTP valuation differences

When respondents were presented with alternative investment options in the WTP trade off exercise, half of them saw the choices expressed in terms of the impact on the region as a whole (e.g. 'number of households affected') and half saw them in terms of the impact it would have on them personally (e.g. 'you will experience this once over the next 20 years'). This gives a useful perspective when using the results for business planning, as customers who answer the questions in the context of being directly affected by an event can have a greater WTP for an improvement than those who are answering at a regional level.

All the values reported above are an average of these two alternative ways of presenting the investment options. When the results were split by public/private, the following was observed:

- water quality attributes, with the exception of 'taste and smell of your tap water' attract significantly higher WTP valuations in both regions when asked in a private context compared to public. This suggests that a notable number of customer are more concerned about the impacts of service failures to their property;
- low water pressure is the only reliability of supply attribute that attracts higher WTP figures in a public context in both regions; and
- for environmental attributes, Cambridge customers clearly feel that investment is more highly valued at a public level than private. In South Staffs there are no strong differences for public/private. This reflects the common theme throughout our engagement of more Cambridge customers putting more emphasis on these areas as a priority.

3.5.6 Vulnerable Customers

When comparing the results for different social groups, we find that customers who are experiencing difficulties (such as a financial, a mental/physical impairment or temporary vulnerability) show a higher WTP than other customer groups when valuing reliability of supply attributes.

The observation that vulnerable customers attach higher WTP values for reliability of supply attributes is consistent with the insights from our in-depth hard to reach engagement (see appendix A15, section 3). This highlights how disruptions to their water supply can significantly impact on their lives.

3.5.7 Regional WTP valuation differences

At our customer Panel's request we have also looked at regional differences between our customers' WTP for service improvements. This analysis has given us insights to better shape our plans to meet the needs of our two distinct customer bases. There are significant differences between the two areas, which remain even when regional demographic differences are accounted for:

- South Staffs customers value service improvement more highly for:

    - avoiding low water pressure;
    - having safe drinking water;
    - unexpected temporary loss of water supply; and
    - water hardness.
- Cambridge customers value service improvement more highly for:
    - avoiding drought restrictions;
    - leakage levels;
    - giving customers control of their water usage (through increased meter reads);
    - flooding from a burst pipe; and
    - traffic disruption.

Interestingly we found that when the regional demographics were then overlaid that the differences in the values grew even wider. These regional differences are useful insights to help support decisions. For example:

- to make the significant investment in our two main Water Treatment works in our South Staffs region to improve water quality; and
- to first move towards a position to give customers more meter readings and control over their water usage to help reduce demand in our Cambridge region (such as our WaterSmart trial).

Importantly, we used our regional triangulated WTP values in our Investment Optimiser tool to assess the impact they had. These differences also closely mirror those we have observed in our early engagement work to understand customer priorities. We can conclude that:

- Cambridge customers give greater weight to supply and demand issues like leakage and metering. This logically flows through given that Cambridge customers are living in a more 'water stretched' region and have demonstrated a greater emphasis a total level for environmental protection and reducing leakage throughout all our engagement; and
- South Staffs customers are more likely to want greater improvements to the water quality and reliability of supply. This is likely down to a combination of factors, such as there being more water quality failures in our South Staffs region and a higher number of vulnerable customers who prioritise water supply failures above other areas.

3.5.8 Initial Priorities v WTP

Leading on from this, figure 11 compares the relative orders of priority observed in the initial measurement exercise without bills (Max Diff) and the subsequent WTP exercise with bills (Discrete Choice Exercises). Each item is standardised so that the most valued has a score of 1.0 and for the WTP values, the significant improvement level is used.

This suggests broad agreement between the initial priorities and the WTP values, with the notable exception of 'water not safe to drink' among HH customers. For NHH customers, 'use of renewable energy' takes on more importance for WTP - this is driven primarily by customers in the Cambridge area.

Figure 11: Comparison of Max Diff and WTP Priorities

3.5.9 Reaction to greywater harvesting

In the survey customers where shown a diagram of a greywater harvesting system that can be installed at an individual property level, with supporting text to explain how it worked in practice. They were then asked for their level of interest in having the system fitted at their property and given a number of price points to test their WTP for this service.

Because grey water system is a new concept and not directly in the same category as general service improvements, customers' potential willingness to pay was tested separately using contingency valuation. Using the 'Turnbull non-parametric' method, the data produces a total investment pot of £3.7m a year to run a potential service offering to customers wanting to install a full greywater system at their home.

We have also carried out further follow-up engagement among a range of customers in our segmentation research (see appendix A16, section 2) on their likelihood to take up a greywater harvesting scheme, as per the same type tested in our WTP Wave 1 study. This revealed that:

- with no costs being shown, that 58% of our customers would be interested in installing this type of system at their property; but
- this figure fell to 18% once a price point of £5,000 was introduced. Assuming a rule of thumb that likelihood to take up a proposition is equal to, 80% of these saying very likely and 20% of those saying fairly likely, then less than 5% of our customer base would be interested in installing this type of solution.

Whilst customers are mainly positive about the need for increased water recycling, particularly once informed about challenges we face, there were a number of concerns they had about installing a full greywater system at their property. On top of this there were 29% of customers who said that the system would not be open to them as they live in rented or social housing as so the decision. Among those who owned their own properties the main areas of concern were:

- the hassle and difficulty of installation (main reason)
- the amount of space it would take up at the property; and

- concerns over on-going maintenance of the system and safety of the water.

Because of the valuations and these wider reasons from our engagement work it showed us that the best approach, at this time, is to incentivise developers to install water recycling schemes at a development level. A good example of this is the North West Cambridge development in our Cambridge region, which has the largest greywater scheme in the Northern Hemisphere.

3.6 WTP Wave 2 summary results

3.6.1 Overview of wave 2

The main survey approach for Wave 2 followed a similar approach to Wave 1, but the following changes were made to allow sensitivity testing of the WTP values:

- the up-front Grey water recycling questions were removed;
- the MaxDiff exercise was removed;
- each participant saw two choice experiment exercises rather than just the one, plus a package choice question. The second choice experiment contained a new set of attributes focused on retail attributes, while the first focused on one of the three groups of attributes also included in the Wave 1 survey:
    - within the three groups of attributes carried forward from Wave 1 to Wave 2, three individual attributes were excluded from Wave 2: drought restrictions, giving customers control of their water usage and traffic disruption; and
    - the new retail attributes added were: investing in community projects, educating future generations and supporting customers experiencing difficult situations.
- for the attributes that were carried forward from Wave 1 to Wave 2, all attributes were worded with a public orientation rather than a split sample between a public and private content;
- a number of changes were made to the attribute wordings:
    - water not safe to drink: duration of incident increased from 2 to 3 weeks;
    - lead pipes: altered from no health risk to almost none;
    - water hardness: definition altered to state that hardness is good for health;
    - unexpected temporary loss of water supply: duration of incident changed from ‘up to 24 hours’ to ‘1-5 hours’ or ‘6-11 hours;
    - protecting of wildlife habitats: information was added about the amount of land currently being managed in comparison to the total area; and
    - managing impacts on rivers and streams: a more detailed and descriptive description shown in Wave 2 focused on preventing pollution of water sources from run-off.
- in addition to these wording changes, we made changes to the service levels shown for most of the attributes. In most cases, the changes involved reducing the scope of improvement shown quite substantially. In particular, for the following attributes the ‘S2’ substantial improvement in Wave 1 was set equal to zero whereas the Wave 2 S2 level was greater than zero:
    - water not safe to drink;
    - discoloured water;
    - taste and smell of water;
    - lead pipes;
    - unexpected temporary loss of water supply;
    - temporary use ban;

    - low water pressure; and
    - flooding from a burst pipe.
- finally, a split-design was created, for households only, whereby one group saw a version with a lower bill presented as the starting point (the 'low bill' scenario). All other households, and all non-households (NHH) were shown a scenario where the starting point was equal to the current bill level (the 'current bill' scenario).

Before launching the main survey in Wave 2 we carried out:

- two facilitated focus groups in the South Staffs region with household customers and business customers who attended the groups in 2017 as part of Wave 1. Here we asked for their feedback on the results of Wave 1 and asked them to help us further refine the wording of the attributes and their associated levels we were planning to re-test and also the new retail attributes being added. We then asked them about the best way to present the lower bill starting point (more details can be found in the supporting document appendix A14.3); and
- conducted a small scale pilot study to test how customers responded to the changes made. A series of changes were made before the main survey launch as a result of customer feedback and challenge from our independent customer panel. This particularly focused on the stimulus material shown to customers before the DCE around how the bill change was presented, including the impact of inflation on this. This led to improvements to help ensure it was clear and customers' understood how their bill could change if improvements to service were made.

