Appendix 5f:
Understanding Customer Values_ Stated Preference Severity Report

YorkshireWater

PR19 Understanding Customer Values: Work Package 2 – Second Round Stated Preference

AECOM

Quality information

Document name	Prepared for	Prepared by	Date	Approved by
Work Package 2	Yorkshire Water	Ali Sims	01/11/17	Chris White

Contents

Appendix 1:PR19 Understanding Customer Values: Willingness to Pay Workpackage 2 – Approach, Methodology & Results Aecom & DJS Report

Work Package 2 – Second Round

Context

The aim of this project is to undertake primary research to ascertain the values that Yorkshire Water (YWS) customers place on changes in service measures such as interruptions to supply or drinking water failures. These values will then be used to populate the Decision Making Framework (DMF) in order to inform the investment planning process and support the wider Outcome Delivery Incentives (ODI) work stream.

In light of Ofwat's recommendations for improving the approach to understanding customer's values in PR19, the project includes six work packages (see Figure 1) which draw on a range of data to allow methodological triangulation; whereby data of different types are used to cumulatively refine and validate research outputs.

Figure 1. Overview of the six work packages
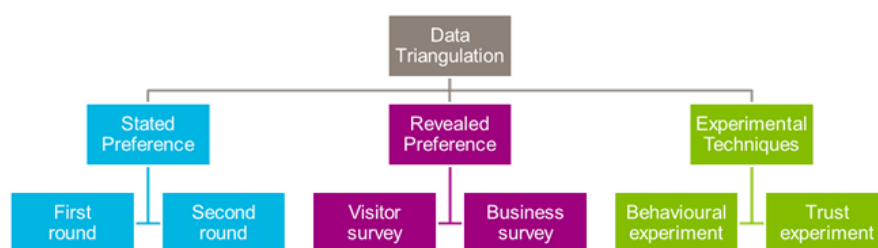
Aims

The aim of this work package is to try to estimate the values YWS' customers place on changes in service measures using a stated preference survey. This work package follows on from the Work Package 1 household and business surveys. In this work package different severity levels are tested within a smaller set of 10 key service measures (compared to 13 tested in Work Package 1). In addition, this work package is focussed on household customers only, as it is assumed that the values from household customers for the different severity levels will be transferable to business customers as well.

The specific questions which this work package aims to answer are as follows:

- What is the willingness-to-pay (WTP) amongst YWS customers for changes in severity levels of the service measures?
- How does WTP differ across socio-economic group, age, lifestage, vulnerable customers, low income customers, location in the region, and those who have experienced a service measure failure?
- How do use and non-use values compare for environment related service measures (i.e. bathing water quality, river water quality, pollution incidents, and land conservation)?

Method

This work package involved undertaking a quantitative survey of YWS household customers, conducted via a combination of Computer Aided Personal Interviewing (CAPI) and online panel. A total of 1,216 household interviews are included in the analysis for this report. The survey was conducted with (three) split samples; with each group tasked with a choice experiment exercise focussing on one of the three key service areas:

- Water quality and interruptions
- Sewer flooding and odour
- Environmental

The make-up of interviews was based on a pre-agreed sample structure in order to provide a representative sample of bill paying household customers in the YWS region by age, socio-economic group, gender, region, and metered status. Quotas were set to ensure the three split samples were matched. Despite best efforts, a truly representative sample of the desired population was not possible, so weighting has been applied to the data. At the total level, the 'under-represented' groups are: males, over 65s, and CD2E SEG customers.

This work package uses stated preference methods to undertake quantitative household customer research. The work package aims to quantify customer preferences for service levels by completing choice experiments conducted in a survey format. A choice experiment (CE) and a MaxDiff approach of stated preference were adopted in this study to prioritise levels within the service delivery.

To assist in customer understanding of the concepts being presented to them a visually engaging set of show cards and choice cards were developed. Examples of the design are shown in Figures 1 and 2 below.

Figure 1: Show card example

Figure 2: Choice card example

Results

Table 1 to **Table 3** below summarise the relative degree to which household customers wish to avoid water service issues occurring for each level of severity. The level of service highlighted bold indicates that this was the level included in the Work Package 1 valuations and is included as the base case in this analysis. Non-base case Odds Ratios (ORs) of value 1.000 show no significant difference from the base case. Severity levels of below 1.000 show that customers are less likely to want to avoid the scenario than the base case, while ORs above 1.000 show that customers are more likely to want to avoid the scenario than the base case.

Table 1. Overview of results – water quality and interruptions

Service measure	Levels of service	Normalises ORs	WTP for +1 improvement
Unexpected interruptions	An unexpected supply interruption for less than 3 hours	0.531	£0.43
	An unexpected supply interruption for 3–6 hours	1.000	£0.81
	An unexpected supply interruption for 6–12 hours	1.000	£0.81
	An unexpected supply interruption for 12–24 hours	1.000	£0.81
	An unexpected supply interruption for over 24 hours and up to 48 hours	1.424	£1.15
	A planned supply interruption for 3-6 hours which is announced in advance	0.607	£0.49
Drinking water quality	**4 in 10,000 samples of tap water fail government standards but with no health impact**	1.000	£0.66
	4 in 10,000 samples of tap water seriously fail government standards affecting public health e.g. causing stomach upsets	3.540	£2.34
	4 in 10,000 samples of tap water seriously fail government standards causing a significant risk to health and requiring water to be boiled before use	2.571	£1.70
Discoloured water	Water with a smell and taste of disinfectant, earthiness or chemicals when it comes out of the tap	1.000	£2.17
	Discoloured water that is the colour of weak tea when it comes out of the tap (due to peaty water)	1.000	£2.17
	Discoloured water that is cloudy when it comes out of the tap (due to high pressure)	1.000	£2.17
Water restrictions	A reduction in the amount of water available for supply, but this would have no noticeable impact on customer water use	0.661	£0.20
	A reduction in the amount of water available for supply that would require voluntary restrictions on customer water use e.g. publicity campaigns	1.000	£0.31
	A reduction in the amount of water available for supply that would require a 5-month hosepipe ban occurring in any one year (May-September)	1.000	£0.31

DJS Research Ltd. 2017

Service measure	Levels of service	Normalises ORs	WTP for +1 improvement
	A reduction in the amount of water available for supply which would lead to emergency restrictions being imposed leading to standpipes in streets etc.	1.761	£0.55

Table 1 shows the severity level that customers would most wish to avoid is a failure in water quality that leads to health risks. This increased 'wish to avoid' is mirrored in a higher WTP estimate for the water quality service measure of £2.34. The varying levels of discoloured water all have the same WTP estimate because there are no significant differences to the base case that was presented to respondents in Work Package 1.

Table 2. Overview of results – sewer flooding and odour

Service measure	Levels of service	Normalises ORs	WTP for +1 improvement
Sewer flooding inside properties	Sewer flooding of a cellar	0.069	£0.06
	Sewer flooding of a living area	1.000	£0.92
Sewer flooding outside properties	Sewer flooding of minor roads	1.367	£0.77
	Sewer flooding of major roads	1.262	£0.71
	Sewer flooding inside your property boundary (but not indoors) which doesn't prevent normal access (e.g. flooding at the back of your garden away from normal access points)	0.884	£0.49
	Sewer flooding inside your property boundary (but not indoors) which prevents normal access (e.g. flooding outside of your property near a front or back door)	1.000	£0.56
	Sewer flooding causing social disruption (e.g. disruption to hospitals and schools)	3.977	£2.23
Odour	**Properties subjected to unbearable smells which come and go**	1.000	£0.58
	Properties subjected to chronic (seasonal) unbearable smells	0.707	£0.41

Table 2 shows the highest levels of avoidance for sewer flooding which causes social (e.g. to hospitals and schools). The base-case of sewer flooding of a living area shows a higher level of avoidance than cellar flooding. Across all the severity levels in the flooding and smells theme there are significant Odds (OR) showing there are strong preferences in some measures that respondents wish to avoid. An increase of almost £2.00 per customer is seen in WTP to avoid flooding that could impact schools and hospitals above the level of WTP for flooding outside a property when this was related to incidents within their property

boundary.

Table 3. Overview of results – environmental

Service measure	Levels of service	Normalises ORs	WTP for +1 improvement
Bathing water quality	One of the bathing water samples fails to meet government standards due to a temporary increase in pollution	0.492	£0.20
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard	1.000	£0.40
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard and it's 'Blue Flag' status	1.027	£0.41
Pollution incidents	A significant long-term impact on the environment; altering the smell and look of the water affected and having a substantial impact on aquatic life (e.g. a loss of over 50% of the fish population and damage to spawning areas for species such as salmon and trout)	3.153	£1.77
	A significant impact on the environment; altering the smell and look of the water affected and a having a noticeable impact on aquatic life (e.g. a loss of 10% to 50% of the fish population)	2.073	£1.16
	A minor localised impact on the environment; having a minimal impact on the quality of the water and a very small impact on aquatic life e.g. a small loss of larvae or fish species	1.000	£0.56
	Incident with no environmental impact	0.424	£0.24
Land conserved or improved by YWS	**Yorkshire Water do not conserve or improve any of the land they own or manage**	1.000	£0.56
	Yorkshire Water do not conserve or improve areas of plantation woodland on land they own or manage (e.g. pine and fir tree areas)	1.000	£0.56
	Yorkshire Water do not conserve or improve areas of broadleaved woodland on land they own or manage (e.g. oak and birch tree areas)	1.000	£0.56
	Yorkshire Water do not conserve or improve areas of grasslands and pastures on land they own or manage	1.000	£0.56
	Yorkshire Water do not conserve or improve areas of farmland on land they own or manage (e.g. areas used for growing crops)	1.000	£0.56
	Yorkshire Water do not conserve or improve areas of wetlands and marshes on land they own or manage	1.000	£0.56
	Yorkshire Water do not conserve or improve mountainous and moorland areas on land they own or manage	1.000	£0.56
	Yorkshire Water do not conserve or improve coastal areas on land they own or manage	0.859	£0.48

Service measure	Levels of service	Normalises ORs	WTP for +1 improvement
	Yorkshire Water do not conserve or improve areas greenspace on land they own or manage (e.g. public parks)	0.766	£0.43

Table 3 shows the highest levels of avoidance pollution incidents which have a significant long-term impact on the environment; altering the smell and look of the water affected and having a substantial impact on aquatic life (e.g. a loss of over 50% of the fish population and damage to spawning areas for species such as salmon and trout). Only slight differences in ORs are noted across the different land improved measures resulting in very similar WTP estimates at all levels. Pollution incidents have the widest range in WTP estimates with respondents willing to pay more than 3 times as much as the Work Package 1 estimates when the severity level is at the highest category of pollution incident.

Implications

The three service levels customers most want to avoid are:

- Sewer flooding causing social disruption (e.g. disruption to hospitals and schools).
- 4 in 10,000 samples of tap water seriously fail government standards affecting public health e.g. causing stomach upsets.
- A significant long-term impact on the environment altering the smell and look of the water affected and having a substantial impact on aquatic life.

When the odds ratios from the severity study are applied to the linear model results from Work Package 1, willingness to pay to avoid certain levels of service is highest for:

- 4 in 10,000 samples of tap water seriously fail government standards affecting public health e.g. causing stomach upsets (£2.34).
- Sewer flooding causing social disruption (e.g. disruption to hospitals and schools) (£2.23).
- Discoloured tap water (there is no difference between the three levels) (£2.17).

This is followed by significant impacts on the environment (£1.77 for a long-term impact – Category 4, and £1.16 for a Category 3) and by unexpected supply interruptions of over 24 hours and up to 48 hours (£1.15). When looking at differences between sub-groups, it becomes apparent that customers who fall into the definitions of vulnerability are more likely to want to avoid the three service level areas that have the highest levels of overall avoidance.

Customers who have experienced a (similar) issue to those top three service levels are more likely to want to avoid than those who haven't had the experience. However, for service areas that customers are less likely to want to avoid overall, differences in avoidance between those who have and haven't experienced are smaller.

Care should be taken when using the ORs and WTP estimates for the Land Improvement levels. There is little differentiation between levels and there is evidence that some customers found it difficult to choose. A validation question shows that customers would actually prioritise improvements to coastal areas, followed by broadleaved woodland and arable farmland.

PR19 Understanding Customer Values: Willingness to Pay, Work Package 2 Report

November 2017

Ali Sims, Research Director
asims@djsresearch.com

Rachel Waddington, Statistician
rwaddington@djsresearch.com

Matt Prince, Research Manager
mprince@djsresearch.com

3 Pavilion Lane, Strines,
Stockport, Cheshire, SK6 7GH

+44 (0)1663 767 857
djsresearch.co.uk

JN4604

Contents

This document has been prepared by DJS Research Ltd (DJS), consisting of the following project team:

Ali Sims – Research Director

Rachel Waddington – Statistician

Matt Prince – Research Manager

A table of contents is provided below:

Appendix 1 - approach

Design and interviewing summary

Surveys were designed by DJS Research, Yorkshire Water and Aecom, with input from London Economics and the Yorkshire Water Customer Forum Group. A detailed outline of the conceptual approach to the survey design is provided in the *Conceptual summary* (p.10) section.

Prior to conducting the main fieldwork, a pilot phase testing the survey was conducted in August 2017.

The pilot phase of the fieldwork consisted of 15 CAPI interviews, and 50 online interviews.

The purpose of the pilot phase was to validate the survey structure and design, with the aim of refining the approach and questions ahead of the main fieldwork period.

CAPI interviews in the pilot phase were conducted by experienced interviewers who were accompanied by a member of the DJS Research team, who were present to observe the interviews.

The findings of the pilot phase suggested that the surveys were well understood by customers, but that some refinement of approach was required to optimise the survey design and validity.

Main stage surveys

Pictorial show cards and choice experiment grids were created to aid respondent understanding of the concepts displayed (examples of the show cards are shown from p.13). In addition, show cards were created to deliver information to respondents about Yorkshire Water's responsibilities. CAPI respondents were provided with bound, laminated booklets of the show cards and example grids, while online respondents were shown 'dynamic' on screen images which re-sized according to the device used.