3.6.2 Willingness to Pay results

Following completion of the Wave 2 main survey, our preferred partners Impact provided an analysis of the results of Wave 1 and Wave 2 to allow comparisons to be made. The main observations from this analysis are:

- the WTP values that relate directly to the improvements shown in the trade-off exercises are almost all significantly lower than in wave 1, reflecting the lower levels of service improvement shown;
- 'metering' and 'managing rivers and streams' are exceptions, with higher values for both among HH customers in South Staffs. We discuss the reasons for this in more detail in below;
- water hardness and discolouration of water continue to attract some of the highest WTP valuations, showing consistency in how highly customers value high-quality drinking water; and
- the new retail attributes attracted relatively low valuations, except for 'supporting customers experiencing difficult situations'. We have found throughout our engagement that supporting vulnerable customers has emerged as an important priority.

Due to the small base sizes for Cambridge business customers, we have placed a high level of caution on the results and used them only as a sensitivity checkpoint in our WTP triangulation study (detailed in section 4).

Table 6 details the 'public' WTP unit valuations of the Wave 1 and Wave 2 studies to allow a comparison.

Table 6: Comparison of WTP figures from Wave 1 and Wave 2 by region. (Wave 1 = Public Values only)

COMPARISON OF WTP VALUES FROM SP EXERCISES	SST								CAM							
	HH				NHH				HH				NHH			
	Wave 2		Wave 1		Wave 2		Wave 1		Wave 2		Wave 1		Wave 2		Wave 1	
	S1	*S2*	*S1*	*S2*	*S1*	*S2*	*S1*	*S2*	*S1*	*S2*	*S1*	*S2*	*S1*	*S2*	*S1*	*S2*
Water not safe to drink	£0.89	**£1.11**	**£3.34**	£4.18	0.02%	**0.09%**	**1.21%**	1.35%	£1.05	**£2.46**	**£2.22**	£2.97	0.10%	**0.17%**	**0.89%**	1.23%
Discolouration of your tap water	£3.37	**£3.97**	**£0.93**	£3.26	1.94%	**1.99%**	**0.54%**	1.65%	£3.12	**£4.46**	**£3.51**	£4.57	5.64%	**5.66%**	**0.76%**	1.04%
Taste and smell of your tap water	£0.31	**£0.49**	**£1.23**	£2.94	0.37%	**0.37%**	**0.77%**	1.20%	£0.05	**£0.17**	**£2.36**	£5.28	4.26%	**5.35%**	**0.46%**	0.73%
Lead pipes	£2.13	**£3.51**	£5.78	£9.02	0.41%	**0.74%**	2.78%	3.69%	£0.43	**£0.64**	£6.30	£8.95	5.02%	**5.39%**	1.73%	2.17%
Water hardness	£5.29	**£5.90**	£5.45	£6.53	0.42%	**0.47%**	3.03%	3.50%	£2.64	**£3.15**	£4.39	£6.05	5.90%	**5.94%**	1.08%	1.61%
Unexpected temporary loss of water supply	£0.40	**£0.94**	**£1.24**	£4.71	0.02%	**0.06%**	**0.79%**	2.35%	£0.05	**£0.39**	**£0.39**	£2.77	0.03%	**0.03%**	**0.27%**	1.77%
Temporary use ban	£0.41	**£0.69**	**£0.38**	£2.39	0.10%	**0.17%**	**0.08%**	0.80%	£0.16	**£0.21**	**£1.44**	£1.99	0.14%	**0.25%**	**0.86%**	1.10%
Low water pressure	£0.78	**£1.15**	**£2.20**	£4.51	0.01%	**0.05%**	**0.73%**	1.68%	£2.14	**£2.98**	**£0.92**	£1.31	0.00%	**0.48%**	**0.31%**	0.53%
Flooding from a burst pipe	£1.43	**£1.63**	**£2.11**	£2.92	0.33%	**0.40%**	**0.82%**	1.42%	£1.31	**£1.83**	**£2.75**	£3.12	0.00%	**0.06%**	**2.98%**	3.31%
Leakage SST	£1.23	**£1.67**	**£2.00**	£3.80	1.84%	**2.51%**	**0.49%**	1.08%								
Leakage CAM									£3.13	£3.14	**£7.22**	£10.31	7.2%	10.69%	**0.22%**	1.40%
Metering	£3.98	**£4.50**	£0.58	£1.01			0.00%	0.07%	£1.44	**£2.35**	£1.21	£2.16			0.00%	0.00%
Use of renewable energy (proportion of power use)	£0.81	**£1.66**	£1.51	£2.91	1.21%	**1.60%**	2.21%	2.35%	£0.01	**£0.13**	£2.18	£10.49	0.02%	**0.30%**	0.65%	0.66%
Protecting wildlife habitats	£0.31	**£0.44**	£0.42	£0.57	0.04%	**0.18%**	0.11%	0.16%	£0.17	**£0.19**	£0.09	£1.13	1.50%	**2.03%**	0.06%	0.07%
Restoring rivers and streams and the land around them	£1.60	**£2.62**	£0.16	£0.51	0.05%	**0.77%**	0.75%	0.75%	£0.89	**£1.34**	£0.19	£1.45	7.02%	**7.03%**	2.55%	2.55%
Traffic disruption			£0.06	£0.52			0.11%	0.23%			£0.21	£0.72			0.26%	0.79%
Investing in community projects	£0.29	£1.44			0.33%	0.51%			£0.05	£0.39			0.15%	0.16%		
Educating future generations	£0.17	£0.24			0.29%	0.34%			£0.01	£0.25			0.00%	0.83%		
Supporting customers experiencing difficult situations	£1.21	£2.26			1.74%	2.69%			£0.37	£1.49			2.55%	2.56%		

Wave 2, level 2 levels are compared against the most relevant Wave 1 public levels and if the difference is significant at 95% level of confidence, the number is highlighted in red. In most cases wave 2, level 2 is compared with wave 1, level 1, except for lead pipes, water hardness, metering, renewable energy, protecting habitats and protecting rivers and streams. Figures in Wave 2 are only those who saw the current bill starting point as per the Wave 1 approach.

Table 7 details the public WTP 'unit' values for Wave 1 and Wave 2. These have been normalised to reflect the number of properties affected and the scope of the service level improvement shown to customers in the DCE.

Table 7: Unit values, Wave 2 v Wave 1: All Wave 1 levels are 'Public' level S1 (mid level)

		South Staffordshire				Cambridge				Total			
		HH		NHH		HH		NHH		HH		NHH	
Measure	Unit	Wave 2	Wave 1	Wave 2	Wave 1	Wave 2	Wave 1	Wave 2	Wave 1	Wave 2	Wave 1	Wave 2	Wave 1
Water not safe to drink	per prop affected	£250	£752	£57	£807	£548	£495	£146	£777	£308	£703	£76	£800
Discolouration of your tap water	per prop affected	£140	£28	£207	£48	£606	£305	£3,004	£277	£229	£81	£802	£97
Taste and smell of your tap water	per prop affected	£83	£171	£185	£68	£37	£205	£4,537	£165	£74	£178	£1,111	£89
Lead pipes	per prop affected	£24.65	£32.48	£15.46	£46.37	£4.48	£35.14	£146.89	£37.74	£20.78	£32.99	£43.42	£44.53
Water hardness	per prop affected	£5.53	£12.23	£1.30	£19.44	£2.93	£11.24	£21.57	£11.70	£5.03	£12.04	£5.61	£17.79
Unexpected temporary loss of water supply	per prop affected	£184	£160	£43	£306	£43	£28	£12	£83	£157	£135	£37	£259
Temporary use ban	per 1% risk change	£396,645	£254,004	£326,771	£150,337	£16,195	£453,525	£190,218	£1,060,712	£323,674	£292,272	£297,717	£344,034
Low pressure	per prop affected	£45	£41	£6	£40	£171	£18	£108	£24	£73	£36	£27	£36
Flooding from a burst pipe	per prop affected	£366	£474	£270	£547	£408	£612	£55	£2,597	£374	£501	£224	£983
Leakage	per Ml/d reduction	£26,174	£31,355	£116,342	£33,359	£60,941	£140,165	£810,506	£70,980	£32,843	£52,225	£264,036	£128,948
Metering	per new metered prop	£26.49	£1.82		£0.00	£9.42	£12.06		£0.00	£23.22	£3.78	£0.00	£0.00
Use of renewable energy (proportion of power use)	per 1% increase	£130,680	£43,735	£373,030	£190,761	£2,472	£15,021	£21,830	£17,531	£106,089	£38,228	£298,307	£153,903
Protecting wildlife habitats	per additional hectare	£4,904	£12,238	£5,979	£9,419	£2,728	£2,011	£115,707	£5,457	£4,486	£10,277	£29,325	£8,576
Restoring rivers and streams and the land around them	per additional hectare	£7,224	£579	£6,299	£8,204	£1,749	£492	£35,976	£26,115	£6,174	£562	£12,613	£12,015
Traffic disruption	per roadwork	-	£752	-	£807	-	£495	-	£777	-	£703	-	£800
Investing in community projects	per person-day	£5,301	-	£5,522	-	£511	-	£830	-	£4,382	-	£4,523	-
Educating future generations	per 1% of schools visited	£10,027	-	£41,218	-	£2,410	-	£31,736	-	£8,566	-	£39,201	-
Supporting customers experiencing difficult situations	per property affected	£227	-	£238	-	£558	-	£263	-	£290	-	£243	-

Given all the changes made between the two waves of the study, it has been problematic to accurately assess the impact each has had on the Wave 2 results. We have outlined in table 8 the main reasons for the differences due to the change in the methodology to the Wave 2 survey, to assess what level of impact they might have had on customers' valuations.