The survey designs

This section outlines the final survey design mechanics. The survey consisted of six main question sections:

- **Screening questions** to establish respondent suitability for the survey:
  - The respondent does not work in any conflict professions (Journalism, advertising, market research, PR, the water industry or the Environment Agency)
  - The respondent has their water and sewerage services provided by Yorkshire Water;
  - And, has sole or joint responsibility for paying the water bill
- **Max diff exercise** here the sample split, with a focus on one of the three key service areas. Respondents were shown 6 grids of potential service issues

DJS Research Ltd. 2017

relating to their key service areas with differing levels of severity. At each screen respondents were asked to select the scenario they most wanted to avoid

- The MaxDiff element was included in the questionnaire in order to check the validity of the CE results. The dual-response MaxDiff exercise had 6 repetitions and respondents were asked to select the individual water service issue they would most like to avoid from a set of issues. The dual-response element involves a supplementary question where respondents rate whether some, all or none of the issues presented to them in the exercise were problematic to them.

- **Choice experiment blocks** respondents were shown two scenarios relating to the same service level attributes within key service area, and asked to select which of the two options was the worst (as a collective) – and therefore, again asked to choose which they would most like to avoid
  - Respondents were provided with show cards for each of the service level attributes, before being asked to make their choices;
  - Respondents were shown 6 choice cards per service area. Prior to making their choices respondents were provided with an example choice card and an explanation of the questions they would be asked.

- **Choice experiment validation questions** to establish the extent to which the respondent had understood the concepts and questions they were faced with, and to understand the rationale behind the respondent's decision making

- **Land conservation question** all respondents were shown a picture of 8 types of land owned/managed/maintained by Yorkshire Water and asked to pick their 1st and 2nd choices for the types of land they would like to be maintained or improved out of the 8 shown.

- **Classification and demographic questions** to provide the basis for sub-group analysis

Interviewing

Interviews were conducted using the following approaches:

- **Computer Aided Personal Interviewing (CAPI):** surveys were conducted in the customer's home on a tablet device and were interviewer led. Interviewers were provided with quotas to complete, and sampling points by region were designed to provide a robust representation of customers across Yorkshire.

- **Online panel interviews:** surveys were completed by the respondent online. Quotas on participation were set to ensure a representative sample of customers and respondents were sourced through panel providers.

The use of a CAPI approach, in conjunction with online panel, was used in order to reach customers and communities that may be underrepresented online.

Surveys lasted, on average, 12 minutes online and 17 minutes on CAPI.

Interviews were conducted from 31st August to 12th October 2017.

DJS Research Ltd. 2017

Sample

The following split of interviews across household quota groups was achieved:

Table 4: Interviews

	Sample A		Sample B		Sample C	
	CAPI	**Online**	**CAPI**	**Online**	**CAPI**	**Online**
Male	34	126	37	118	32	101
Female	71	169	69	187	72	185
Prefer not to say / Transgender / Non-binary	-	7	-	2	-	6
18-34	21	66	22	69	15	63
35-44	18	55	27	54	23	55
45-54	30	68	15	69	16	65
55-64	13	51	23	53	23	57
65+	23	62	19	62	27	52
North Yorkshire	18	56	17	56	18	52
East Yorkshire	15	40	11	41	11	32
South Yorkshire	42	77	40	79	37	81
West Yorkshire	30	129	38	131	38	127
ABC1	40	168	35	180	40	163
C2DE	65	134	71	127	66	129
Metered	45	156	46	147	47	140
Unmetered	59	139	58	153	59	143
Total	**407**		**413**		**396**	

Conceptual summary

This section provides an overview of the concepts and theories that underlie the stated preference methods.

Estimating customer preference

The relative importance of the frequency and/or severity levels of an issue relating to household customers' water service is quantified through a choice experiment where customers are shown examples of issues related to their water service and are asked which scenario they would most like to avoid.

The data collected from these choice experiments is analysed using economic modelling. Two models are considered in the analysis of respondents' choices; the Multinomial Logit model and the Random Parameter mixed model. The Multinomial Logit model explains the likelihood of an option being chosen by a respondent by the attributes of the service (for example, that an interruption to water supply lasts between 3 and 6 hours) and the characteristics of the respondent. The random parameter logit model allows for the assumption that different variables influence individual respondents in different ways. In other words, the coefficients could vary between individuals.

The different severity/frequency levels evaluated in this research are specific to the water service. Some of the water services have quasi-linear levels, for example the interruption to water supply service includes levels relating to the length of the unplanned interruption from level 1 '<3 hrs' to level 5 '24 to 48 hrs' but the majority of water service levels are non-linear, for example sewer flooding outside the property has levels relating to flooding of property boundaries and level relating to flooding of local infrastructure. These severity/frequency levels are therefore treated as non-linear variables with no ordering so that no restrictive assumptions are applied to the levels. Each water service has dummy coded binary variables defined for each level of each water service.

Although the levels are non-linear we do have some a priori expectations which will help us to assess the goodness of fit of the different models, for example, we would expect water quality issues that may pose a risk to health to have higher 'wish to avoid' levels compared to no health risk scenarios or internal flooding of a cellar to have lower 'wish to avoid' levels than 'flooding of living areas'.

Comparing the 'fit' for each model

There is no single criterion by which a model can be identified as the 'correct' or 'best' model. Models are assessed on a wide range of criteria including:

- goodness-of-fit of the model: across various goodness-of-fit criteria, including log-likelihood; AIC; BIC; HQIC; McFadden pseudo R^2, AdjR^2; etc.;
- Positive or negative coefficients: do the signs conform to a priori expectations: that is, are coefficients higher for 'in home' flooding than 'cellar only' flooding;
- statistical significance of the coefficients: are the coefficients statistically significant?

DJS Research Ltd. 2017

A pseudo-R^2 is a measure of goodness of fit: the higher the pseudo-R^2 value, the greater the ability of the model to explain the choice data. A pseudo-R^2 value of 0.12 is considered good for Conditional Logit models employing cross-sectional data (Breffle and Rowe, 2002).

Checking the validation of the estimates

An important component of the analysis of stated preference data is to assess validity. Evidence in support of the validity of the results can be found in a variety of ways. There are generally two types of validity tests that researchers employ in stated preference exercises: content validity and construct validity.

Content validity

Content validity refers to whether the survey questionnaire succeeded in achieving meaningful and accurate measures of the respondents' water service preferences. Content validity can be affected by the information provided to respondents or the structure of the questionnaire. We can use data from other questions in the survey to determine if problems with content validity are evident.

It is important to identify if there are any systematic biases in responses (i.e. a respondent always choosing the same first option for example). In addition, for CAPI (Computer Aided Personal Interview) surveys interviewers report on respondents' understanding and ability to pick between the options presented in the CE exercise and provide additional feedback about how individual respondents have engaged with the task.

Construct validity

In addition to content validity, stated preference studies are often subjected to tests of construct validity, which examine whether or not the results are consistent with external evidence and expectation. Construct validity is generally broken down into two categories: convergent validity and theoretical validity.

Convergent validity

Convergent validity refers to the comparison of relative preference results for the same water service derived by different methods. Our study incorporates both CE and MaxDiff exercises to quantify relative preferences. The results from each method are compared to determine areas of commonality and any differences.

Theoretical validity

Theoretical validity involves testing the study results against the a priori expectations. If the results show that the quasi-linear levels show decreasing preference, this provides further evidence that the results conform to expectations and are theoretically valid.

For example, we expect to see that customers are more likely to wish to avoid a 24-hour interruption to water supply compared to a 3-6 hr interruption.

DJS Research Ltd. 2017

Stated preference survey design and testing

This section presents the methodology applied for designing, testing and implementing the present study with the CE and Max Diff components.

MaxDiff

The MaxDiff element was included in the questionnaire in order to check the validity of the CE results. The dual-response MaxDiff exercise had 6 repetitions and respondents were asked to select the individual water service issue that they would most like to avoid from a set of issues. The dual-response element involves a supplementary question where respondents rate whether some, all or none of the issues presented to them in the exercise were problematic to them.

Choice experiment themes

The choice experiment element investigated in this research is a pairwise discrete choice exercise which focuses on the scenario a customer would most wish to **avoid** rather than the scenario they would prefer. Respondents were shown two scenarios which detailed the severity of different service measures in their theme. The exercise had a number of follow up questions to ascertain how easily the respondent could make their choice and their motivations for choosing each scenario.

The choice experiment blocks and service level attributes to be tested within the survey were created and refined over a period of weeks by Yorkshire Water, Aecom and DJS Research. Three choice experiment themes were tested: Water quality and interruptions; flooding and smells, and environment.

A split sample approach was taken with respondents required to complete the CE relating to one of the three themes. These four blocks of service measures formed the basis of CE1 to CE3 respectively. An experimental design was produced for each of these blocks.

Designs that are both orthogonal (when the services that are being valued are uncorrelated) and balanced (when each level occurs equally often) are often used in choice experiments. The complex design and level specification did not lend itself to a standard design format since the number of levels within each service measure ranged from 2 to 9. A fractional factorial design was used for the design of both the CE and MaxDiff scenarios. The Water Quality and Interruptions design produced 74 choice cards, 82 for Flooding and Smells and 77 for Environment. In each choice experiment, respondents were shown 4 pairs of choice cards showing each of the service measures at varying severity levels and asked to pick which of the two options they would most want to avoid. In the MaxDiff exercise, respondents were shown 6 sets of the water service severity levels and asked which of the individual levels they would most want to avoid.

When creating the scenarios for the MaxDiff exercise, the pollution incident L=4 'a pollution incident with no environmental impact' was removed from the design as the level did not have any impact with which to trade-off against other service measures.

Choice experiment blocks

The choice experiment blocks and service level attributes to be tested within the survey were created and refined over a period of weeks by Yorkshire Water, Aecom and DJS Research. Three choice experiment blocks were tested: water quality and interruptions, flooding and smell, and environment.

Water quality and interruptions

Four types of water quality and interruption issues were covered in the study. For each of the service level attributes a visual show card was designed to aid respondents' understanding of each of the attributes. The show cards presented are shown below.

- **Unexpected supply interruption:**

When you turn on your tap you expect the water to flow. You can rely on this to happen almost all the time but for various reasons your supply can be interrupted.

Sometimes this is unexpected (for example due to a burst pipe), so you would not be warned in advance, and you would not know how long it would last.

Showcard M

Unexpected supply interruption
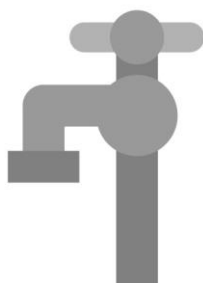
41,000 properties a year affected by an unexpected supply interruption

Yorkshire Water performance at 2020

- **Drinking water quality:**

The Drinking Water Inspectorate (DWI) is a government body which sets very strict drinking water standards to protect public health and to ensure water quality is acceptable to consumers.

The standards cover the presence of micro-organisms such as bacteria, chemicals (such as nitrates & pesticides) and metals, the way the water looks and how it tastes.

Every year, Yorkshire Water conducts more than 500,000 tests on samples taken from customers' taps. A sample may fail the test, due to local factors e.g. a leak or burst pipe can disturb sediment in the pipes which can make the water unclear. In most cases the water is safe to drink.

Showcard N

Drinking water quality

9,996 out of 10,000 samples will pass the DWI's requirements for chemical & biological content

Yorkshire Water performance at 2020

- **Taste, smell & colour of drinking water:**

Every year some customers will contact Yorkshire Water if their water is discoloured e.g. cloudy, milky or brown or has an unpleasant taste or smell.

In these instances the water is very unlikely to cause illness, but may put customers off drinking it or using it for washing clothes and cleaning.

Taste, smell & colour of drinking water

Showcard O

6,000 customer contacts a year concerned with discolouration, taste or smell of their drinking water

Yorkshire Water performance at 2020

- **Voluntary water restrictions**

Seasonally low rainfall and low capacity in Yorkshire Water's reservoirs can impact on water supplies. When supplies are low, you may be unable to use a hosepipe for any or all of the following uses at home:

- Watering your garden or plants
- Cleaning your car or boat
- Cleaning walls, windows, paths, patios or other surfaces at home
- Filling a pond

- Filling or maintaining a domestic swimming pool, paddling pool or ornamental fountain
- Other recreational use at home (e.g. children's play).

Yorkshire Water would let you know about the ban through local meetings, newspaper adverts, media press releases, press conferences and their website.

Voluntary water restrictions

Showcard P

1 in 25 chance of a 5 month hosepipe ban in any one year (May – September)

Yorkshire Water performance at 2020

Flooding and smell

Three types of flooding and smell issues were covered in the study. For each of the service level attributes a visual show card was designed to aid respondents' understanding of each of the attributes. The show cards presented are shown overleaf.

- **Sewer flooding inside properties**

Internal sewer flooding is where human waste and other things people flush down their toilets enter your property by 'backing up' through toilets or sinks or comes in from outside. It is unpleasant and distressing to those affected.

Internal sewer flooding can also be caused by heavy rainfall, or because the sewer has been damaged or has collapsed. Sometimes, it is out of Yorkshire Water's control e.g. when large volumes of water run off the fields, rivers overflow or if there are problems with private drains.

Showcard R

Sewer flooding inside properties

1,900 Incidents of sewer flooding inside properties per year

Yorkshire Water performance at 2020

- **Sewer flooding outside properties**

These are incidents of sewer flooding affecting external areas such as roads, car parks, footpaths, public open spaces, fields, agricultural land and woodland.

They happen if the sewer system backs up, either because the rainfall is so heavy it has filled the sewer system, or because the sewer has become blocked or damaged.

Showcard S

Sewer flooding outside properties

10,500 Incidents per year of flooding outside customers' homes but on their land

Yorkshire Water performance at 2020

- **Smell from sewers and sewage treatment works**

Unpleasant smells from sewers & treatment works can affect properties including houses, flats and business premises.

They may experience such smells on certain days or at certain times of the year e.g. when it is warm or windy. The sale value of their home may be affected by being in an area which is affected by the odour.

Showcard T

Smell from sewers & treatment works

6,000 complaints to Yorkshire Water per year because they are affected by smells from sewers & treatment works

Yorkshire Water performance at 2020

Environmental

Three types of flooding and smell issues were covered in the study. For each of the service level attributes a visual show card was designed to aid respondents' understanding of each of the attributes. The show cards presented are shown below.

- **Bathing water quality**

Water at beaches officially designated for people to swim, has to meet tight quality and safety standards. There are 19 bathing water sites in Yorkshire including Scarborough, Bridlington, Filey, etc.

Based on EU bathing water standards, good or excellent bathing water quality is where no more than two people in every 100 become ill as a result of bathing in the sea at these sites (e.g. with a sore throat or ear infection).