Table 8: Review of differences between Wave 1 and Wave 2 WTP values

Proposed Reason	Comment	Impact on Wave 2 values
Changes in the levels and in particularly the fact that wave 2 has no 'never occurs' levels	Although some customers are sceptical that we could ever get to zero (evidence from the ECP groups) this was not expressed at any stage in the survey and indeed a number of customers expressed the view that they would highly value the complete removal of lead or the elimination of all supply interruptions.	Very likely
Changes in the attribute wordings	From the ECP groups we picked up that using particular words such as 'children' in the lead pipes description can be emotive to some customers and potential influence their views.	Likely
No MaxDiff exercise preceded the Discrete Choice exercises	The completion of the Max Diff in wave 1 may have made customers think more about the value of these improvements to them; the Wave 1 pilot suggested that those who went straight into the choice exercises from the MaxDiff produced more consistent (better fitting) models – i.e. they appeared to have a clearer idea of what they were choosing.	Likely
In wave 2, respondents completed two DCEs (choice exercises); they completed only one in wave 1	The design covering 'Retail' attributes was always the second DCE, so in that sense the two waves were the same for the three other attribute groups – that is, any fatigue or other effect would not apply.	Unlikely
No greywater question was included	This would have little influence on the results as it was shown earlier in the questionnaire in Wave 1 and asked using a different approach.	Unlikely

In Table 9 we further assess the potential differences for each attribute between Wave 1 and Wave 2 in more detail. However, we believe that it would require significantly larger WTP studies, beyond our resources, to truly say with a very high degree of confidence which changes are the cause of the differing customer valuations we have found. We have ignored the Wave 2 Cambridge NHH results, due to the lower sample bases.

Table 9: Review of differences between Wave 1 and Wave 2 WTP values

Attribute	Comments on changes between Wave 1 and Wave 2	
	WTP values - table 6	WTP Unit values - table 7
Water not safe to drink	Wave 1 results significantly higher (except CAM NHH), despite in Wave 2 increasing the length of time (2 to 3 weeks) the contamination would mean that customers would have no access to drinking water at their property. We	Wave 1 values are higher (except Cambridge HH). We can conclude from this that the majority of customers are expressing a strong view to removing this scenario from ever happening as they were shown a

	can conclude that customers value larger improvements to the service level more highly.	'never occurs' option in Wave 1.*
Discolouration of your tap water	Wave 2 results significantly higher than Wave 1. However, we would expect Wave 1 to be higher due to showing customers a 'never occurs' scenario. We can conclude that customers may be expressing the view that they do not see the benefit of paying more to remove the last trace of risk for discolouration occurring at their property.	Wave 2 values are higher. Most likely driven by fact that the change in service improvement shown was lower, as no other changes were made to the attribute between waves.**
Taste and smell of your tap water	Wave 1 results significantly higher (except CAM NHH). We can conclude that customers, particularly household, value larger improvements to the service level more highly.	Wave 1 values are higher (except among NHH). For household customers we can conclude from this that customers were expressing a strong view to removing this scenario from happening as they were shown a 'never occurs' option in Wave 1.* For NHH customers the higher Wave 2 figures are most likely driven by fact that the change in service improvement shown was lower, as no other changes were made to the attribute between waves.**
Lead pipes	Wave 1 results are significantly higher (except CAM NHH) by some distance. We can conclude that customers value larger improvements to the service level more highly. Also, the removal of the word children from the level description is also likely to have been a factor in the large fall in the valuations in Wave 2.	Wave 1 values are higher (except among CAM NHH). We can conclude from this that customers were expressing a strong view to removing this scenario from happening as they were shown a 'never occurs' option in Wave 1.*
Water hardness	Wave 1 results are slightly higher than Wave 2 (except CAM NHH) but not significantly. The removal of the word damage from the level description and adding that hard water provides health benefits in the attribute description are also likely to have been a factor in the fall in the valuations.	Wave 1 values are higher (except among CAM NHH). We can conclude from this that customers were expressing a strong view to removing this scenario from happening as they were shown a 'soften the whole supply' option in Wave 1.*
Unexpected loss of water supply	Wave 1 results significantly higher for all customer groups. We can conclude that customers value larger	Wave 1 values are higher (except among CAM NHH). We can conclude from this that customers were

	improvements to the service level more highly. Altering the length of time of the supply interruption in Wave 2 made no difference to the valuation. This suggests that many customers' are expressing a view that are prepared to pay to remove the risk of any length of supply interruption from occurring.	expressing a strong view to removing this scenario from happening as they were shown a 'never occurs' option in Wave 1.*
Temporary use ban	Wave 1 results significantly higher for customers in the South Staffs region (slightly higher in Cambridge). We can conclude that customers value larger improvements to the service level more highly.	For Cambridge customers, where Wave 1 values are higher, we can conclude from this that customers were expressing a strong view to removing this scenario from happening as they were shown a 'never occurs' option in Wave 1.* This is not the case for South Staffs customers where the higher Wave 2 values are most likely driven by fact that the change in service improvement shown was lower, as no other changes were made to the attribute between waves.** We can conclude that Cambridge customers value service improvements more in this area.
Low water pressure	Wave 1 results lower among Cambridge household customer (but not significantly). This is unexpected as lower levels of service improvement were shown in Wave 2. This suggests that customers are expressing a general preference for reducing the chance of having low water pressure, but that there is no obvious link between the service level change and the amount they are prepared to pay. Wave 1 results significantly higher in the South Staffs region among both household and business customers. This shows that customers value a greater level of service improvement more in this region.	Wave 2 values are higher (except SSW NHH). Most likely driven by fact that the change in service improvement shown was lower, as no other changes were made to the attribute between waves.**
Flooding from a burst pipe	Wave 1 results significantly higher than Wave 2. We can conclude that customers value larger improvements to the service level more highly.	Wave 1 values are higher (except among CAM NHH). We can conclude from this that customers were expressing a strong view to removing this scenario from happening as they

		were shown a 'never occurs' option in Wave 1.*
Leakage	There are no significant differences between Waves, but Wave 1 values are higher among household customers. We can conclude that customers value larger improvements to the service level more highly. This is particularly true in Cambridge where the differences between values are much larger than for South Staffs. For NHH customers the Wave 2 values are higher, which suggests that these customers are potentially valuing leakage more highly over time. The impact of the Beast from the East (which occurred just before the fieldwork) and other negative media stories around leakage may have influenced the results between waves.	Wave 2 values are higher among NHH customers. Most likely driven by fact that the values are higher and the change in service improvement shown was lower, as no other changes were made to the attribute between waves.** We would expect the Wave 2 values for household customers to be higher, but Wave 1 are higher. This could suggest that customers are valuing leakage more over time, or that they are expressing a more general wish for service improvements and there is no obvious link between the service level change and the amount they are prepared to pay.
Metering	Wave 2 results significantly higher than Wave 1 among household customers, even with lower levels of improvement shown. We believe one potential reason for the large shift in the values is driven by the fact that during the period between the two Waves that the energy/gas companies were heavily promoting metering and so this raised the level of preference for this option in customers' minds. The change in values is significantly higher in the South Staffs region, potentially also driven by the significantly lower metering rate shown to customers. However, the large increase is hard to fully explain.	The higher value in Wave 2 in the South Staffs, is therefore more likely driven by fact that the change in service improvement shown was lower as no other changes were made.** The higher value in Wave 1 in the Cambridge region could suggest customers are just expressing a more general wish for service improvements and there is no obvious link between the service level change and the amount they are prepared to pay.
Use of renewable energy	Wave 1 results significantly higher for all customer groups. We can conclude that customers value larger improvements to the service level more highly.	Wave 2 values are higher among all groups (except Cambridge household customers). Most likely driven by fact that the values are higher and the change in service improvement shown was lower, as no other changes were made to the attribute between waves.** The higher value in Wave 2 in the Cambridge region could suggest that customers are just expressing a more

		general wish for service improvements and there is no obvious link between the service level change and the amount they are prepared to pay.
Protecting wildlife habitats	Wave 2 results significantly higher among household customers (slightly higher among NHH). As service level changes were higher in Wave 2 we can conclude that customers value larger improvements to the service level more highly. Changing the attribute wording to inform customers about the amount of land managed against the total has potentially also influenced the Wave 2 results.	Wave 1 values are higher among South Staffs customers. As service levels were increased in Wave 2, this result is to be expected.** The higher value in Wave 2 in the Cambridge region could suggest either that customers are heavily influenced by the amount of land we actively managed, or that customers are just expressing a more general wish for service improvements and there is no obvious link between the service level change and the amount they are prepared to pay.
Protecting rivers and streams	Wave 2 results significantly higher than Wave 1 among South Staffs customers (similar among Cambridge household). Given the complete change in attribute and level wording this change is likely driven by customers demonstrating higher preferences for protecting water sources from run-off damage, compared to improving the area of land protected from the current level managed.	The service level change is not comparable due to the major change in the level descriptions between waves.

* PJM-Accent, 2016, notes that, in general, we would expect reductions in the scope of service change offered to lower the value for the change in service level offered, in comparison to the previous wave, but by a less-than-proportionate amount. So, if the scope of service change offered halved for an attribute we would expect the WTP value to fall but by less than one half. However, in cases where the initial maximum (S2) service improvement entailed a reduction to zero in the number of service issues, the WTP value may possibly fall by more than a proportional amount due to the special significance of 'zero risk' as a driver of choice (Kahneman and Tversky, 1979; Schneider et al. 2017). In general, people tend to give excessively high value to removal of the last trace of risk to go from a very low risk to a certainty.
**As WTP unit values are derived by dividing the value for the service level change through by the amount of service change offered, if the value for the service level change decreases by less than the amount of service change offered, the unit value will increase.

3.6.3 Testing customer valuations from a lower bill starting point

In the main survey, a group of 290 household customers were shown a lower bill starting point. We were anticipating that a low bill would encourage customers to spend more as the bill reduction gives them more available to spend (£10). Instead, we found that the opposite is true, with noticeably lower WTP results for those seeing low bills. This may suggest that people assess the bill changes as proportional to the bill level shown and the +£ levels consequently seem larger to them from a lower starting point. However, we do have concerns that people can only realistically assess bill changes relative to what they pay now, not some future hypothetical level. The careful introduction of how price reductions work over time may also have made them more sensitive to the topic and possibly more reluctant to sacrifice what could be seen as a 'bill discount'.

Given these findings we are giving more priority to the results from those who completed the DCE with their current bill level shown, because we cannot be confident that respondents who saw a lower bill start point are truly expressing their willingness to pay for improvements. They are instead expressing their desire to keep hold of an unexpected discount. We saw in our business plan acceptability testing qualitative groups that all customers said they expect their bills to go up. This supports the fact that a declining bill would be an 'unexpected surprise' and potentially more likely that a customer would not want to give this up.

We have however used the lower bill starting point results as a sensitivity test in our WTP triangulation work as outlined in section 4. These feed into the figures for the upper and lower confidence intervals around our central value.

3.6.4 Package scaling effect

In Wave 2, our package scaling question was presented to respondents with a choice between one service defined in terms of two or three blocks of attributes, one set (A) all at current levels and one set (B) all at the best levels. The price increase for (B) varied from +£10 to +£50 for HH customers and +10% to +50% for NHH.

In Impact's analysis of this question, they:

- plotted a 'demand curve' for each customer type in each region, for each price point tested and identified the price at which take up is 50% of respondents. This represents the collective point of indifference for the utility of the improvements v the disutility of the bill increase. This required extrapolation from the levels used;
- compared this with the aggregate WTP value for the corresponding attributes tested in the SP exercises (again representing the point of indifference between the utility of the improvements and the disutility of the price increase); and
- then took the ratio of the two to establish a scaling parameter.

Because the number of questions had to be limited to one per respondent, results had to be aggregated across regions to represent HH and NHH customers only. The full results of this are detailed in appendix A14, pages 27 to 31.

The final package scaling analysis showed that for HH customers the relationship suggests a tailing off of total value as packages get larger. In our Optimiser tool we have over 11 attributes and this analysis showed that we should apply a scaling factor of 0.65 to the WTP figures. (Note that we have sensitivity tested the results in our Investment Optimiser tool against the unscaled figures after both sets of WTP figures had first been triangulated). For NHH customers, the results were not consistent with expectations as there was no difference in the scaling factor between two and three packs of attributes (i.e. that NHH customers already express their full willingness to pay when assessing a single group of service improvements). Given this, we decided not to use the NHH scaling factors and instead applied the household scaling factor to the NHH WTP figures.

3.6.5 Next steps

Despite a robust and improved approach, compared to PR14, across our two WTP studies we had anticipated some challenges and uncovered more when valuing customers' preferences for service improvements. These include the different results over time and what drives these, such as sensitivity to context and framing of questions and how results are scaled to the number of affected properties.

To further mitigate these challenges we then carried out an extensive triangulation process, which is outlined in summary in section 4 below. Innovatively this includes the use of our day-to-day customer contact data.

4. Triangulating customers' WTP for service investments

4.1 Overview of approach

Our approach to triangulation has been central in us responding to the challenge levelled against water companies following the 2014 price review (PR14) that they were too reliant on stated preference surveys, mainly willingness to pay (WTP) when setting their outcome delivery incentive (ODI) rates.

Ofwat's Price review 2019 (PR19) customer engagement policy statement[3] consequently included the guideline that companies should draw evidence from a wider range of customer data sources (internal and external) to supplement their stated preference WTP survey results.

In February 2018 we commissioned independent, expert support from our research agency partners, Accent and PJM Economics, to review all our customer engagement activity related to our studies to a robust and proportionate evidence base on customers' WTP for ODI rates, as well as an input into our wider Cost Benefit Analysis (CBA) modelling. This is a vital step in helping to put customers' priorities at the heart of our PR19 business plan.

As Ofwat has not yet released any formal guidance around how to approach triangulation, a key report used to help develop our approach was CCWater's and ICF's framework for triangulation[4].

We worked with our partners to build upon the approach outlined in the report to develop an innovative triangulation methodology to support our investment plans. This is what we call our 6-step "SMARTS" approach.

Our approach to triangulation utilises a wide range of data sources to make a number of adjustments to our core WTP values (taken from our Wave 1 and Wave 2 studies) to derive their "triangulated" values. These triangulated values are obtained as a 'weighted average' of the comparable measures derived from the various supplementary data sources.

Each of these data sources has certain strengths and weaknesses, so that the comparable measures or estimates derived from these sources are subject to errors. However, since the errors in the different estimates are independent, a weighted average of these estimates is expected to lead to a lower overall error.

Since it is difficult to determine the sizes of these errors, reasoning and expert judgement was used to evaluate the evidence across all the data sources. Sensitivity testing was then used for the key areas where judgement had been applied.

Through this process we believe that the triangulated values derived using our approach produces better estimates of the true WTP values. These are then used to reflect customers' preferences within our investment modelling and as part of the process of setting ODI rates. Full details of the approach can be found in appendix A25 which details the full technical report and appendix A25.1 for the supporting workbook.

[3] 'Ofwat's customer engagement policy statement and expectations for PR19', Ofwat, May 2016.

[4] 'Defining and applying "triangulation" in the water sector', ICF for the Consumer Council for Water, 2017.

The approach was also extensively reviewed throughout by our independent customer Panel and their views on our approach can be found in their report submitted to Ofwat on the 3rd September. They received a number of challenges, particularly around the use of contact and satisfaction data. This positively led to a review of a number of the weighting given to data sources which has led to a more balanced set of valuations.

An academic expert (Giles Atkinson, Professor of Environmental Policy at London School of Economics & Political Science) also peer reviewed the triangulation methodology and the final report. Section 4.2 details a summary of our six step 'SMARTS' triangulation.

4.2 WTP summary of 6 steps, key findings and conclusions

4.2.1 Screen

Our approach works on the principle that a data source is suitable for triangulation if it contain relevant information that can provide us with a measure of priority for at least two service measures, such as leakage and metering. We identified with PJM/Accent a number of studies containing customer evidence suitable for WTP triangulation. These are:

- the core data comes from the WTP research which includes results from the discrete choice experiments in both Wave 1 and Wave 2;
- MaxDiff priorities exercise from our Wave 1 WTP study;
- Water resource management plan (WRMP) research (online and workshops);
- customer priorities research;
- customer contacts/complaints;
- customer satisfaction survey data;
- performance commitments (PC) slider research which involved customers moving a slider to improve or decrease the level of service we could offer whilst being exposed to a dynamic bill impact; and
- external WTP evidence (PR14, PR19, academic and grey literature).