There are several awards for which beaches in Yorkshire can qualify. To achieve the awards a number of standards have to be met, including provision of toilets and lifeguards etc. not all of which fall under Yorkshire Water's remit.

Showcard V

Bathing water quality

Yorkshire Water performance at 2020 **15** out of 19 beaches at *good* or *excellent* standard, four of which have 'Blue Flag' status

- **Pollution incidents**

This is where Yorkshire Water's sewerage system causes pollution when unexpected sewage escapes into rivers and streams. This includes incidents where pollutants enter watercourses, causing an environmental impact.

These can be anything from serious incidents, which can have long-term and extensive effects on water quality (e.g. a loss of over 50% of the fish population and damage to spawning areas for species such as salmon and trout), to minor pollution incidents which can have minimal effects on water quality (a very small impact on aquatic life e.g. a small loss of larvae or fish species).

Showcard W

Pollution incidents

210 minor pollution incidents per year which have a minimal impact on the quality of water in the area

Yorkshire Water performance at 2020

- **Land conserved or improved by Yorkshire Water**

Choice experiment examples

Examples of the choice experiment grids presented to respondents to make their stated preference choices against each of the service level areas are shown below.

- **Water quality and interruptions**

- **Supply of water**

- **Environmental**

Land improvement choices

Respondents were also shown an image showing 8 types of land that Yorkshire Water own/manage/maintain, and were asked to select 2 of the 8 (a first choice and second choice) for Yorkshire Water to maintain or improve service on:

Appendix 2 – results and findings

Introduction

This section of the report presents the main findings from the Work Package 2 survey. Target quotas were applied to gender, region, age, metered status and SEG. Data were weighted to reflect the population.

A total of 1,216 interviews were conducted, with a split of 901 online interviews and 315 CAPI interviews. The sample was split three ways with c. 400 respondents completing each of the choice experiments (c.300 online and c.100 CAPI interviews).

Respondent profile

The image below shows a demographic sample overview for the total sample on an unweighted basis.

Figure 1: Household sample
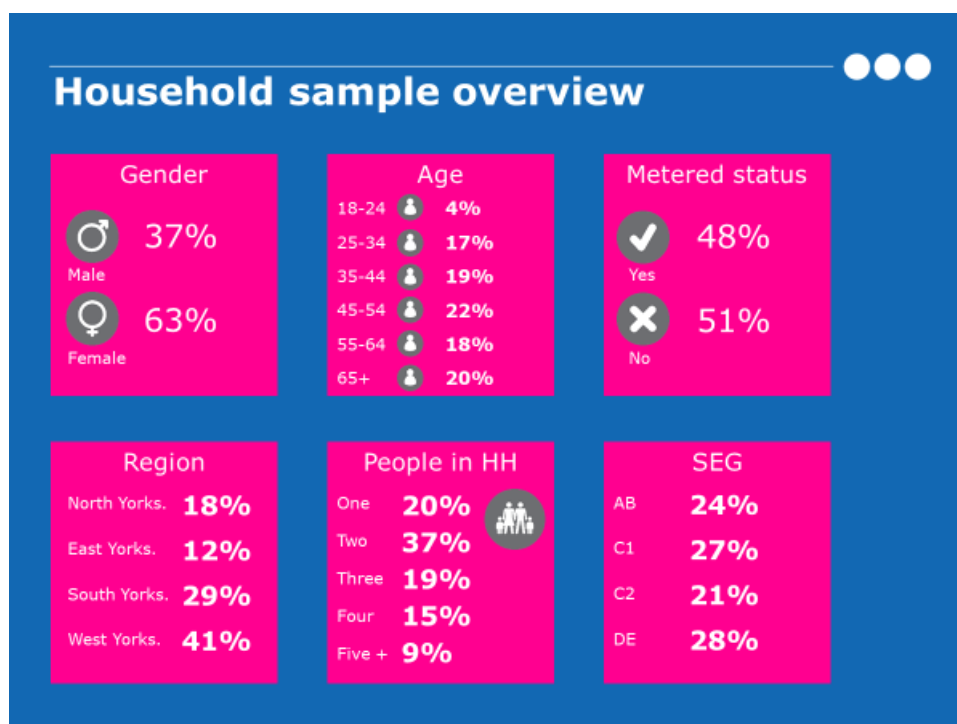
Sub-group analysis

The analysis section of this report includes data and analysis of various customer groups. Firstly, demographic groups, as outlined above are analysed, and any differences in attitude or outcome are either presented in chart form, or discussed in the report commentary. In addition, two further sets of customer groups are analysed:

- Customers in vulnerable circumstances vs. customers not in vulnerable circumstances

DJS Research Ltd. 2017

- Customers who have experienced service issues/outages in the past three years vs. customers who haven't

The next two sections discuss the make-up of the variables outlined above.

Customers in vulnerable circumstances

In order to identify customers who might find themselves in vulnerable circumstances a number of questions were asked to respondents. Firstly, customers were asked to rate the extent to which they agreed with three statements relating to the affordability of water bills. Two statements dealt with concerns about paying water bills ("I worry about not being able to afford my water bill" and, "I already can't afford my water bill"), and one statement concerned not thinking too much about water bills ("I don't really think about my water bill it's just something I have to pay")

Figure 2: Water bill affordability – household
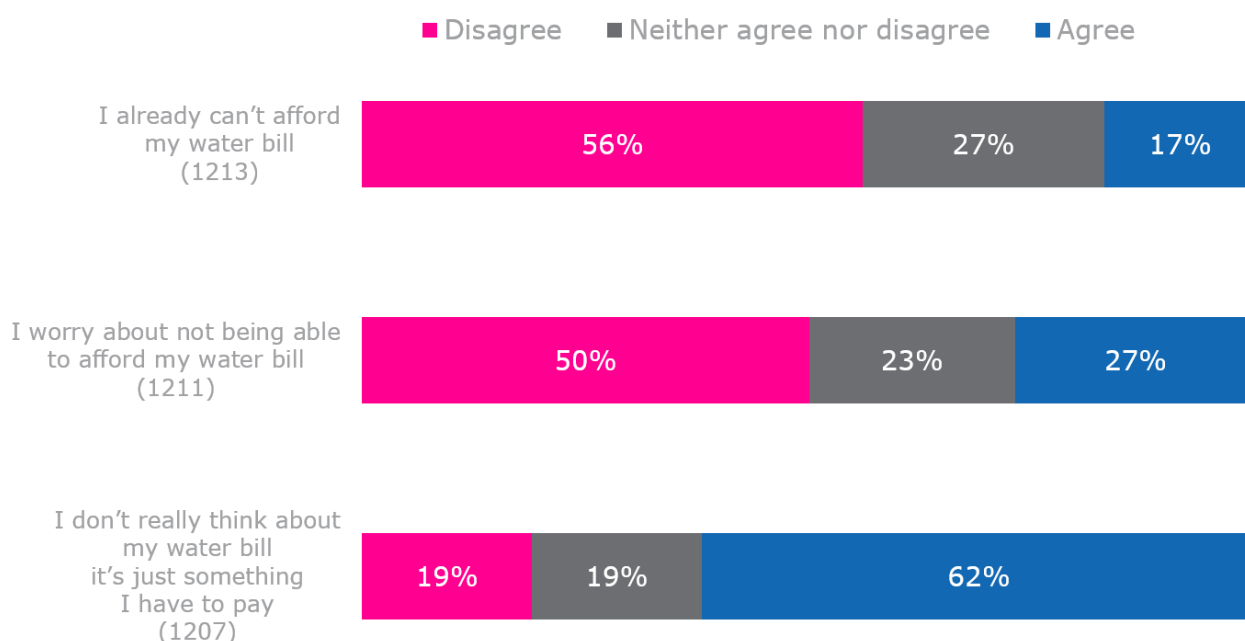
Base: all household respondents, excluding don't knows (as shown)

In the first iteration of the *customers in vulnerable circumstances* variable, customers who strongly or slightly agreed with either of the top two sentiments were classed as 'bill vulnerable'. However, as the analysis progressed, it became clear that the definitions of vulnerability were too broad as to be useful, so a secondary analysis of customers who agreed strongly with either of the top two sentiments was undertaken.

Towards the end of the survey respondents were asked whether they are in receipt of any of the following benefits (please note: fieldwork was carried out during the period of Universal Credit roll out. Benefit brackets were used from the pre-Universal Credit list):

DJS Research Ltd. 2017

- Housing benefit
- Jobseekers allowance
- Working tax credits
- Child tax credits
- Employment and Support Allowance
- Pension Credit
- Universal Credit
- Disability Living Allowance

Figure 3: Customers in receipt of benefits
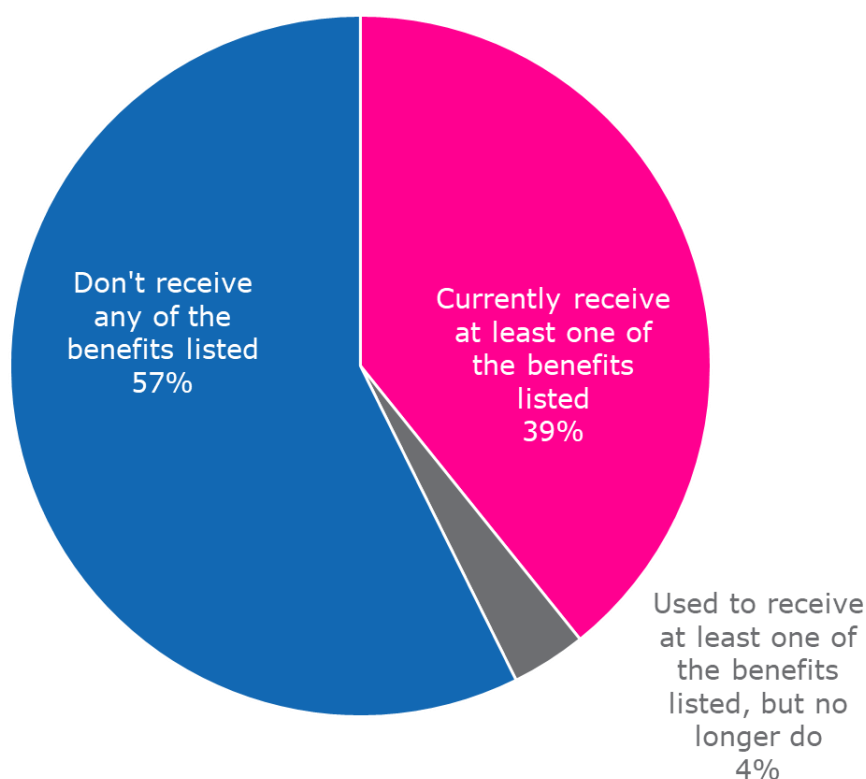
Base: all respondents

Additionally, respondents were also asked how many people there are in their household, and their household income. Households of fewer than four people with an annual income of <£10,000, or with four or more residents and a household income of <£20,000 are also included in definitions of customers in vulnerable circumstances.

Additionally, questions were also asked in order to establish the number of respondents who might be considered vulnerable due to them (or someone in the household) having a physical or mental disability, and/or or a learning difficulty.

DJS Research Ltd. 2017

Figure 4: Households with someone registered disabled, or suffering from a severe medical condition
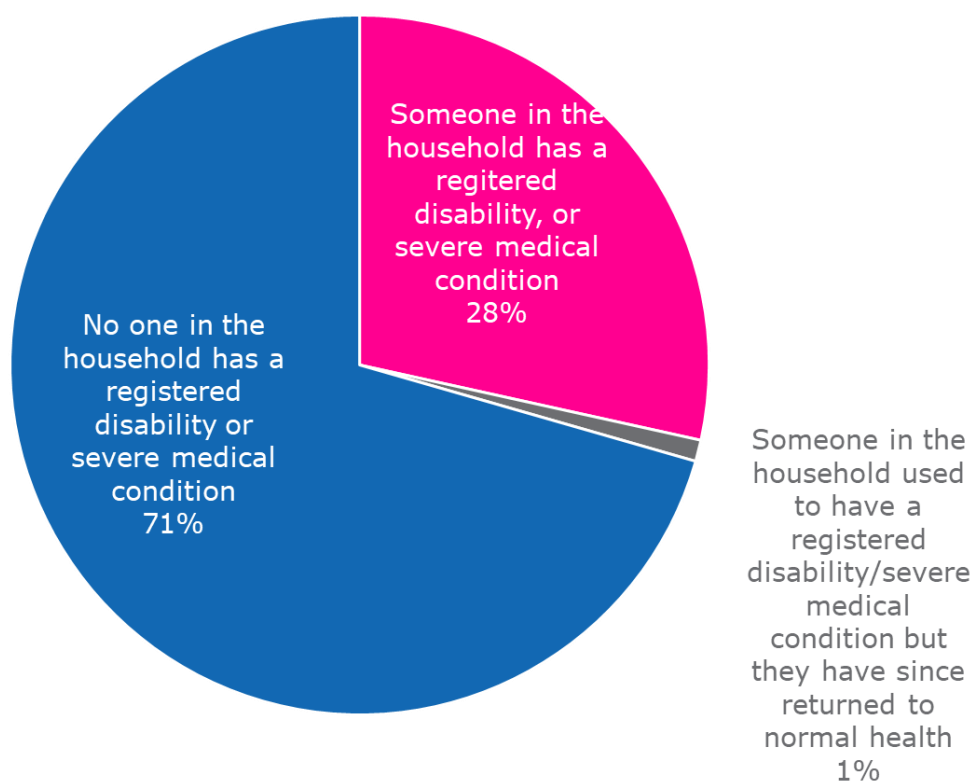
In total, 346 (28%) respondents record themselves, or someone in their household as having a disability or a learning difficulty. Of these, 97 (8%) say that the disability has an impact on the way in which water is used or needed. Only 21 of the 346 respondents in this category are not a part of other possible definitions of vulnerability.

Customers were also asked whether English is spoken as a first language, or not. Overall, only 31 (3%) interviews with respondents where English is not their 1st language were recorded – meaning there isn't a sufficient base of responses to include as a separate (robust) definition of vulnerability due to language circumstances.