A number of data sources used in our wider triangulation work were excluded from this stage of the customer engagement evidence review. These and the reasons for their exclusion are detailed in the full technical report. However, we have still used them as part of our wider review of customers' priorities and preferences.

4.2.2 Map

The primary focus of the stage was on the 'core WTP' data. The final outputs from the WTP core Discrete Choice Exercise (DCE) research from both waves of the study included the following (for each of the 16 service measures triangulated):

- attribute levels for the status quo situation (S0) and two possible levels of improvement from the current level (S0): 'some improvement' (S1) and 'significant improvement' (S2).
- WTP values for each of these levels, together with statistical confidence intervals around the average values;
- total pot values together with confidence intervals around the values; and
- unit WTP values (for improvement from S0 to S2) together with confidence intervals around these values.

PJM focused on the unit WTP values (i.e. WTP for 'S0 to S2' improvement) rather than Mean WTP (S0 to S1) or Mean WTP (S1 to S2) values for our triangulation exercise. This is because the scope of

service changes offered to participants varied considerably across service measures. For example, if WTP (S0 to S1) for property flooding for a company was £6 and WTP (S0 to S1) for discoloured water was £5, then it would not necessarily be the case that property flooding incidents were considered worse than discoloured water incidents. It may instead have been that the company was offering a greater reduction in the risk of property flooding in the S1 level than it was offering for discoloured water in that S1 level.

Note that PJM included WTP values based on both the pilot and main interviews, rather than those from the main stage only. This was done to maintain consistency with the report produced by Impact. No 'package scaling' was applied to the results by PJM despite a package exercise being included in the Wave 2 research, and analysis by Impact (who ran the study) showing that package effects were important. The reason for PJM not scaling down the WTP results to be consistent with a large-scale package of improvements was because package scaling is only necessary when the overall business plan involves increases in customers' bills. Further, PJM used the WTP `Wave 2' results based on the stated preference (SP) exercise in the context of the current bill as the main WTP values for purposes of triangulation. The WTP values resulting from the lower bill SP exercise were used as a sensitivity check that contributed to the range of values, but not to the central case.

However, following completion of the work and following challenge from our independent customer Panel we also decided to produce a set of scaled WTP values for the 16 attributes. These were also used as an input to our Investment Optimiser tool allowing us to test how sensitive the model was to different sets of figures. This proved a valuable step as it allowed us to better understand which schemes would bring the greatest benefits to customers.

Unit WTP was derived by PJM by dividing the WTP for S0 to S2 improvements by the number of units of service change between S0 and S2 service levels. Unit WTP values represent a comparable unit of change being valued across service measures. This is because they express customer's WTP for one avoided incident of each type of service measure in each case. Therefore, we used unit WTP values for our triangulation exercise since they are not sensitive to the scope of service change offered and are also likely to be more closely related to customer contacts and priorities, once scaled by the number of households affected.

The final output of the WTP core DCE exercise is based on a revised methodology of taking the per customer (household (HH) and non-household (NHH)) data from the WTP survey and converting it into the units of measure that were then utilised within the Investment Optimiser tool. We have detailed the following steps below which were used to derive the final output of the WTP core DCE exercise and highlights the robust approach we have taken:

- per customer WTP data from the survey is in the form £X per customer;
- there are three service levels, the starting point S0, the 'some improvement' level S1 and the 'significant improvement 'level S2. The WTP values provided by our surveys are cumulative, so to get from S0 to S2 PJM added together the two WTP values. (i.e. if customers are willing to pay £X to get to S1, and then a further £Y to get to S2, then to go from S0 to S2 they would be willing to pay £X+£Y). The final approach ignores the 'some' improvement level;
- the service level improvements shown to respondents in Wave 2 were different to those shown in Wave 1. In order to combine the Wave 2 and Wave 1 values in a meaningful manner, PJM has taken the Wave 2 (S2) service level to be the correct range for the combined case and have used either the intermediate level or the best level from Wave 1 to be consistent with this assumption. For example, for discoloured water, the unit values in Wave 1 were recalculated based on service level improvements from base to the Wave 1 intermediate level (S1). However, for metering, PJM calculated the unit values based on service level improvements from base to the Wave 1 best level (S2);

- WTP per customer is converted into a total WTP for all customers in that group by multiplying by the number of customers in the group. There are four groups – SST HH, SST NHH, CAM HH and CAM NHH (SST is South Staffs and CAM is Cambridge);
- the total WTP for all customers in the group ('the pot') is divided by the range of service improvement asked in the question for that group. For example, if S0 to S2 is 5,000 properties, we divide the total pot WTP by 5,000 to get a 'per property affected' value;
- public values are taken for each group. Note that, following challenge from our customer Panel, we use the Wave 1 WTP 'private' value and the WTP values resulting from the lower bill Wave 2 DCE exercise as sensitivity checks in the triangulation so that they contribute to the range of values, but not to the central estimate;
- all the external WTP data from PR14 and PR19 have been averaged before applying the weighting, so that the impact of any outliers is minimised. Any external studies where the measure cannot be mapped to our WTP data has already been exclude during the screening process;
- the household and business WTP are added together for each region. Note that due to small sample bases we only use the Wave 2 WTP 'CAM NHH' value as a sensitivity check in the triangulation so that they contribute to the range of values but not to the central estimate;
- the regional WTP totals are weighted by the size of each region (using property counts) to get to a final, weighted, combined WTP;
- the 'combined SSC' WTP triangulated values are calculated as a weighted average of the South Staffs and Cambridge area results; and
- the above steps are repeated to generate the low and high confidence intervals, so we end up with a low, mean and high value for each measure, for each region and combined. Note that for sensitivity testing we define the low and high values such that the low value is calculated as the minimum WTP value plus 20% of the difference between the minimum value and the central case value, and the high value is calculated as the maximum value minus 20% of the difference between the central case value and the maximum value. The justification for redefining the confidence intervals in this manner is to avoid having extreme range of values for the combined WTP.

Importantly, this approach of generating sets of triangulated scaled and unscaled WTP values for the central, high and low confidence intervals allowed a more robust evaluation of the potential schemes within our Investment Optimiser tool. Specifically to allow us to understand which schemes fall in or out of the preferred scenario when different customer valuations are used.

The final output of the WTP MaxDiff choice exercise from Wave 1 is an index for each service measure that summarises the relative priority given to each S0 to S2 improvement, with the sum of the indices equal to 100. There was no mention of cost in the exercise and so it is ambiguous whether costs were, or were not, considered by customers when choosing their priorities amongst options. In light of this ambiguity we have made no adjustments to the measure, and hence implicitly assume that it is a measure of WTP.

PJM then converted the evidence from each suitable data source, as detailed above in Section 4.2.1 that passed the screening stage, into a form that is comparable to our 'core WTP' measures. This step is necessarily source-specific and requires assumptions in some cases to enable the comparison. For example:

- to convert the WRMP priorities scales to a comparable measure for the WTP service measures PJM use the derived WRMP priority indices (see section 3.2 of the full technical report, appendix A25) as a measure of relative WTP for 'S0 to S2'. These relative WTP values are scaled to equate package WTP to the WTP Wave 2 DCE results for leakage and water

metering and to the WTP Wave 1 DCE results for smart metering. The resultant measures are then translated to the same units as reported for each of the common service measures in the core WTP research. These values are also adjusted for by the bill impact per customer for moving from S0 to S2; and

- PJM were also able to map four service areas using the outputs from a regression analysis of our customer service tracker data. Satisfaction scores do not themselves necessarily correlate with WTP for improvement, since WTP is a measure associated with a change rather than a static state. Instead, PJM translated the satisfaction scores to a comparable unit by using the results of a regression analysis conducted by Accent, which examined how the impact of a service failure affected overall satisfaction. The principle being adopted in using this as a measure of WTP, is that a WTP index for one fewer service failure in the future of each type of service failure should be proportional to the relative impact of each type of service failure on satisfaction. However, we found from the regression analysis that an 'interruptions to supply failure' actually improved satisfaction. The conclusion for this is that if you handle the service failure to a high standard, customer satisfaction actually improves and we have also seen evidence of this in our SIM survey results. However, as our objective in our plans is to minimise service interruptions for customers, we set the unit impact index for 'Interruption to water supply' for South Staffs Water region to be equal to zero. We also down-weighted the rating of this data source in the triangulation approach, based on the caveats uncovered from using this data source.

These important assumptions for each comparable measure are detailed in the full technical report for this project.

4.2.3 Assess

To robustly assess the measures used in our WTP triangulation approach, we considered with PJM/Accent each data source in detail against the two areas below. The details of the review of each data source are detailed in the full technical report.

- theoretical robustness:
  - are definitions of the candidate and target measure the same?;
  - are contextual conditions (eg type of questions asked) the same between candidate and target measures?; and
  - if no to either of these, what issues do the differences give rise to?
- statistical robustness:
  - how large is the sample?;
  - how representative is the sample – a review of any biases, timing of the study, make up of sample?;
  - how wide are the confidence intervals within the data?; and
  - have the results been derived using best practice techniques?

4.2.4 Rate

We then worked with PJM/Accent to assign an overall Red/Amber/Green (RAG) rating for each source, against the above criteria. These ratings are based on our best judgment in light of the balance of evidence across all data sources being evaluated.

These judgements are detailed in the full technical report and it is important to note that these ratings are intended to be meaningful in a comparative, rather than an absolute sense.

Table 10 summarises the ratings of the data sources we used, which included both waves of our WTP studies.

Table 10: Data sources used in our WTP triangulation approach

Overall RAG rating	Weight	Data source classification on overall validity
Green	100%	WTP Wave 1 DCE study WTP Wave 2 DCE study: All groups except CAM NHH*
Green / Amber	50%	Performance Commitments (PC) slider research
Amber	25%	WRMP qualitative workshop WRMP quantitative on-line survey Customer priorities quantitative study Customer contacts Customer satisfaction data – regression analysis External WTP PR19 studies South Staffs and Cambridge Water (SSC) PR14 study
Amber / Red	10%	External WTP PR14 studies
Red	0%	

* Wave 2 CAM NHH excluded from main case due to small sample base sizes.

Triangulate

This step involved from applying weights to each of the data sources, including the external WTP data, based on their overall RAG ratings and combining the measures to derive central values and associated ranges for the 16 core WTP service measures covered in our triangulation work.

For all the figures shown in this section the combined 'all' unit values have a very significant range, due to the significant ranges associated with the `combined NHH' values, especially with the Cambridge NHH values. This is in part due to the less robust sample bases in this region and a key reason why they are used as a sensitivity check point for the high and low values only and not the central main case.

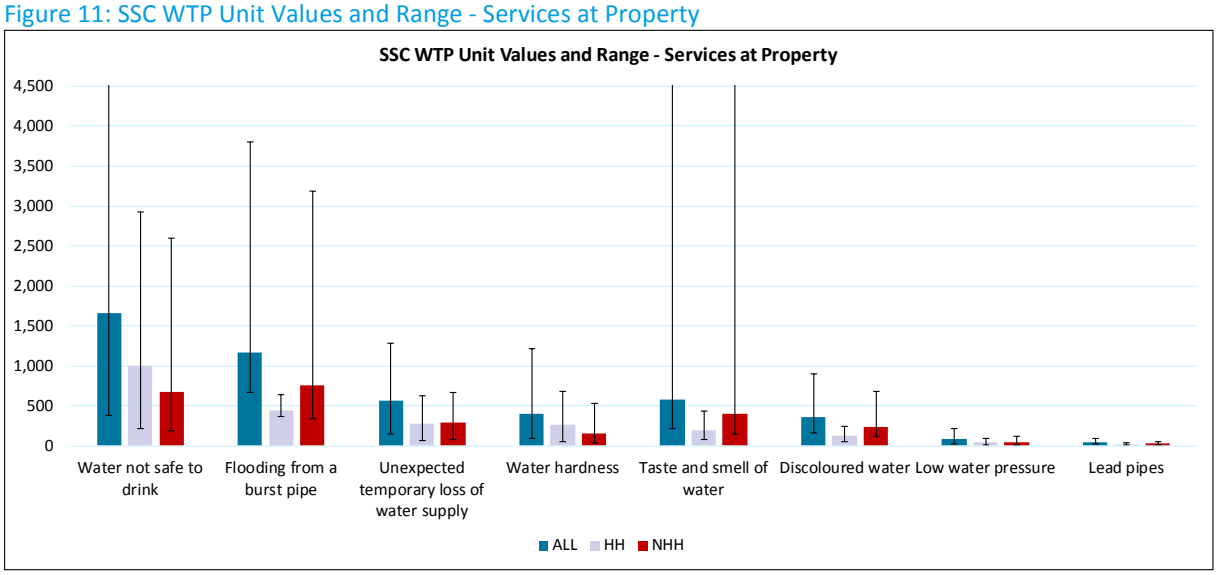
Figure 11 presents the final WTP triangulated values for 'Services at Property' and their associated ranges for SSC (ie. SSW and CAM combined). It is important to note that the:

- `combined unit WTP HH' is the weighted average of the triangulated WTP values for SSW HH and CAM HH, weighted by their respective HH property counts;
- `combined unit WTP NHH' is the weighted average of the triangulated WTP values for SSW NHH and CAM NHH, weighted by their respective NHH property counts; and
- 'combined all' figure is the weighted average of the triangulated WTP values for SSW (HH and NHH combined) and CAM (HH and NHH combined), weighted by their respective total (HH and NHH) property counts.

Water not safe to drink has the highest triangulated WTP figure per property, followed by flooding from a burst pipe, taste and smell and unexpected temporary loss of supply. Encouragingly, these closely match with the priority ranking order in all our customer priorities research. Water hardness

figures are higher than expected ahead of discoloured water, most likely driven by the fact that more customers are dissatisfied about the hardness of their water compared to other areas.

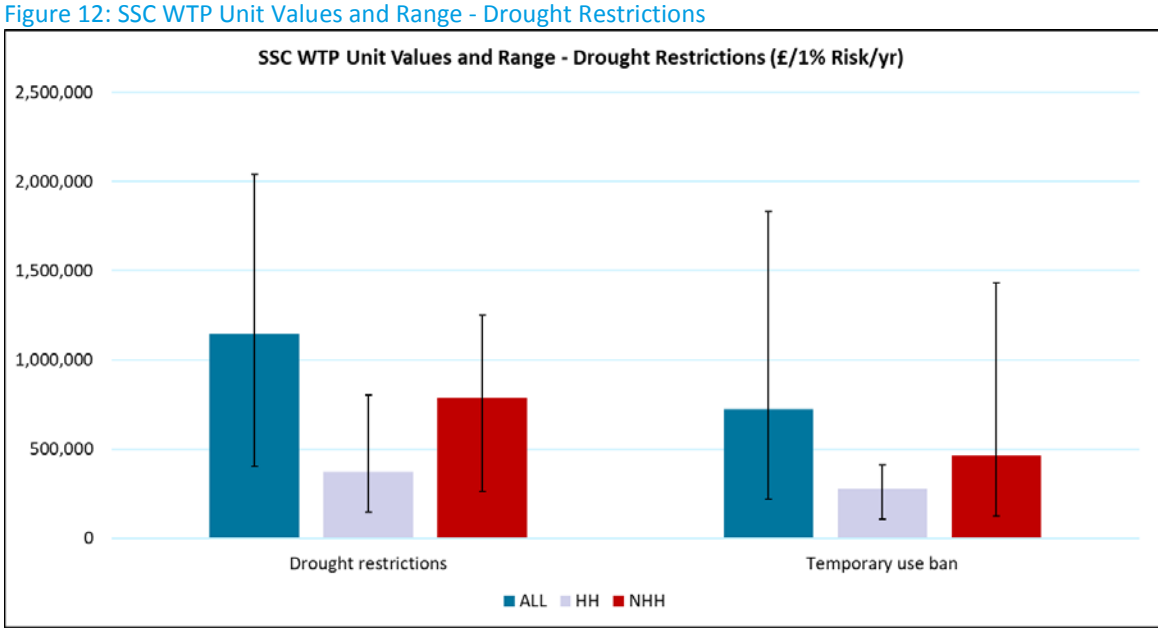
Figure 11: SSC WTP Unit Values and Range - Services at Property



Note: Range curtailed to aid legibility. Upper bound of 'Water not safe to drink' (ALL) = £5,504; Upper bound of 'Taste and smell of water' (ALL) = £19,894. Upper bound of 'Taste and smell of water' (NHH) = £19,479.

Figure 12 shows WTP triangulated values for 'drought restrictions' and 'temporary use bans'. We find that valuations are higher for avoiding severe drought restrictions, which reflects the customer feedback across our engagement with customers. Customers are clear that the use of standpipes is never acceptable.