Based on the possible indicators of vulnerability discussed, four definitions have been created, and are used for additional analysis later in the report:

- **Possible vulnerability:**
    - respondents who agree, strongly or slightly, with either of the two bill struggle statements, and/or;
    - report being in receipt of benefits, and/or;
    - report someone in the household having a disability and/or a learning difficulty, and/or;
    - live in a household of <4 people and have an annual household income of <£10,000, or live in a household of 4+ people and have an annual household income of <£20,000

This definition of potential vulnerability resulted in 62% of the sample being flagged. Based on this large proportion, it was felt that a 'stricter' definition of vulnerability was required in order to truly understand whether any differences in attitude or WTP exist between customers in different circumstances. Therefore, a second definition of vulnerability was created:

- **Focussed vulnerability:**
    - respondents who agree strongly with either of the two bill struggle statements, and or;
    - respondents who receive help to pay their water bill, and/or;
    - report someone in the household having a disability that impacts on the way water is used/consumed

This more focussed definition resulted in 22.2% of the sample being flagged as vulnerable.

In addition to these two definitions of vulnerability, 2 further definitions were created and analysed in order to provide data comparability across Work Packages:

- **Financially vulnerable:**
    - respondents who agree, strongly or slightly, with either of the two bill struggle statements; and/or;
    - Receive(d) help to pay a bill, and/or;
    - Receive(d) benefits, and/or;
    - live in a household of <4 people and have an annual household income of <£10,000, or live in a household of 4+ people and have an annual household income of <£20,000
- **Health vulnerable:**
    - respondents aged 75+, and/or;
    - respondents who report someone in the household having a disability
        - Note: within the sample, there are only two incidences of customers over 75 not also reporting a disability in the household

DJS Research Ltd. 2017

The financially vulnerable definition covers 43.2% of the sample, and the health vulnerable definition covers 24.3% of the definition.

Service experiences

In order to include an additional layer of understanding to respondent reactions in the stated preference exercises, respondents were asked whether they had ever experienced any of the following water related issues whilst living in Yorkshire. The table below shows the proportion of respondents reporting having experienced each issue.

Figure 5: Water issues experienced - household
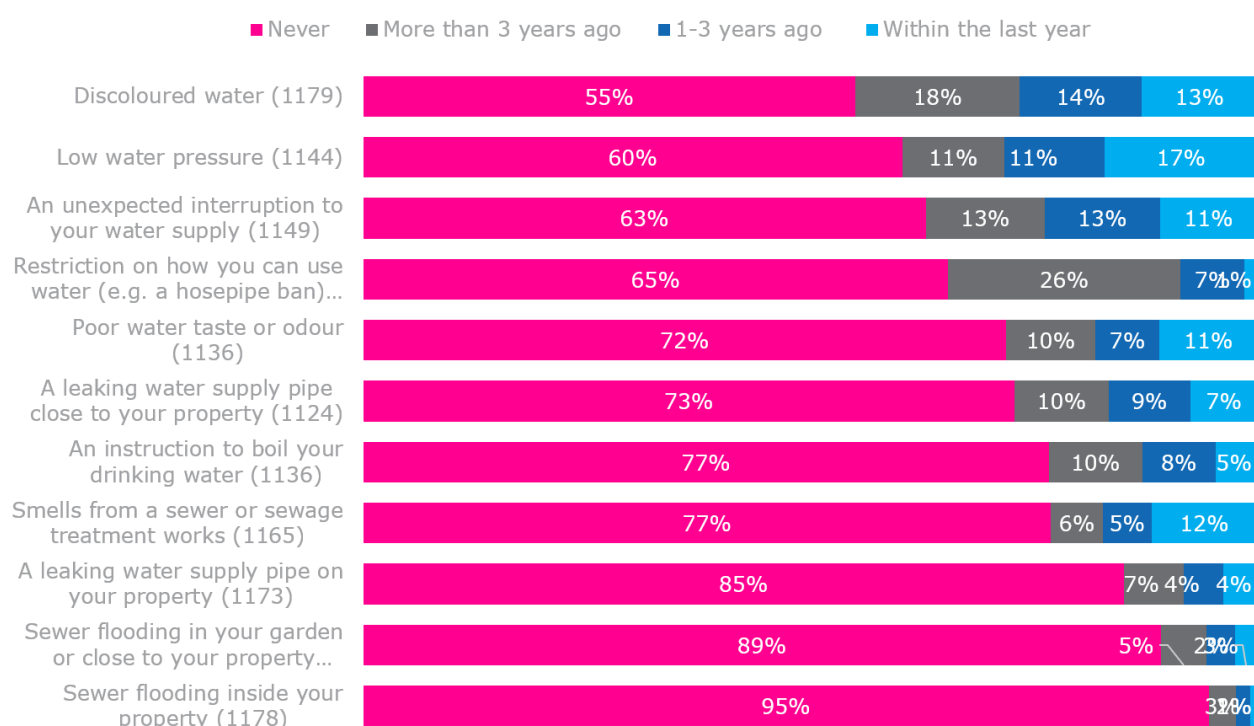
Base: all household respondents excluding don't know per issue (as shown)

The 17% of respondents who said they had experienced smells from sewers or sewage treatment works in the past three years were asked a follow up question about where they experience the issue. Of those respondents, 50 (25%) said they'd experienced the smells only at their property, and 38 (19%) said they'd experienced smells caused by sewers/sewage treatment works both at their property and when out. The remainder (56%) either couldn't remember where they'd experienced the smells, or had only experienced them when passing near a sewer/sewage treatment works.

Overall, 278 (23%) have never experienced any of the incidents listed, and 430 (35%) have not experienced any of the incidents listed in the past 3 years. In the past 12 months 469 (39%) have experienced at least one of the incidents listed.

DJS Research Ltd. 2017

Respondents were also asked whether they had visited a beach and/or river in Yorkshire before – and if so, when. 18% have visited a river in Yorkshire in the past 12 months, and 23% have visited a beach. 15% have visited both in the past year. Only 1% have never visited a river in Yorkshire, and only 3% have never visited a beach.

Analysis and results

In this section the Water Service Severity choice task data are analysed using discrete choice models where both Multinomial Logit and Random Parameter specifications can be estimated. The model estimates the 'wish to avoid' specific water service issues in terms of the change in utility associated with each issue.

The Multinomial Logit model is a standard technique that models the choices people make based on the different choices that were presented. The model specifies a coefficient for each of the different service measure severity levels excluding the base case which is the level that related directly to the measure presented in the stated preference exercise in WP1 for household customers. The Random Parameter Logit model relaxes some of the conditions associated with the Multinomial Logit model (The Multinomial Logit model assumes that the odds ratio of any two categories are independent of all other response categories. For example, if we introduced a new flooding severity level 'flooding inside the property with only minor damage to fixtures and fittings', this assumption states that the preference shares of all other options would be affected proportionally equally).

The specification for the Multinomial Logit model is detailed in the main section of the results since this model is also used in the Odds Ratio calculations that follow.

The analysis uses dummy coding for each explanatory variable. Each severity level of each service measure is coded into a binary (1,0) variable for presence on the choice card that the respondent was examining. Customer preferences for each severity level are estimated relative to the 'base case' which is the level shown in WP1. This provides a consistent 'anchor' for subsequent application of the results from WP1 to WP2. A severity level that respondents have a greater wish to avoid will have a positive coefficient; levels that have a lower wish to avoid than the base case will have a negative coefficient.

Each 'theme' is analysed separately since the respondents interviewed in each theme are mutually exclusive.

Discrete choice analysis – Multinomial Logit model results for households

Water quality and interruptions

Table 5 below presents results from the Multinomial Logit model water quality and interruptions data.

Table 5: Water Quality and Interruptions Choice Experiment

Service measure	Levels of service	Coefficients	Prob.|z|>Z
Unexpected interruptions	An unexpected supply interruption for less than 3 hours	-0.633*	0.001
	An unexpected supply interruption for 3–6 hours		
	An unexpected supply interruption for 6–12 hours	0.205	0.284
	An unexpected supply interruption for 12–24 hours	0.233	0.223
	An unexpected supply interruption for over 24 hours and up to 48 hours	0.354*	0.033
	A planned supply interruption for 3-6 hours which is announced in advance	-0.499*	0.012
Drinking water quality	**4 in 10,000 samples of tap water fail government standards but with no health impact**		
	4 in 10,000 samples of tap water seriously fail government standards affecting public health e.g. causing stomach upsets	1.2604**	0.000
	4 in 10,000 samples of tap water seriously fail government standards causing a significant risk to health and requiring water to be boiled before use	0.944**	0.000
Discoloured water	Water with a smell and taste of disinfectant, earthiness or chemicals when it comes out of the tap	0.139	0.343
	Discoloured water that is the colour of weak tea when it comes out of the tap (due to peaty water)		
	Discoloured water that is cloudy when it comes out of the tap (due to high pressure)	-0.016	0.913
Water restrictions	A reduction in the amount of water available for supply, but this would have no noticeable impact on customer water use	-0.414*	0.011
	A reduction in the amount of water available for supply that would require voluntary restrictions on customer water use e.g. publicity campaigns (local press/radio)	-0.036	0.826
	A reduction in the amount of water available for supply that would require a 5-month hosepipe ban occurring in any one year (May-September)		

DJS Research Ltd. 2017

	A reduction in the amount of water available for supply which would lead to emergency restrictions being imposed leading to standpipes in streets etc	0.566**	0.000

* Indicates statistical significance at 5% level ** statistical significance at 1% level Base cases are highlighted in bold

The main findings of this analysis are:

- As expected, the greater the length of an unexpected interruption, the more a respondent wishes to avoid this situation. An unexpected interruption of less than 3 hours has a significantly lower coefficient than the base case of 3-6 hours, meaning that customers are significantly more averse to a 3-6-hour interruption compared to less than 3 hours. Whilst the coefficients increase for each increase in length of interruption, it is only when interruptions of more than 6 hours reach the level of 24-48 hours that the coefficient becomes significant compared to the base case.
- The 2 levels of water quality severity that have health risks associated with them have significantly positive coefficients and are therefore more likely to be chosen as 'wish to avoid' scenarios.
- When respondents considered the colour and taste of their water there were no significant differences in a preference to avoid between the different levels presented to respondents.
- A water restriction that had no noticeable impact on supply had lower levels of 'wish to avoid' compared to the base case. Emergency restrictions were significantly more preferable to avoid.

The model fit results (pseudo r^2 and χ^2 test) indicate that the model provides a reasonable explanation of customer preferences for water service issues to avoid.

Table 6: Multinomial Logit model test statistics – water quality and interruptions

Model test statistics	
Pseudo r^2	0.194
LR χ^2	0.000
Observations	3256

Flooding and smell

Table 6 below presents results from the Multinomial Logit model flooding and smell data.

Table 6: Flooding and smells choice experiment

Service measure	Levels of service	Coefficients	Prob.|z|>Z
Sewer flooding inside properties	Sewer flooding of a cellar	-2.678**	0.000
	Sewer flooding of a living area		
Sewer flooding outside properties	Sewer flooding of minor roads	0.312**	0.000
	Sewer flooding of major roads	0.233**	0.000
	Sewer flooding inside your property boundary (but not indoors) which doesn't prevent normal access (e.g. flooding at the back of your garden away from normal access points)	-0.124**	0.000
	Sewer flooding inside your property boundary (but not indoors) which prevents normal access (e.g. flooding outside of your property near a front or back door)		
	Sewer flooding causing social disruption (e.g. disruption to hospitals and schools)	1.380**	0.000
Odour	**Properties subjected to unbearable smells which come and go**		
	Properties subjected to chronic (seasonal) unbearable smells	0.347**	0.000

* Indicates statistical significance at 5% level ** statistical significance at 1% level

Base cases are highlighted in bold

The main findings of this analysis are:

- As expected, a flooding incident affecting only the cellar has a negative coefficient meaning that this is less likely to be chosen as 'wish to avoid' compared to flooding of the living area.
- When considering the impact of sewer flooding outside the property, an incident which did not restrict access is less likely to be chosen as 'wish to avoid' compared to the base case where access is restricted. It is interesting to note that the societal impacts of road closure and disruption to schools or hospitals are all preferred to be avoided than the issues relating to their own property.
- Chronic seasonal smells are significantly preferred to be avoided than smells that come and go.

The model fit results (pseudo r^2 and χ^2 test) indicate that the model provides an excellent explanation of customer preferences for flooding and smell water service issues to avoid.

Table 7: Multinomial Logit model test statistics – flooding and smell

Model test statistics	
Pseudo r^2	0.300
LR χ^2	0.000
Observations	3304

Environment

Table 8 below presents results from the Multinomial Logit Model Environment theme data.

Table 8: Environment choice experiment

Service measure	Levels of service	Coefficients	Prob.|z|>Z
Bathing water quality	One of the bathing water samples fails to meet government standards due to a temporary increase in pollution	-0.709	0.000
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard		
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard and it's 'Blue Flag' status	0.027	0.767
Pollution incidents	A significant long-term impact on the environment; altering the smell and look of the water affected and having a substantial impact on aquatic life (e.g. a loss of over 50% of the fish population and damage to spawning areas for species such as salmon and trout)	1.148	0.000
	A significant impact on the environment; altering the smell and look of the water affected and a having a noticeable impact on aquatic life (e.g. a loss of 10% to 50% of the fish population)	0.729	0.000
	A minor localised impact on the environment; having a minimal impact on the quality of the water and a very small impact on aquatic life e.g. a small loss of larvae or fish species		
	Incident with no environmental impact	-0.858	0.000

DJS Research Ltd. 2017

	Yorkshire Water do not conserve or improve any of the land they own or manage		
Land conserved or improved by YW	Yorkshire Water do not conserve or improve areas of plantation woodland on land they own or manage (e.g. pine and fir tree areas)	0.118	0.263
	Yorkshire Water do not conserve or improve areas of broadleaved woodland on land they own or manage (e.g. oak and birch tree areas)	0.062	0.585
	Yorkshire Water do not conserve or improve areas of grasslands and pastures on land they own or manage	-0.169	0.329
	Yorkshire Water do not conserve or improve areas of farmland on land they own or manage (e.g. areas used for growing crops)	0.066	0.537
	Yorkshire Water do not conserve or improve areas of wetlands and marshes on land they own or manage	-0.071	0.533
	Yorkshire Water do not conserve or improve mountainous and moorland areas on land they own or manage	0.089	0.439
	Yorkshire Water do not conserve or improve coastal areas on land they own or manage	-0.152	0.041
	Yorkshire Water do not conserve or improve areas greenspace on land they own or manage (e.g. public parks)	-0.266	0.040

* Indicates statistical significance at 5% level ** statistical significance at 1% level

Base cases are highlighted in bold

The main findings of this analysis are:

- A temporary failure to meet standards is seen as less of an issue to customers than repeatedly failing standards in bathing water samples. There is little difference between this resulting in the loss of a blue flag status or not.
- Pollution incidents see great variation in the 'wish to avoid', with the worst category of pollution incident having a significant positive coefficient. A pollution incident that has no environmental impact has a strong negative coefficient.
- Variation in preference for the land improved measures is limited. The coefficient reaches statistical significance in only 2 measures, coastal and green spaces which both have negative coefficients. However, it is clear that some customers struggled with this question due to the non-linearity of the scale and a validation question found that in fact, coastal areas are the areas customers would most like to see improved and conserved.