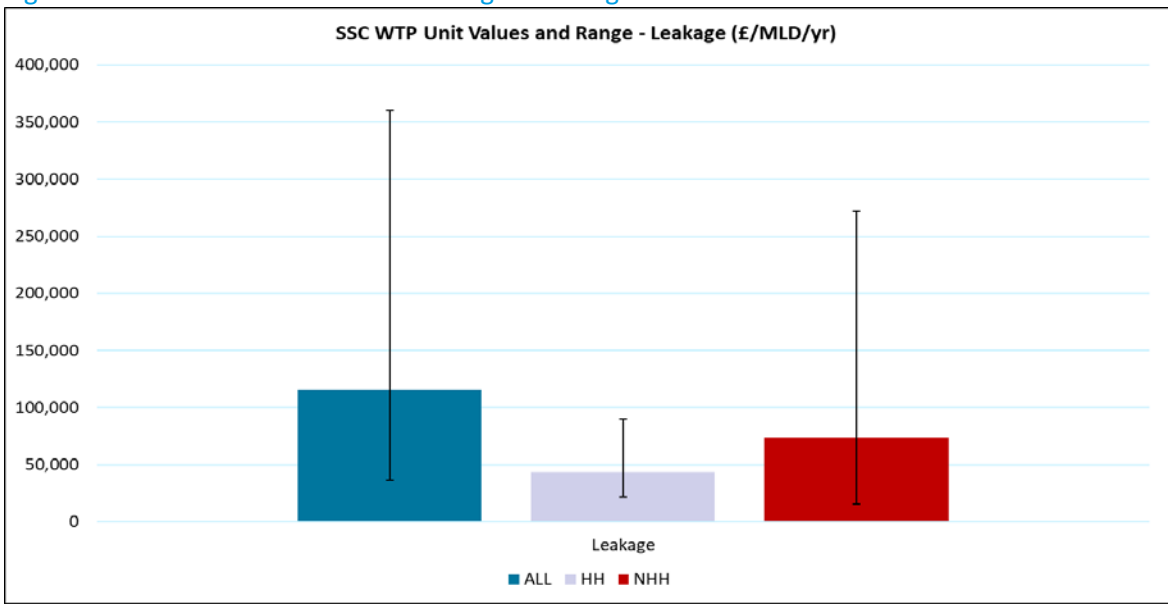
Figure 12: SSC WTP Unit Values and Range - Drought Restrictions



Note: No WTP data available on Drought restrictions from the SSW PR14 study and the Wave 2 WTP study.

Figure 13 shows our final WTP triangulated values for 'leakage'. When looking in more detail we find that the figures for our Cambridge region are significantly higher. This confirms the increased level of priority placed on reducing leakage expressed among customers from this region in our other engagements studies.

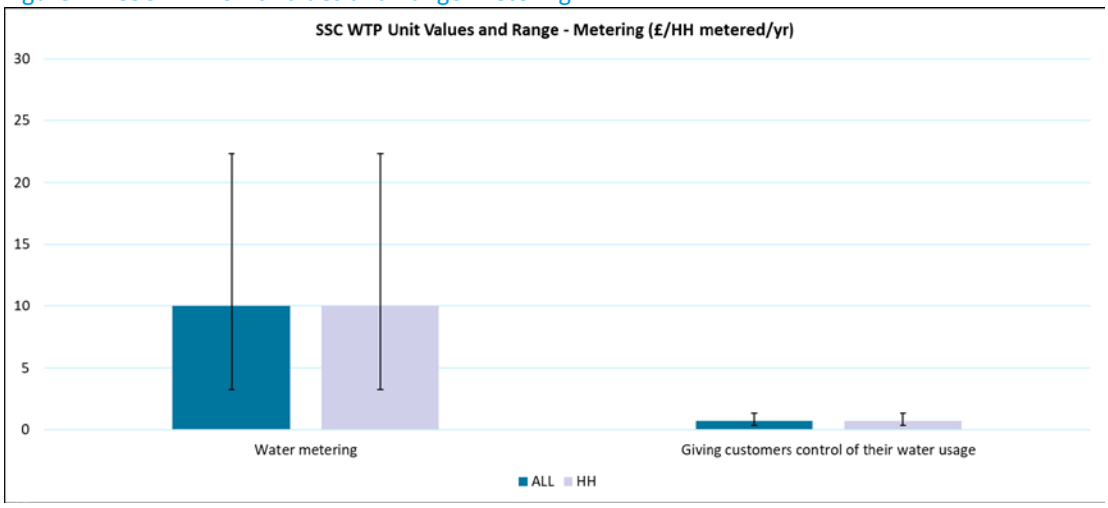
Figure 13: SSC WTP Unit Values and Range – Leakage



Note: SSW PR14 WTP value for Leakage not included since units are not comparable.

Figure 14 shows our final WTP triangulated values for 'water metering' and 'giving customers' control of their water usage (through more meter readings)'. We find that valuations are higher for 'increased water metering', which we believe in part points towards customers becoming conditioned to seeing this offering as an expected 'free service' for their gas/electivity supply and that many remain disconnected to water and do not consider the benefit of more regular meter reads as a way to help them reduce their consumption.

Figure 14: SSC WTP Unit Values and Range-Metering



Note: No values available for NHH metering (water metering and smart metering).

Figure 15 shows our final WTP triangulated values for 'protecting wildlife habitats' and 'managing the impacts on rivers and streams'. We find that valuations are higher for protecting habitats, which we believe points towards some household customers not being able to make the link between our activities and the impact on rivers, as observed in our WRMP workshop.

Figure 15: SSC WTP Unit Values and Range-Environmental Protection

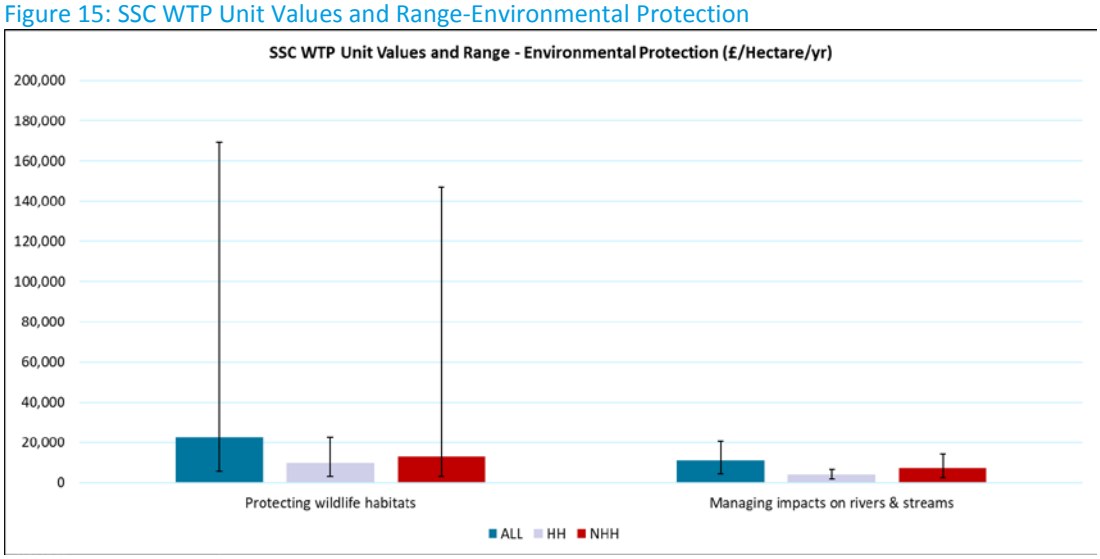
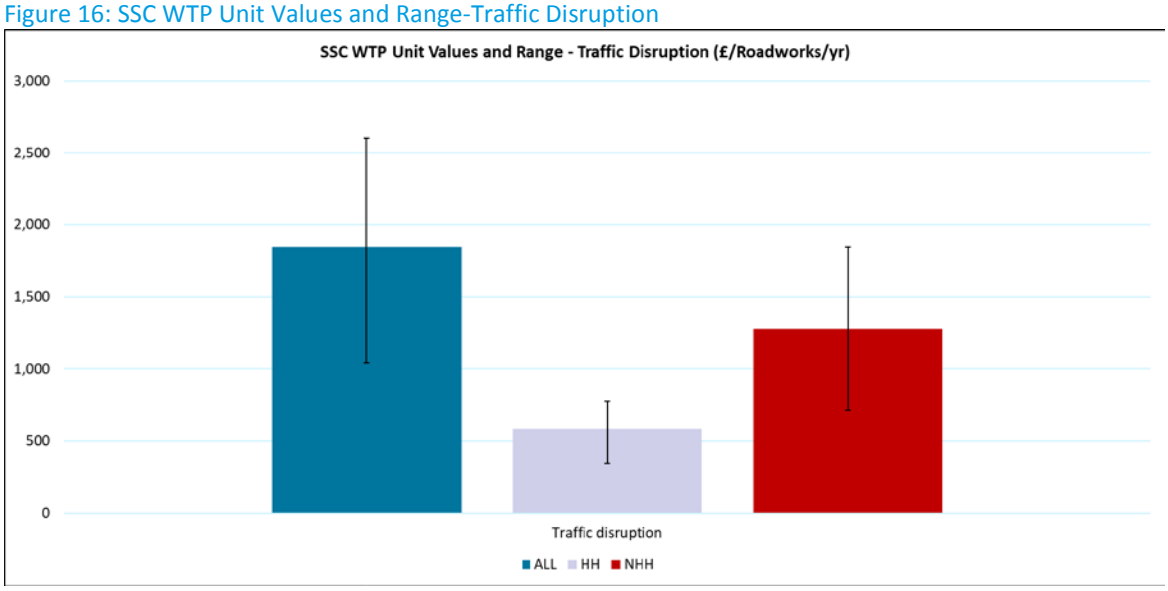


Figure 16 shows our final WTP triangulated values for 'traffic disruption'. When looking in more detail the figures for our Cambridge region are significantly higher, potentially driven by what customers regularly describe in our focus groups as the terrible 'traffic problems' that blight the city centre and main roads serving it.