The model fit results (pseudo r^2 and χ^2 test) indicate that the model provides an excellent explanation of customer preferences for Environmental service issues to avoid.

Table 9: Multinomial Logit model test statistics – environment

DJS Research Ltd. 2017

Model test statistics	
Pseudo r^2	0.357
LR χ^2	0.000
Observations	3168

Relative weights for severity levels in water services (odds ratios)

The results from the discrete choice models that examine preferences for water service severity levels can be used to calculate a set of preference weights for household customers. These preference weights are calculated as 'odds ratios' and indicate the relative priority that customers place on alternative levels.

Odds ratios are calculated as the exponent of the coefficient estimates for each option. The value for the base case in each service measure is EXP(0)=1. The application of the CE analysis reported above uses the Multinomial Logit model specification as this typically produces more conservative preference weights. Results from Random Parameter Logit specifications can in some cases give more exaggerated weights, due to the sensitivity to variation in respondent preferences (for example, respondents who live near a beach might always choose options that favour maintaining or improving beaches).

For illustration, the odds ratio (OR) for wishing to avoid a water quality issue that might have a health impact is calculated as:

OR[health impact] = EXP(coefficient estimate for health impact)

OR = EXP(1.26) = 3.54

The tables below display the Odds Ratios for each severity level by service measure by theme. The ORs are shown as a direct calculation from the Multinomial Logit coefficient (initial OR) and then as an adjusted OR where we account for the statistical significance of the original coefficient (adjusted OR). In the adjusted OR, where customer preferences were not statistically different from the base case, the weight for the severity level is set to unity (= 1.00).

The ORs can be used to calculate a WTP for each severity level. The WTP estimate is the product of the adjusted OR and the WTP (for a +1 level of service improvement) recorded in the stated preference WP1 study.

Table 10: Preference weights for water quality and interruptions services

Service measure	Levels of service	Initial OR	Adjusted OR	WTP for +1 level of service improvement
Unexpected interruptions	An unexpected supply interruption for less than 3 hours	0.531	0.531	£0.43
	An unexpected supply interruption for 3–6 hours	1.000	1.000	£0.81
	An unexpected supply interruption for 6–12 hours	1.228	1.000	£0.81
	An unexpected supply interruption for 12–24 hours	1.262	1.000	£0.81
	An unexpected supply interruption for over 24 hours and up to 48 hours	1.424	1.424	£1.15
	A planned supply interruption for 3-6 hours which is announced in advance	0.607	0.607	£0.49
Drinking water quality	4 in 10,000 samples of tap water fail government standards but with no health impact	1.000	1.000	£0.66
	4 in 10,000 samples of tap water seriously fail government standards affecting public health e.g. causing stomach upsets	3.540	3.540	£2.34
	4 in 10,000 samples of tap water seriously fail government standards causing a significant risk to health and requiring water to be boiled before use	2.571	2.571	£1.70
Discoloured water	Water with a smell and taste of disinfectant, earthiness or chemicals when it comes out of the tap	1.149	1.000	£2.17
	Discoloured water that is the colour of weak tea when it comes out of the tap (due to peaty water)	1.000	1.000	£2.17
	Discoloured water that is cloudy when it comes out of the tap (due to high pressure)	0.984	1.000	£2.17
Water restrictions	A reduction in the amount of water available for supply, but this would have no noticeable impact on customer water use	0.661	0.661	£0.20
	A reduction in the amount of water available for supply that would require voluntary restrictions on customer water use e.g. publicity campaigns (local press/radio)	0.965	1.000	£0.31
	A reduction in the amount of water available for supply that would require a 5-month hosepipe ban occurring in any one year (May-September)	1.000	1.000	£0.31
	A reduction in the amount of water available for supply which would lead to emergency restrictions being imposed leading to standpipes in streets etc	1.761	1.761	£0.55

The severity level that customers would most wish to avoid is a failure in water quality that leads to health risks. This increased 'wish to avoid' is mirrored in a higher WTP estimate for the water quality service measure of £2.34. The varying levels of discoloured water all have the same WTP estimate because there are no significant differences to the base case level that was presented to respondent in WP1.

Table 11: Preference weights for flooding and odour

Service measure	Levels of service	Initial OR	Adjusted OR	WTP for +1 level of service improvement
Sewer flooding inside properties	Sewer flooding of a cellar	0.069	0.069	£0.06
	Sewer flooding of a living area	1.000	1.000	£0.92
Sewer flooding outside properties	Sewer flooding of minor roads	1.367	1.367	£0.77
	Sewer flooding of major roads	1.262	1.262	£0.71
	Sewer flooding inside your property boundary (but not indoors) which doesn't prevent normal access (e.g. flooding at the back of your garden away from normal access points)	0.884	0.884	£0.49
	Sewer flooding inside your property boundary (but not indoors) which prevents normal access (e.g. flooding outside of your property near a front or back door)	1.000	1.000	£0.56
	Sewer flooding causing social disruption (e.g. disruption to hospitals and schools)	3.977	3.977	£2.23
Odour	Properties subjected to unbearable smells which come and go	1.000	1.000	£0.58
	Properties subjected to chronic (seasonal) unbearable smells	1.415	1.415	£0.82

Across all the severity levels in the flooding and smells theme we see significant Odds Ratios showing there are strong preferences in some measures that they wish to avoid. An increase of almost £2.00 per customer is seen in willingness to pay to avoid flooding that could impact schools and hospitals above the level of WTP for flooding outside a property when this was related to incidents within their property boundary.

Table 12: Preference weights for Environment

Service measure	Levels of service	Initial OR	Adjusted	WTP for +1 level of service improvement
Bathing water quality	One of the bathing water samples fails to meet government standards due to a temporary increase in pollution	0.492	0.492	£0.20
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard	1.000	1.000	£0.40
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard and it's 'Blue Flag' status	1.027	1.027	£0.41
Pollution incidents	A significant long-term impact on the environment; altering the smell and look of the water affected and having a substantial impact on aquatic life (e.g. a loss of over 50% of the fish population and damage to spawning areas for species such as salmon and trout)	3.153	3.153	£1.77
	A significant impact on the environment; altering the smell and look of the water affected and a having a noticeable impact on aquatic life (e.g. a loss of 10% to 50% of the fish population)	2.073	2.073	£1.16
	A minor localised impact on the environment; having a minimal impact on the quality of the water and a very small impact on aquatic life e.g. a small loss of larvae or fish species	1.000	1.000	£0.56
	Incident with no environmental impact	0.424	0.424	£0.24
Land conserved or improved by YW	Yorkshire Water do not conserve or improve any of the land they own or manage	1.000	1.000	£0.56
	Yorkshire Water do not conserve or improve areas of plantation woodland on land they own or manage (e.g. pine and fir tree areas)	1.126	1.000	£0.56
	Yorkshire Water do not conserve or improve areas of broadleaved woodland on land they own or manage (e.g. oak and birch tree areas)	1.064	1.000	£0.56
	Yorkshire Water do not conserve or improve areas of grasslands and pastures on land they own or manage	0.845	1.000	£0.56
	Yorkshire Water do not conserve or improve areas of farmland on land they own or manage (e.g. areas used for growing crops)	1.068	1.000	£0.56

DJS Research Ltd. 2017

	Yorkshire Water do not conserve or improve areas of wetlands and marshes on land they own or manage	0.932	1.000	£0.56
	Yorkshire Water do not conserve or improve mountainous and moorland areas on land they own or manage	1.093	1.000	£0.56
	Yorkshire Water do not conserve or improve coastal areas on land they own or manage	0.859	0.859	£0.48
	Yorkshire Water do not conserve or improve areas greenspace on land they own or manage (e.g. public parks)	0.766	0.766	£0.43

Only slight differences in ORs are noted across the different land improved measures resulting in very similar WTP estimates at all levels.

Pollution incidents have the widest range in WTP estimates with respondents willing to pay more than 3 times as much as the WP1 estimates when the severity level is at the highest category of pollution incident.

Additional analysis relative weights - households

Additional analysis of the relative weights was conducted looking at preference by demographics, vulnerability and service experience. These are shown in the tables below.

Table 13: relative weights water quality and service interruptions – age, SEG and metered status

Service measure	Levels of service	<45	45+	ABC1	C2DE	Metered	Unmetered
Unexpected interruptions	An unexpected supply interruption for less than 3 hours	0.54	0.52	0.52	0.54	0.51	0.56
	An unexpected supply interruption for 3–6 hours	1.00	1.00	1.00	1.00	1.00	1.00
	An unexpected supply interruption for 6–12 hours	1.21	1.24	1.27	1.18	1.19	1.27
	An unexpected supply interruption for 12–24 hours	1.25	1.27	1.24	1.29	1.24	1.28
	An unexpected supply interruption for over 24 hours and up to 48 hours	1.43	1.42	1.43	1.42	1.48	1.35
	A planned supply interruption for 3-6 hours which is announced in advance	0.58	0.62	0.60	0.61	0.61	0.60
Drinking water quality	4 in 10,000 samples of tap water fail government standards but with no health impact	1.00	1.00	1.00	1.00	1.00	1.00
	4 in 10,000 samples of tap water seriously fail government standards affecting public health e.g. causing stomach upsets	3.56	3.53	3.51	3.57	3.52	3.53
	4 in 10,000 samples of tap water seriously fail government standards causing a significant risk to health and requiring water to be boiled before use	2.65	2.52	2.64	2.50	2.64	2.52

Discoloured water	Water with a smell and taste of disinfectant, earthiness or chemicals when it comes out of the tap	1.03	1.22	1.15	1.15	1.16	1.15
	Discoloured water that is the colour of weak tea when it comes out of the tap (due to peaty water)	1.08	0.95	1.00	1.00	0.96	1.03
	Discoloured water that is cloudy when it comes out of the tap (due to high pressure)	1.01	0.96	0.95	1.02	1.02	0.95
Water restrictions	A reduction in the amount of water available for supply, but this would have no noticeable impact on customer water use	0.65	0.66	0.66	0.66	0.64	0.67
	A reduction in the amount of water available for supply that would require voluntary restrictions on customer water use e.g. publicity campaigns (local press/radio)	0.94	0.98	0.94	0.99	0.98	0.95
	A reduction in the amount of water available for supply that would require a 5-month hosepipe ban occurring in any one year (May-September)	1.00	1.00	1.00	1.00	1.00	1.00
	A reduction in the amount of water available for supply which would lead to emergency restrictions being imposed leading to standpipes in streets etc	1.80	1.73	1.87	1.64	1.79	1.74

Unexpected interruptions show no particular differences in avoidance between groups – with, unsurprisingly, all groups most wanting to avoid a 24-48-hour disruption.

C2DE SEG customers show a higher level of avoidance for water quality issues which cause stomach upsets than ABC1 customers, and under 45 years olds show a higher level of avoidance than their older counterpart. Otherwise differences between groups are minimal where water quality issues are concerned.

DJS Research Ltd. 2017

Customers aged 45+ have a higher level of avoidance of water that has the taste and smell of disinfectant than customers aged under 45.

When looking at water restrictions, C2DE SEG customers have a higher level of avoidance emergency restrictions than ABC1s.

Table 14: relative weights water quality and service interruptions – Gender, Mode of interview and people in HH

Service measure	Levels of service	Male	Female	Online	CAPI	1	2	3	4+
Unexpected interruptions	An unexpected supply interruption for less than 3 hours	0.60	0.48	0.57	0.44	0.51	0.53	0.53	0.55
	An unexpected supply interruption for 3–6 hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	An unexpected supply interruption for 6–12 hours	1.24	1.21	1.23	1.22	1.15	1.23	1.14	1.35
	An unexpected supply interruption for 12–24 hours	1.28	1.23	1.27	1.22	1.19	1.19	1.47	1.28
	An unexpected supply interruption for over 24 hours and up to 48 hours	1.35	1.50	1.41	1.47	1.51	1.37	1.34	1.50
	A planned supply interruption for 3-6 hours which is announced in advance	0.62	0.60	0.60	0.61	0.69	0.65	0.54	0.51
Drinking water quality	4 in 10,000 samples of tap water fail government standards but with no health impact	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	4 in 10,000 samples of tap water seriously fail government standards affecting public health e.g. causing stomach upsets	3.45	3.61	3.38	3.99	3.38	3.65	3.63	3.43

DJS Research Ltd. 2017

	4 in 10,000 samples of tap water seriously fail government standards causing a significant risk to health and requiring water to be boiled before use	2.43	2.65	2.66	2.31	2.56	2.43	3.04	2.49
Discoloured water	Water with a smell and taste of disinfectant, earthiness or chemicals when it comes out of the tap	1.16	1.13	1.14	1.18	1.23	1.20	1.11	1.04
	Discoloured water that is the colour of weak tea when it comes out of the tap (due to peaty water)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Discoloured water that is cloudy when it comes out of the tap (due to high pressure)	0.96	1.01	0.97	1.03	1.05	0.98	0.84	1.05
Water restrictions	A reduction in the amount of water available for supply, but this would have no noticeable impact on customer water use	0.62	0.68	0.66	0.67	0.64	0.68	0.63	0.67
	A reduction in the amount of water available for supply that would require voluntary restrictions on customer water use e.g. publicity campaigns (local press/radio)	0.97	0.96	0.93	1.07	0.97	0.98	0.89	0.99
	A reduction in the amount of water available for supply that would	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

	require a 5-month hosepipe ban occurring in any one year (May-September)								
	A reduction in the amount of water available for supply which would lead to emergency restrictions being imposed leading to standpipes in streets etc	1.75	1.78	1.86	1.50	1.80	1.70	1.70	1.87

1-person households and 4+ person households are more likely to want to avoid a 24-48-hour interruption than 2 and 3-person households. Similarly, females have a higher level of avoidance of a 24-48-hour interruption than males.

Customers who completed the survey via CAPI (who are more likely to be older, and in vulnerable circumstances) have a significantly higher level of avoidance of drinking water samples that significantly fail checks that have an impact on public health (e.g. stomach upsets).

Table 15: relative weights water quality and service interruptions – region

Service measure	Levels of service	East Yorks.	North Yorks.	South Yorks.	West Yorks.
Unexpected interruptions	An unexpected supply interruption for less than 3 hours	0.48	0.58	0.53	0.60
	An unexpected supply interruption for 3–6 hours	1.00	1.00	1.00	1.00
	An unexpected supply interruption for 6–12 hours	1.17	1.33	1.23	1.20
	An unexpected supply interruption for 12–24 hours	1.34	1.19	1.33	1.26
	An unexpected supply interruption for over 24 hours and up to 48 hours	1.55	1.35	1.33	1.44
	A planned supply interruption for 3-6 hours which is announced in advance	0.50	0.59	0.65	0.62
Drinking water quality	4 in 10,000 samples of tap water fail government standards but with no health impact	1.00	1.00	1.00	1.00
	4 in 10,000 samples of tap water seriously fail government standards affecting public health e.g. causing stomach upsets	3.17	3.59	3.66	3.17
	4 in 10,000 samples of tap water seriously fail government standards causing a significant risk to health and requiring water to be boiled before use	2.64	2.64	2.71	2.65
Discoloured water	Water with a smell and taste of disinfectant, earthiness or chemicals when it comes out of the tap	1.17	1.01	1.01	1.26
	Discoloured water that is the colour of weak tea	1.00	1.00	1.00	1.00

DJS Research Ltd. 2017

	when it comes out of the tap (due to peaty water)				
	Discoloured water that is cloudy when it comes out of the tap (due to high pressure)	1.00	0.93	1.07	0.91
Water restrictions	A reduction in the amount of water available for supply, but this would have no noticeable impact on customer water use	0.72	0.68	0.69	0.60
	A reduction in the amount of water available for supply that would require voluntary restrictions on customer water use e.g. publicity campaigns (local press/radio)	0.90	0.93	0.87	0.98
	A reduction in the amount of water available for supply that would require a 5-month hosepipe ban occurring in any one year (May-September)	1.00	1.00	1.00	1.00
	A reduction in the amount of water available for supply which would lead to emergency restrictions being imposed leading to standpipes in streets etc	2.18	1.64	1.66	1.97

Customers in East Yorkshire are most likely to want to avoid a 24-48-hour interruption.

Customers in North and South Yorkshire have a higher level of avoidance of water issues that cause stomach upsets

Those in East and West Yorkshire are most likely to want to avoid water with a taste and smell of disinfectant and East Yorkshire customers are distinct in their avoidance of emergency restrictions.

Table 16: relative weights water quality and service interruptions – vulnerability definitions

Service measure	Levels of service	Not possible vulnerability	Possible vulnerability	Not focussed vulnerability.	Focussed vulnerability
Unexpected interruptions	An unexpected supply interruption for less than 3 hours	0.51	0.54	0.53	0.54
	An unexpected supply interruption for 3–6 hours	1.00	1.00	1.00	1.00
	An unexpected supply interruption for 6–12 hours	1.27	1.21	1.18	1.31
	An unexpected supply interruption for 12–24 hours	1.22	1.28	1.26	1.26
	An unexpected supply interruption for over 24 hours and up to 48 hours	1.30	1.48	1.44	1.39
	A planned supply interruption for 3-6 hours which is announced in advance	0.65	0.59	0.62	0.57
Drinking water quality	4 in 10,000 samples of tap water fail government standards but with no health impact	1.00	1.00	1.00	1.00
	4 in 10,000 samples of tap water seriously fail government standards affecting public health e.g. causing stomach upsets	3.45	3.59	3.52	3.58
	4 in 10,000 samples of tap water seriously fail government standards causing a significant risk to health and requiring water to be boiled before use	2.44	2.63	2.55	2.62
Discoloured water	Water with a smell and taste of disinfectant, earthiness or chemicals when it comes out of the tap	1.20	1.13	1.16	1.14

DJS Research Ltd. 2017

	Discoloured water that is the colour of weak tea when it comes out of the tap (due to peaty water)	1.00	1.00	1.00	1.00
	Discoloured water that is cloudy when it comes out of the tap (due to high pressure)	1.00	0.98	1.03	0.89
Water restrictions	A reduction in the amount of water available for supply, but this would have no noticeable impact on customer water use	0.64	0.67	0.65	0.68
	A reduction in the amount of water available for supply that would require voluntary restrictions on customer water use e.g. publicity campaigns (local press/radio)	0.91	0.99	0.96	0.97
	A reduction in the amount of water available for supply that would require a 5-month hosepipe ban occurring in any one year (May-September)	1.00	1.00	1.00	1.00
	A reduction in the amount of water available for supply which would lead to emergency restrictions being imposed leading to standpipes in streets etc	1.84	1.73	1.77	1.74

Customers in the focussed vulnerable definition are more likely to want to avoid a 6-12-hour supply, than non-focussed vulnerable customers – although there is no difference in avoidance of a 24-48-hour supply interruption. This suggests that for customers in vulnerable circumstances their needs aren't particularly different to non-vulnerable customers at the extreme ends of an interruption, but for extended periods up to a day where non-vulnerable customers might be able to cope, the issues for vulnerable customers become more acute.

Customers in the broad definition of vulnerability are more likely to want to avoid a water quality issue resulting in either a stomach upset or a boil notice.

DJS Research Ltd. 2017

Table 17: relative weights water quality and service interruptions – finance and health vulnerability

Service measure	Levels of service	Not financially vulnerable	Financially vulnerable	Not health vulnerable	Health vulnerable
Unexpected interruptions	An unexpected supply interruption for less than 3 hours	0.54	0.52	0.49	0.61
	An unexpected supply interruption for 3–6 hours	1.00	1.00	1.00	1.00
	An unexpected supply interruption for 6–12 hours	1.17	1.35	1.32	1.05
	An unexpected supply interruption for 12–24 hours	1.28	1.23	1.23	1.33
	An unexpected supply interruption for over 24 hours and up to 48 hours	1.43	1.40	1.40	1.47
	A planned supply interruption for 3-6 hours which is announced in advance	0.60	0.61	0.60	0.61
Drinking water quality	4 in 10,000 samples of tap water fail government standards but with no health impact	1.00	1.00	1.00	1.00
	4 in 10,000 samples of tap water seriously fail government standards affecting public health e.g. causing stomach upsets	3.56	3.50	3.53	3.55
	4 in 10,000 samples of tap water seriously fail government standards causing a significant risk to health and requiring water to be boiled before use	2.52	2.67	2.58	2.56
Discoloured water	Water with a smell and taste of disinfectant, earthiness or chemicals when it comes out of the tap	1.17	1.12	1.11	1.23

DJS Research Ltd. 2017

	Discoloured water that is the colour of weak tea when it comes out of the tap (due to peaty water)	1.00	1.00	1.00	1.00
	Discoloured water that is cloudy when it comes out of the tap (due to high pressure)	1.00	0.95	1.02	0.91
Water restrictions	A reduction in the amount of water available for supply, but this would have no noticeable impact on customer water use	0.67	0.65	0.65	0.68
	A reduction in the amount of water available for supply that would require voluntary restrictions on customer water use e.g. publicity campaigns (local press/radio)	0.95	0.99	0.94	1.03
	A reduction in the amount of water available for supply that would require a 5-month hosepipe ban occurring in any one year (May-September)	1.00	1.00	1.00	1.00
	A reduction in the amount of water available for supply which would lead to emergency restrictions being imposed leading to standpipes in streets etc	1.74	1.80	1.85	1.59

Health vulnerable customers though are more likely to want to avoid supply interruptions of 12 hours or more – suggesting the impact of longer term water supply outages have a far greater impact on this group. Financially vulnerable customers are more likely than non-financially vulnerable customers to want to avoid supply interruption of 6-12 hours.

For drinking water quality, financially vulnerable customers are more likely to want to avoid a boil notice than non-financially vulnerable customers.

When looking at differences in avoidance between groups on discoloured water, it's customers who are classed as health vulnerable that are most likely to want to avoid water with a smell and taste of disinfectant.

DJS Research Ltd. 2017

For water restrictions, customers who aren't vulnerable due to health reasons are far more likely to want to avoid emergency restrictions being imposed.

Table 18: relative weights water quality and service interruptions – service experiences, discoloured water & poor water taste/odour

Service measure	Levels of service	Discoloured water – no	Discoloured water – yes	Poor water taste/odour - no	Poor water taste/odour - yes
Unexpected interruptions	An unexpected supply interruption for less than 3 hours	0.52	0.57	0.52	0.55
	An unexpected supply interruption for 3–6 hours	1.00	1.00	1.00	1.00
	An unexpected supply interruption for 6–12 hours	1.24	1.17	1.21	1.27
	An unexpected supply interruption for 12–24 hours	1.27	1.22	1.25	1.30
	An unexpected supply interruption for over 24 hours and up to 48 hours	1.41	1.48	1.39	1.52
	A planned supply interruption for 3-6 hours which is announced in advance	0.62	0.55	0.66	0.45
Drinking water quality	4 in 10,000 samples of tap water fail government standards but with no health impact	1.00	1.00	1.00	1.00
	4 in 10,000 samples of tap water seriously fail government standards affecting public health e.g. causing stomach upsets	3.60	3.29	3.60	3.36
	4 in 10,000 samples of tap water seriously fail government standards causing a significant risk to health and requiring water to be boiled before use	2.49	2.90	2.51	2.75

DJS Research Ltd. 2017

Discoloured water	Water with a smell and taste of disinfectant, earthiness or chemicals when it comes out of the tap	1.18	1.02	1.19	1.02
	Discoloured water that is the colour of weak tea when it comes out of the tap (due to peaty water)	1.00	1.00	1.00	1.00
	Discoloured water that is cloudy when it comes out of the tap (due to high pressure)	0.99	0.96	1.01	0.90
Water restrictions	A reduction in the amount of water available for supply, but this would have no noticeable impact on customer water use	0.67	0.61	0.68	0.60
	A reduction in the amount of water available for supply that would require voluntary restrictions on customer water use e.g. publicity campaigns (local press/radio)	0.96	0.98	0.97	0.94
	A reduction in the amount of water available for supply that would require a 5-month hosepipe ban occurring in any one year (May-September)	1.00	1.00	1.00	1.00
	A reduction in the amount of water available for supply which would lead to emergency restrictions being imposed leading to standpipes in streets etc	1.75	1.79	1.74	1.81

Customers who have experienced discoloured water are most likely to want to avoid a boil water notice. There are no differences by customer experience though when it comes to discoloured water.

Table 19: relative weights water quality and service interruptions – service experiences, water restrictions / instructions to boil water

Service measure	Levels of service	Restriction on how you can use water -no	Restriction on how you can use water -yes	An instruction to boil your drinking water - no	An instruction to boil your drinking water -yes
Unexpected interruptions	An unexpected supply interruption for less than 3 hours	0.52	0.56	0.51	0.80
	An unexpected supply interruption for 3–6 hours	1.00	1.00	1.00	1.00
	An unexpected supply interruption for 6–12 hours	1.25	1.17	1.25	1.05
	An unexpected supply interruption for 12–24 hours	1.25	1.29	1.27	1.13
	An unexpected supply interruption for over 24 hours and up to 48 hours	1.41	1.46	1.42	1.51
	A planned supply interruption for 3-6 hours which is announced in advance	0.62	0.56	0.61	0.57
Drinking water quality	4 in 10,000 samples of tap water fail government standards but with no health impact	1.00	1.00	1.00	1.00
	4 in 10,000 samples of tap water seriously fail government standards affecting public health e.g. causing stomach upsets	3.57	3.46	3.57	3.25
	4 in 10,000 samples of tap water seriously fail government standards causing a significant risk to health and requiring water to be boiled before use	2.52	2.71	2.54	2.88
Discoloured water	Water with a smell and taste of disinfectant, earthiness or chemicals	1.17	1.10	1.15	1.11

DJS Research Ltd. 2017

	when it comes out of the tap				
	Discoloured water that is the colour of weak tea when it comes out of the tap (due to peaty water)	1.00	1.00	1.00	1.00
	Discoloured water that is cloudy when it comes out of the tap (due to high pressure)	0.99	0.96	0.99	0.96
Water restrictions	A reduction in the amount of water available for supply, but this would have no noticeable impact on customer water use	0.67	0.63	0.66	0.70
	A reduction in the amount of water available for supply that would require voluntary restrictions on customer water use e.g. publicity campaigns (local press/radio)	0.97	0.94	0.96	0.97
	A reduction in the amount of water available for supply that would require a 5-month hosepipe ban occurring in any one year (May-September)	1.00	1.00	1.00	1.00
	A reduction in the amount of water available for supply which would lead to emergency restrictions being imposed leading to standpipes in streets etc	1.77	1.74	1.76	1.73

Customers who have experienced a boil water notice are more likely to want to avoid the scenario than those who haven't. Customers who have experienced water restrictions though aren't particularly more likely to want to avoid.

Table 20: relative weights flooding and smells – age, SEG and metered status

Service measure	Levels of service	<45	45+	ABC1	C2DE	Metered	Unmetered
Sewer flooding inside properties	Sewer flooding of a cellar	0.08	0.06	0.07	0.07	0.07	0.07
	Sewer flooding of a living area	1.00	1.00	1.00	1.00	1.00	1.00
Sewer flooding outside properties	Sewer flooding of minor roads	1.41	1.34	1.40	1.33	1.34	1.39
	Sewer flooding of major roads	1.31	1.23	1.30	1.21	1.31	1.22
	Sewer flooding inside your property boundary (but not indoors) which doesn't prevent normal access (e.g. flooding at the back of your garden away from normal access points)	0.97	0.82	0.96	0.80	0.90	0.85
	Sewer flooding inside your property boundary (but not indoors) which prevents normal access (e.g. flooding outside of your property near a front or back door)	1.00	1.00	1.00	1.00	1.00	1.00
	Sewer flooding causing social disruption (e.g. disruption to hospitals and schools)	3.73	4.15	3.81	4.15	4.03	3.94
Odour	Properties subjected to unbearable smells which come and go	1.00	1.00	1.00	1.00	1.00	1.00
	Properties subjected to chronic (seasonal) unbearable smells	1.43	1.40	1.42	1.41	1.40	1.44

Respondents aged under 45 are more likely to want to avoid sewer flooding of roads than those aged 45+ but are less likely to avoid sewer flooding which causes social disruption. Similarly, when looking at SEG, C2DE customers are more likely to want to avoid sewer flooding causing social disruption than ABC1s. There is little difference in outcomes based on a metered vs. unmetered analysis.