Figure 16: SSC WTP Unit Values and Range-Traffic Disruption



4.2.5 Sensitivity testing

Finally, to provide additional confidence, we sensitivity tested our main combined WTP values results by considering alternative sets of weights for the RAG ratings. The full details of this test is laid out in the full technical report.

This review highlighted that the triangulated WTP estimates for all the core service measures were fairly robust to alternative weights assigned to the various data sources. None of the core measures were found to have a value more than 20% different in the sensitivity case when compared to the main combined case. This difference is considered by industry experts to be fairly low in the context of WTP measurement.

In both wave 1 and wave 2 of out WTP research over 90% of customers said they were satisfied with current service levels. The only the notable exception of dissatisfaction is that of water hardness among both household and business customers, reflecting the feedback in our customer service tracker.

Table 11 provides the full details of normalised WTP figures (per year) among South Staffs customers, which have been subject to our triangulation approach. We can see that despite the high levels of satisfaction with current service levels, customers were able to judge which service improvements offered them value for money.

It is important to note that we have not used the values in isolation, as they are a result of the cost of the improvement versus the value placed on them by customers which determines if the investment it cost beneficial. We have used these values alongside a range of other inputs in our Investment Optimiser (IO) tool to help determine the most appropriate PR19 investment programme. We have also used regional South Staffs and Cambridge figures in our IO tool. We have used the unscaled values as an input to setting our ODI incentive rates.

Table 11: Comparison of unscaled WTP triangulated values (£/unit/year)

Attributes	Unit	Combined Unit value: HH	Combined Unit value: NHH	Combined Unit value: MAIN	Combined Unit value: CASE 1
Water not safe to drink	Property affected	£1,009	£676	£1,664	£1,799
Flooding from a burst pipe	Property affected	£446	£750	£1,162	£1,131
Taste and smell of water	Property affected	£196	£401	£578	£653
Unexpected temporary loss of water supply	Property affected	£280	£285	£561	£623
Water hardness	Property affected	£260	£151	£407	£373
Discoloured water	Property affected	£129	£238	£356	£362
Low water pressure	Property affected	£41	£39	£79	£85
Lead pipes	Property affected	£21	£24	£46	£45
Drought restrictions	1% change in risk	£373,350	£783,373	£1,147,454	£1,228,995
Temporary use ban	1% change in risk	£274,355	£461,409	£724,697	£695,074
Leakage	ML/D	£43,416	£73,306	£115,511	£125,188

Water metering	Household	£10	Not covered	£10	£9
Giving customers control of their water usage	Household	£1		£1	£1
Protecting wildlife habitats	Hectare	£10,023	£13,124	£22,720	£24,526
Managing impacts on rivers and streams	Hectare	£4,187	£7,144	£11,220	£11,109
Traffic disruption	Roadworks incident	£585	£1,277	£1,845	£1,816

Note: Combined Unit value: MAIN refers to the WTP triangulated values from wave 1 and wave 2. CASE 1 refers to the WTP triangulated values sensitivity tested using an alternative sets of weights. Drought restrictions, smart metering and traffic disruption were not included in the Wave 2 study.

5. Customers' willingness to fund social tariff contributions

Our Assure tariff has been designed to assist customers on very low incomes and was first introduced in 2016/17. We currently have support from our customers for a £1.50 contribution, which was based on robust customer research. However, we found that due to the success we have had promoting the tariff that in 2018 that it started to be become over sub-scribed. We have looked at how we can support a continuation of the tariff. As part of our response, we decided to use customer research to assess customer support for increasing the customer contribution and therefore funding in 2019/20 and beyond.

5.1 Our approach

Given the scale of our engagement programme we decided to incorporate a social tariff research study into stage three of our wider household engagement around proposition testing and customer segmentation.

We worked with our specialist partner Accent, following CCWater's preferred question wording, to develop a survey that followed best practice for acceptability testing.

This stage of the study involved 420, 20 minute surveys. To ensure a robust sample Accent carried out:

- 270 on-line and 150 by telephone to ensure we reached a representative sample of customers;
- 270 completed in the South Staffs and 150 in the Cambridge region;
- a weighting of the data to reflect South Staffs and Cambridge customer profiles by age, gender and social grade. Hard to reach customers were also profiled;
- an analysis so that we could assess the level of support among our five customer segments uncovered during this wider study.

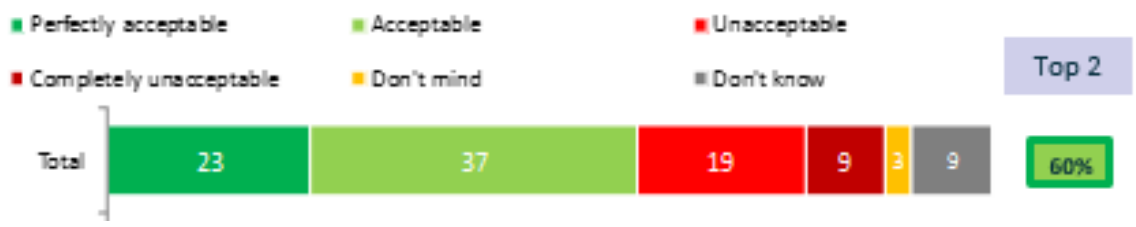
The survey was also piloted to test the questionnaire prior to starting the main fieldwork to ensure customers understood the questions being asked. Our customer Panel also provided challenge to ensure that customers understood the wording of the questions.

Please refer to appendix A16 (section 3) for full details of this study and details of the questions used to test the acceptability of our social tariff contribution level.

5.2 Key findings

The chart below shows that 63% of customers, including those who said don't mind, find the idea of a social tariff acceptable.

Figure 17: Social tariff principal acceptability



Question asked to customers: How acceptable do you find the idea of a reduced price tariff to help customers on limited incomes who struggle to pay and are in financial difficulties? – chart shows % responses.

When looking at responses when contribution levels were introduced to customers, our 2015 research found that approximately seven in 10 customers found the introduction of a proposed social tariff at £1.50 acceptable, with:

- 68% support in our South Staffs region; and
- 76% in our Cambridge region.

The results from our 2018 research showed that:

- when tested uninformed (with no knowledge of our current Assure scheme) that 67% of customers found a social tariff contribution level of £3 acceptable. Willingness to contribute was consistent across the two regions was similar:
  - 67% support in our South Staffs region; and
  - 68% in our Cambridge region.
- once informed about the existence of our current Assure tariff, 24% of participants changed their response. Support for a £3 cross subsidy dropped to 55%. However, there was noticeable variation between the two regions:
  - 52% support in our South Staffs region; and
  - 62% in our Cambridge region.
- when taking the weighted responses between uninformed and informed, it shows that **61%** of customers found a social tariff contribution of £3 acceptable on their bill. We agreed in consultation with CCWater that the weighted approach is acceptable in terms of determining an overall level of customer support. Their threshold for acceptability is 60%;
- There was some variation between the two regions:
  - 60% support in our South Staffs region; and
  - 65% in our Cambridge region.
- there is one segment of our customer base who we know now is significantly less likely to support a social tariff scheme than the others. For example, only 52% of customers in this segment supported a £3 contribution. The figure is 72% among customers in the segment with the highest level of support; and
- one in five customers would be prepared to increase their previously stated contribution if the company were to match fund their additional contribution.

We have also found that other water companies have also seen a drop in support between customers being uninformed and informed about the existence of the current scheme. We have found through our qualitative feedback sessions held in phase 2 of the propositions study, that some customers expressed a view that the scheme is unfair, as they have not been personally consulted as to whether they want to pay the contribution or not. This creates a sense of distrust or resentment towards it.

5.3 Outcomes

As a results of the research, CCWater and our Executive board has approved the uplift of the customer contribution by £1.50 taking the total contribution to £3 per customer, as supported by our research. This will enable around 20,000 customers to be supported through the social tariff in 2019/2020.

We are also committed to consulting with CCWater to secure their formal support for the introduction of any increased cross subsidy if needed. This will involve carrying out further research with customers to support this decision in 2019.