DJS Research Ltd. 2017

Table 21: relative weights flooding and smells – Gender, Mode and people in HH

Service measure	Levels of service	Male	Female	Online	CAPI	1	2	3	4+
Sewer flooding inside properties	Sewer flooding of a cellar	0.08	0.06	0.08	0.05	0.07	0.07	0.08	0.05
	Sewer flooding of a living area	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Sewer flooding outside properties	Sewer flooding of minor roads	1.40	1.35	1.35	1.41	1.29	1.34	1.44	1.40
	Sewer flooding of major roads	1.17	1.31	1.21	1.43	1.35	1.18	1.24	1.34
	Sewer flooding inside your property boundary (but not indoors) which doesn't prevent normal access (e.g. flooding at the back of your garden away from normal access points)	0.98	0.83	0.94	0.72	0.81	0.86	0.89	0.96
	Sewer flooding inside your property boundary (but not indoors) which prevents normal access (e.g. flooding outside of your property near a front or back door)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Sewer flooding causing social disruption (e.g. disruption to hospitals and schools)	3.92	4.01	3.99	3.94	3.84	4.17	4.01	3.79
Odour	Properties subjected to unbearable smells which come and go	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

DJS Research Ltd. 2017

	Properties subjected to chronic (seasonal) unbearable smells	1.35	1.46	1.41	1.42	1.43	1.44	1.50	1.30

Males have a higher level of avoidance of sewer flooding in the property boundary (but not indoors) than females, while females are more likely (comparatively) to want to avoid sewer flooding of major roads. Sewer flooding which causes social disruption is the severity level that has the highest levels of avoidance for all groups.

Table 22: relative weights flooding and smells – region

Service measure	Levels of service	East Yorks.	North Yorks.	South Yorks.	West Yorks.
Sewer flooding inside properties	Sewer flooding of a cellar	0.09	0.09	0.06	0.08
	Sewer flooding of a living area	1.00	1.00	1.00	1.00
Sewer flooding outside properties	Sewer flooding of minor roads	1.19	1.33	1.45	1.35
	Sewer flooding of major roads	1.38	0.86	1.39	1.18
	Sewer flooding inside your property boundary (but not indoors) which doesn't prevent normal access (e.g. flooding at the back of your garden away from normal access points)	1.05	1.14	0.72	0.97
	Sewer flooding inside your property boundary (but not indoors) which prevents normal access (e.g. flooding outside of your property near a front or back door)	1.00	1.00	1.00	1.00
	Sewer flooding causing social disruption (e.g. disruption to hospitals and schools)	3.93	4.10	3.94	3.99
Odour	Properties subjected to unbearable smells which come and go	1.00	1.00	1.00	1.00

DJS Research Ltd. 2017

	Properties subjected to chronic (seasonal) unbearable smells	1.37	1.48	1.36	1.43

When looking at differences in avoidance by region, there is little difference in sewer flooding inside properties.

North Yorkshire customers are most likely to want to avoid sewer flooding inside the property boundary, and sewer flooding which causes social disruption – but least likely to avoid sewer flooding of major roads. Is this due to the lack of major roads i.e. motorways in the county?

Table 23: relative weights flooding and smells – vulnerability definitions

Service measure	Levels of service	Not possible vulnerability	Possible vulnerability	Not focussed vulnerability	Focussed vulnerability
Sewer flooding inside properties	Sewer flooding of a cellar	0.06	0.07	0.07	0.08
	Sewer flooding of a living area	1.00	1.00	1.00	1.00
Sewer flooding outside properties	Sewer flooding of minor roads	1.26	1.44	1.36	1.39
	Sewer flooding of major roads	1.25	1.27	1.23	1.36
	Sewer flooding inside your property boundary (but not indoors) which doesn't prevent normal access (e.g. flooding at the back of your garden away from normal access points)	0.80	0.95	0.84	1.04
	Sewer flooding inside your property boundary (but not indoors) which prevents normal access (e.g. flooding outside of your property near a front or back door)	1.00	1.00	1.00	1.00
	Sewer flooding causing social disruption (e.g. disruption to hospitals and schools)	4.29	3.75	4.09	3.64
Odour	Properties subjected to unbearable smells which come and go	1.00	1.00	1.00	1.00
	Properties subjected to chronic (seasonal) unbearable smells	1.43	1.40	1.40	1.46

When looking at differences in avoidance by vulnerability, customers included in the possible vulnerability definition are more likely to avoid sewer flooding of minor roads than non-vulnerable customers. Whilst they have a high value associated with wanting to avoid sewer flooding which causes social disruption, it's not as high as that for non-vulnerable customers. Similarly, when looking at the focussed vulnerability definition, sewer flooding which causes social disruption is more likely to be avoided by non-focussed vulnerability customers.

Table 24: relative weights flooding and smells – finance and health vulnerability

Service measure	Levels of service	Not financially vulnerable	Financially vulnerable	Not health vulnerable	Health vulnerable
Sewer flooding inside properties	Sewer flooding of a cellar	0.06	0.09	0.07	0.07
	Sewer flooding of a living area	1.00	1.00	1.00	1.00
Sewer flooding outside properties	Sewer flooding of minor roads	1.34	1.43	1.32	1.47
	Sewer flooding of major roads	1.27	1.23	1.25	1.29
	Sewer flooding inside your property boundary (but not indoors) which doesn't prevent normal access (e.g. flooding at the back of your garden away from normal access points)	0.84	1.02	0.85	0.98
	Sewer flooding inside your property boundary (but not indoors) which prevents normal access (e.g. flooding outside of your property near a front or back door)	1.00	1.00	1.00	1.00
	Sewer flooding causing social disruption (e.g. disruption to hospitals and schools)	4.08	3.69	4.14	3.59
Odour	Properties subjected to unbearable smells which come and go	1.00	1.00	1.00	1.00
	Properties subjected to chronic (seasonal) unbearable smells	1.40	1.46	1.42	1.40

When looking at financial and health vulnerability, there is little difference in the levels of avoidance of sewer flooding inside properties, or odour.

Table 25: relative weights flooding and smells – service experiences, sewer flooding

Service measure	Levels of service	Sewer flooding inside property – yes	Sewer flooding inside property – no	Sewer flooding in garden/close to property -no	Sewer flooding in garden/close to property -yes
Sewer flooding inside properties	Sewer flooding of a cellar	0.05	0.07	0.07	0.08
	Sewer flooding of a living area	1.00	1.00	1.00	1.00
Sewer flooding outside properties	Sewer flooding of minor roads	1.55	1.33	1.37	1.43
	Sewer flooding of major roads	1.34	1.25	1.27	0.91
	Sewer flooding inside your property boundary (but not indoors) which doesn't prevent normal access (e.g. flooding at the back of your garden away from normal access points)	0.87	0.89	0.88	1.22
	Sewer flooding inside your property boundary (but not indoors) which prevents normal access (e.g. flooding outside of your property near a front or back door)	1.00	1.00	1.00	1.00
	Sewer flooding causing social disruption (e.g. disruption to hospitals and schools)	3.70	4.03	3.98	3.51
Odour	Properties subjected to unbearable smells which come and go	1.00	1.00	1.00	1.00
	Properties subjected to chronic (seasonal) unbearable smells	1.47	1.41	1.42	1.09

There is no difference in avoidance between customers who have experienced sewer flooding inside the property and those who haven't.

When looking at sewer flooding on the property boundary though, it is customers who have experienced the issue that are most likely to want to avoid it.

Table 26: relative weights flooding and smells – service experiences, smells from a sewer treatment works / leaking supply pipe on the property

Service measure	Levels of service	Smells from a sewer / treatment works – no	Smells from a sewer / treatment works – yes	Leaking water supply pipe on the property -no	Leaking water supply pipe on the property - yes
Sewer flooding inside properties	Sewer flooding of a cellar	0.07	0.09	0.07	0.06
	Sewer flooding of a living area	1.00	1.00	1.00	1.00
Sewer flooding outside properties	Sewer flooding of minor roads	1.36	1.61	1.36	1.41
	Sewer flooding of major roads	1.26	1.28	1.25	1.34
	Sewer flooding inside your property boundary (but not indoors) which doesn't prevent normal access (e.g. flooding at the back of your garden away from normal access points)	0.88	1.02	0.84	1.15
	Sewer flooding inside your property boundary (but not indoors) which prevents normal access (e.g. flooding outside of your property near a front or back door)	1.00	1.00	1.00	1.00
	Sewer flooding causing social disruption (e.g. disruption to hospitals and schools)	4.01	3.30	4.11	3.13
Odour	Properties subjected to unbearable smells which come and go	1.00	1.00	1.00	1.00
	Properties subjected to chronic (seasonal) unbearable smells	1.41	1.54	1.41	1.44

Customers who have experienced smells from sewers/sewage treatment works are slightly more likely to want to avoid a recurrence of the issue than those who haven't.

DJS Research Ltd. 2017

Table 27: relative weights environment - age, SEG and metered status

Service measure	Levels of service	<45	45+	ABC1	C2DE	Metered	Unmetered
Bathing water quality	One of the bathing water samples fails to meet government standards due to a temporary increase in pollution	0.51	0.48	0.50	0.48	0.50	0.49
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard	1.00	1.00	1.00	1.00	1.00	1.00
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard and it's 'Blue Flag' status	1.05	1.01	1.06	1.00	0.99	1.06
Pollution incidents	A significant long-term impact on the environment; altering the smell and look of the water affected and having a substantial impact on aquatic life (e.g. a loss of over 50% of the fish population and damage to spawning areas for species such as salmon and trout)	2.83	3.35	3.25	3.06	3.21	3.08
	A significant impact on the environment; altering the smell and look of the water affected and a having a noticeable impact on aquatic life (e.g. a loss of 10% to 50% of the fish population)	2.12	2.04	2.16	1.99	1.94	2.20
	A minor localised impact on the environment; having a minimal impact on the quality of the water and a very small impact on aquatic life	1.00	1.00	1.00	1.00	1.00	1.00

DJS Research Ltd. 2017

	e.g. a small loss of larvae or fish species						
	Incident with no environmental impact	0.52	0.36	0.41	0.44	0.45	0.40
Land conserved or improved by YW	Yorkshire Water do not conserve or improve any of the land they own or manage	1.00	1.00	1.00	1.00	1.00	1.00
	Yorkshire Water do not conserve or improve areas of plantation woodland on land they own or manage (e.g. pine and fir tree areas)	1.17	1.10	1.08	1.17	1.10	1.15
	Yorkshire Water do not conserve or improve areas of broadleaved woodland on land they own or manage (e.g. oak and birch tree areas)	1.15	1.00	1.04	1.09	1.09	1.01
	Yorkshire Water do not conserve or improve areas of grasslands and pastures on land they own or manage	1.01	0.70	0.95	0.76	0.80	0.92
	Yorkshire Water do not conserve or improve areas of farmland on land they own or manage (e.g. areas used for growing crops)	0.95	1.14	0.97	1.17	1.09	1.07
	Yorkshire Water do not conserve or improve areas of wetlands and marshes on land they own or manage	0.96	0.92	0.97	0.89	0.91	0.95
	Yorkshire Water do not conserve or improve mountainous and moorland areas on land they own or manage	1.08	1.10	1.16	1.03	1.02	1.19
	Yorkshire Water do not conserve or improve coastal areas on land they own or manage	0.90	0.84	0.87	0.85	0.89	0.81
	Yorkshire Water do not conserve or improve	0.68	0.82	0.77	0.76	0.69	0.85

	areas greenspace on land they own or manage (e.g. public parks)							

Under 45s are less likely to want to avoid pollution incidents which have a significant long-term impact on the environment than over 45s. Similarly, C2DE SEG customers and unmeasured customers are less likely to want to avoid this scenario than ABC1s and measured customers.

Table 28: relative weights environment – Gender, mode of contact and number of people in HH

Service measure	Levels of service	Male	Female	Online	CAPI	1	2	3	4+
Bathing water quality	One of the bathing water samples fails to meet government standards due to a temporary increase in pollution	0.53	0.47	0.52	0.42	0.51	0.51	0.49	0.46
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard and it's 'Blue Flag' status	1.02	1.03	1.05	0.98	1.02	1.00	1.03	1.07
Pollution incidents	A significant long-term impact on the environment; altering the smell and look of the water affected and having a substantial impact on aquatic life (e.g. a loss of over 50% of the fish population and damage to spawning	3.34	3.03	3.36	2.61	3.19	3.28	3.01	3.01

DJS Research Ltd. 2017

	areas for species such as salmon and trout)								
	A significant impact on the environment; altering the smell and look of the water affected and a having a noticeable impact on aquatic life (e.g. a loss of 10% to 50% of the fish population)	2.03	2.10	2.12	1.94	2.24	2.03	2.04	2.01
	A minor localised impact on the environment; having a minimal impact on the quality of the water and a very small impact on aquatic life e.g. a small loss of larvae or fish species	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Incident with no environmental impact	0.43	0.41	0.42	0.44	0.34	0.44	0.45	0.45
Land conserved or improved by YW	Yorkshire Water do not conserve or improve any of the land they own or manage	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Yorkshire Water do not conserve or improve areas of plantation woodland on land they own or manage (e.g. pine and fir tree areas)	1.05	1.15	1.16	1.05	1.00	1.10	1.22	1.21
	Yorkshire Water do not conserve or improve areas of broadleaved woodland on land they own or manage (e.g. oak and birch tree areas)	1.00	1.10	1.04	1.14	1.00	1.00	1.22	1.11
	Yorkshire Water do not conserve or improve areas of	0.82	0.84	0.82	0.91	0.46	0.91	0.88	1.02

grasslands and pastures on land they own or manage								
Yorkshire Water do not conserve or improve areas of farmland on land they own or manage (e.g. areas used for growing crops)	1.09	1.05	1.00	1.25	1.13	1.15	0.82	1.06
Yorkshire Water do not conserve or improve areas of wetlands and marshes on land they own or manage	0.88	0.98	0.87	1.11	0.76	0.98	1.01	0.97
Yorkshire Water do not conserve or improve mountainous and moorland areas on land they own or manage	0.99	1.15	1.10	1.08	1.29	1.03	1.11	1.00
Yorkshire Water do not conserve or improve coastal areas on land they own or manage	1.00	0.79	0.83	0.96	1.03	0.79	0.99	0.72
Yorkshire Water do not conserve or improve areas greenspace on land they own or manage (e.g. public parks)	0.82	0.73	0.85	0.53	0.80	0.83	0.75	0.64

Males and customers who completed the survey online are more likely to want to avoid pollution incidents which have a significant long-term impact on the environment; altering the smell and look of the water affected and having a substantial impact on aquatic life.

Table 29: relative weights environment - region

Service measure	Levels of service	East Yorks.	North Yorks.	South Yorks.	West Yorks.
Bathing water quality	One of the bathing water samples fails to meet government standards due to a temporary increase in pollution	0.49	0.49	0.50	0.48
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard	1.00	1.00	1.00	1.00
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard and it's 'Blue Flag' status	1.00	1.08	1.03	1.02
Pollution incidents	A significant long-term impact on the environment; altering the smell and look of the water affected and having a substantial impact on aquatic life (e.g. a loss of over 50% of the fish population and damage to spawning areas for species such as salmon and trout)	3.16	3.14	3.28	2.95
	A significant impact on the environment; altering the smell and look of the water affected and a having a noticeable impact on aquatic life (e.g. a loss of 10% to 50% of the fish population)	2.03	2.15	2.05	2.10
	A minor localised impact on the environment; having a minimal impact on the quality of the water and a very small impact on aquatic life e.g. a small loss of larvae or fish species	1.00	1.00	1.00	1.00
	Incident with no environmental impact	0.44	0.40	0.41	0.45

DJS Research Ltd. 2017

Land conserved or improved by YW	Yorkshire Water do not conserve or improve any of the land they own or manage	1.00	1.00	1.00	1.00
	Yorkshire Water do not conserve or improve areas of plantation woodland on land they own or manage (e.g. pine and fir tree areas)	1.09	1.18	1.10	1.16
	Yorkshire Water do not conserve or improve areas of broadleaved woodland on land they own or manage (e.g. oak and birch tree areas)	1.01	1.15	1.02	1.13
	Yorkshire Water do not conserve or improve areas of grasslands and pastures on land they own or manage	0.94	0.74	0.86	0.81
	Yorkshire Water do not conserve or improve areas of farmland on land they own or manage (e.g. areas used for growing crops)	1.10	1.01	1.03	1.13
	Yorkshire Water do not conserve or improve areas of wetlands and marshes on land they own or manage	0.99	0.84	0.96	0.87
	Yorkshire Water do not conserve or improve mountainous and moorland areas on land they own or manage	1.08	1.11	1.09	1.10
	Yorkshire Water do not conserve or improve coastal areas on land they own or manage	0.82	0.93	0.89	0.81
	Yorkshire Water do not conserve or improve areas greenspace on land they own or manage (e.g. public parks)	0.74	0.82	0.80	0.70

Customers in South Yorkshire are most likely to want to avoid pollution incidents which have a long-term impact on the environment, altering the smell and look of the water affected, especially compared to West Yorkshire customers.

DJS Research Ltd. 2017

Table 30: relative weights environment – vulnerability definitions

Service measure	Levels of service	Not possible vulnerability	Possible vulnerability	Not focussed vulnerability.	Focussed vulnerability
Bathing water quality	One of the bathing water samples fails to meet government standards due to a temporary increase in pollution	0.50	0.48	0.50	0.49
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard	1.00	1.00	1.00	1.00
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard and it's 'Blue Flag' status	1.06	1.00	0.99	1.06
Pollution incidents	A significant long-term impact on the environment; altering the smell and look of the water affected and having a substantial impact on aquatic life (e.g. a loss of over 50% of the fish population and damage to spawning areas for species such as salmon and trout)	3.25	3.06	3.21	3.08
	A significant impact on the environment; altering the smell and look of the water affected and a having a noticeable impact on aquatic life (e.g. a loss of 10% to 50% of the fish population)	2.16	1.99	1.94	2.20
	A minor localised impact on the environment; having a minimal impact on the quality of the water and a very small impact on aquatic life e.g. a small loss of larvae or fish species	1.00	1.00	1.00	1.00
	Incident with no environmental impact	0.41	0.44	0.45	0.40

Land conserved or improved by YW	Yorkshire Water do not conserve or improve any of the land they own or manage	1.00	1.00	1.00	1.00
	Yorkshire Water do not conserve or improve areas of plantation woodland on land they own or manage (e.g. pine and fir tree areas)	1.08	1.17	1.10	1.15
	Yorkshire Water do not conserve or improve areas of broadleaved woodland on land they own or manage (e.g. oak and birch tree areas)	1.04	1.09	1.09	1.01
	Yorkshire Water do not conserve or improve areas of grasslands and pastures on land they own or manage	0.95	0.76	0.80	0.92
	Yorkshire Water do not conserve or improve areas of farmland on land they own or manage (e.g. areas used for growing crops)	0.97	1.17	1.09	1.07
	Yorkshire Water do not conserve or improve areas of wetlands and marshes on land they own or manage	0.97	0.89	0.91	0.95
	Yorkshire Water do not conserve or improve mountainous and moorland areas on land they own or manage	1.16	1.03	1.02	1.19
	Yorkshire Water do not conserve or improve coastal areas on land they own or manage	0.87	0.85	0.89	0.81
	Yorkshire Water do not conserve or improve areas greenspace on land they own or manage (e.g. public parks)	0.77	0.76	0.69	0.85

Customers not included in the possible vulnerable, or focussed vulnerable definitions are more likely to want to avoid a pollution incident that has a significant long-term impact on the environment, altering the smell and look of the water affected and having a long-term impact on aquatic life, than those customers who are not included in the vulnerable definitions.

DJS Research Ltd. 2017

Table 31: relative weights environment – finance and health vulnerability

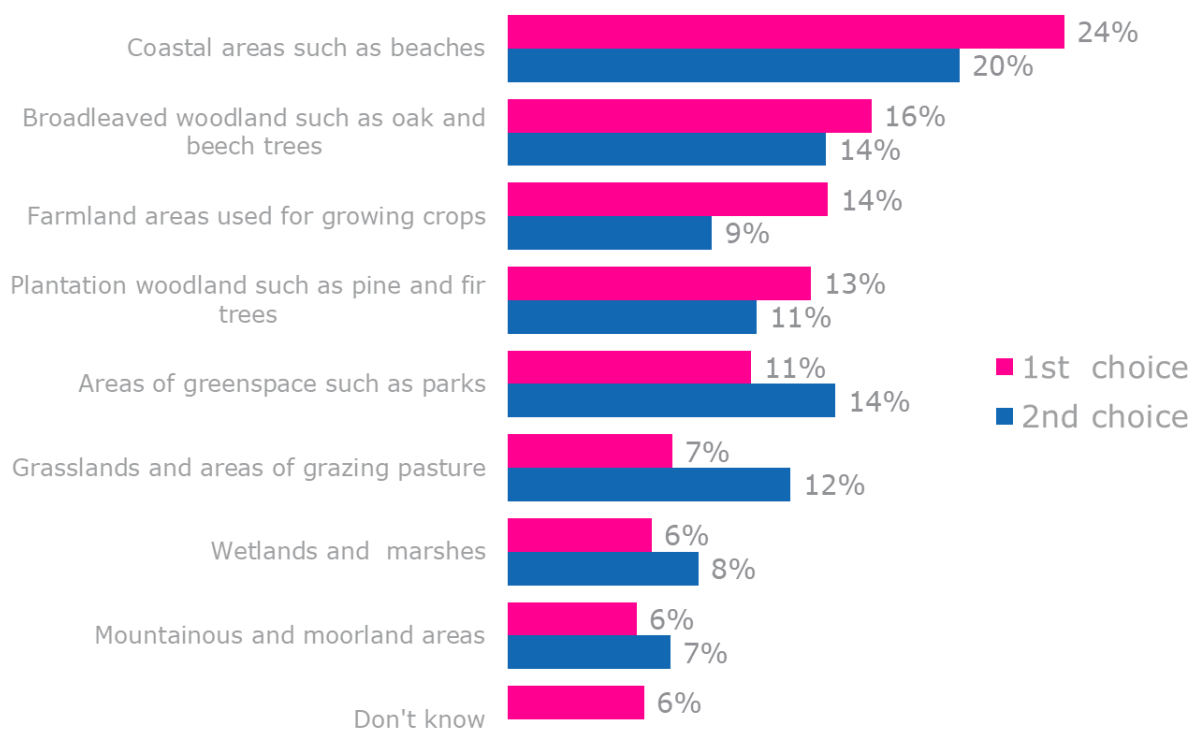| Service measure	Levels of service	Not financially vulnerable	Financially vulnerable	Not health vulnerable	Health vulnerable
Bathing water quality	One of the bathing water samples fails to meet government standards due to a temporary increase in pollution	0.50	0.48	0.49	0.49
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard	1.00	1.00	1.00	1.00
	Bathing water samples repeatedly fail to meet government standards leading to a loss of the beach's 'Good' or 'Excellent' standard and it's 'Blue Flag' status	1.01	1.06	1.03	1.03
Pollution incidents	A significant long-term impact on the environment; altering the smell and look of the water affected and having a substantial impact on aquatic life (e.g. a loss of over 50% of the fish population and damage to spawning areas for species such as salmon and trout)	3.27	2.91	3.35	3.06
	A significant impact on the environment; altering the smell and look of the water affected and a having a noticeable impact on aquatic life (e.g. a loss of 10% to 50% of the fish population)	2.08	2.05	2.01	2.10
	A minor localised impact on the environment; having a minimal impact on the quality of the water and a very small impact on aquatic life e.g. a small loss of larvae or fish species	1.00	1.00	1.00	1.00
	Incident with no environmental impact	0.40	0.48	0.40	0.44

DJS Research Ltd. 2017

Land conserved or improved by YW	Yorkshire Water do not conserve or improve any of the land they own or manage	1.00	1.00	1.00	1.00
	Yorkshire Water do not conserve or improve areas of plantation woodland on land they own or manage (e.g. pine and fir tree areas)	1.15	1.09	1.11	1.13
	Yorkshire Water do not conserve or improve areas of broadleaved woodland on land they own or manage (e.g. oak and birch tree areas)	1.06	1.07	0.94	1.12
	Yorkshire Water do not conserve or improve areas of grasslands and pastures on land they own or manage	0.95	0.53	0.83	0.85
	Yorkshire Water do not conserve or improve areas of farmland on land they own or manage (e.g. areas used for growing crops)	1.04	1.13	1.08	1.06
	Yorkshire Water do not conserve or improve areas of wetlands and marshes on land they own or manage	0.94	0.91	1.01	0.89
	Yorkshire Water do not conserve or improve mountainous and moorland areas on land they own or manage	1.11	1.05	1.14	1.07
	Yorkshire Water do not conserve or improve coastal areas on land they own or manage	0.81	0.97	0.83	0.88
	Yorkshire Water do not conserve or improve areas greenspace on land they own or manage (e.g. public parks)	0.79	0.72	0.80	0.75

As with the broader definitions of vulnerability, customers defined as financially vulnerable are more likely to want to avoid pollution incidents that have a significant impact on the look and smell of the water and having a substantial impact on aquatic life.

Preserving land

Respondents were asked to choose 2 types of land out of a list of 8 that they would most like to see conserved or improved. Coastal areas and woodland are the areas most would like to see conserved.

Coastal areas such as beaches — 24% (1st choice), 20% (2nd choice)

Broadleaved woodland such as oak and beech trees — 16% (1st choice), 14% (2nd choice)

Farmland areas used for growing crops — 14% (1st choice), 9% (2nd choice)

Plantation woodland such as pine and fir trees — 13% (1st choice), 11% (2nd choice)

Areas of greenspace such as parks — 11% (1st choice), 14% (2nd choice)

Grasslands and areas of grazing pasture — 7% (1st choice), 12% (2nd choice)

Wetlands and marshes — 6% (1st choice), 8% (2nd choice)

Mountainous and moorland areas — 6% (1st choice), 7% (2nd choice)

Don't know — 6% (1st choice)

■ 1st choice
■ 2nd choice

DJS Research Ltd. 2017

Validity of survey results

We conclude our analysis of the WP2 household survey with evidence on our validity checking.

Following the CE exercise, respondents were asked if they felt able to choose an option and whether the information presented to them was realistic.

Table 32: relative weights environment

	% felt able to make comparisons between the choices I presented to you?
Water quality and interruptions	92%
Flooding and smells	87%
Environment	78%

Customers taking part in the environment themed questionnaire felt least able to make choices (a significant difference at 95% confidence level). The analysis shows that the land improved measure had little variation across severity levels. The difficulties to engage with the set of land improved severity measures had been anticipated and an additional question was added to the questionnaire to gather more information about this service measure.

Customers who felt unable to make choices were asked for the reason why. Answers were similar across the service areas, with answers focussed on perceived impossibility of choices:

"It is very hard to choose between the two"

"They are all things one would want to avoid/have remedied quickly"

"I made the choices but they were extremely difficult to make"

"Because they are all bad choices and would all cause problems for my family"

"You were acting like a 'Devil's Advocate' because whichever option I chose I was in a no win situation"

Table 33: relative weights environment

	% found each of the levels of service we described, realistic and easy to understand?

DJS Research Ltd. 2017

Water quality and interruptions	95%
Flooding and smells	95%
Environment	87%

Again, those taking part in the environment themed survey were less likely to find the levels of service described easy to understand, again this is significantly lower than the other themes.

However, the levels of respondent who did not feel able to choose or did not find the information realistic are relatively low.

Construct validity

In order to assess the construct validity, we compare the ORs calculated through the CE to the ORs generated through the MaxDiff exercise and we also interrogate the results in terms of how well they conform with prior expectations and uphold statistical theory.

The direction of signs of all of the coefficients observed in this study are consistent with our expectations. For example, 'wish to avoid' increases in line with the pollution incident categories.

In terms of statistical validity, the models provide a good fit to the data. All the models presented display good model fit.

Ali Sims, Research Director
asims@djsresearch.com

Rachel Waddington, Statistician
rwaddington@djsresearch.com

Matt Prince, Research Manager
mprince@djsresearch.com

3 Pavilion Lane, Strines,
Stockport, Cheshire, SK6 7GH

+44 (0)1663 767 857
djsresearch.co.uk