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Appendix 2.3

PR19 RESEARCH TOOL

September 2018

NWG PR19 RESEARCH TOOL

Striking the right balance between delivering business plan insights and cognitively valid results

January 2018

Strictly confidential

CONTENTS

EXECUTIVE SUMMARY

Context and objective of research

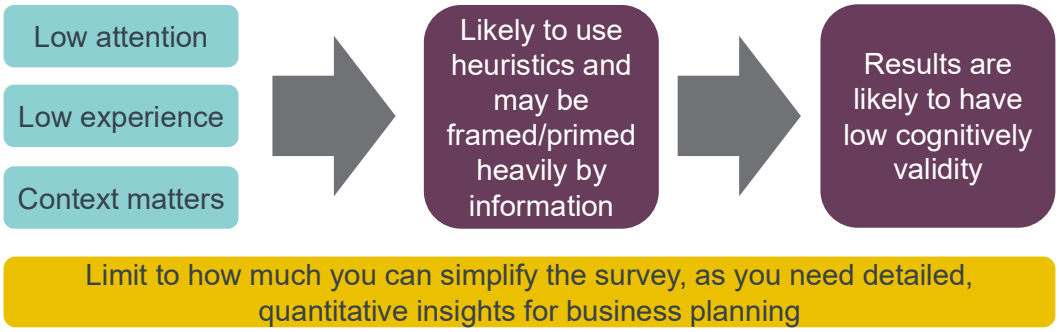
Northumbrian Water Group (NWG) is required to publish its five-year business plan for the upcoming price control review (PR19) in September 2018. This business plan should be supported by customer research in a number of areas. In addition to that, Ofwat has challenged NWG and other companies to design more innovative research than the approaches that were used at the previous price control review. NWG has responded to this challenge from Ofwat, and decided not to carry out traditional WTP research for PR19. Instead, NWG commissioned a consortium (Frontier Economics, Explain Research, and Supercharge) to design an online research tool that delivers results that are tailored to Ofwat's PR19 methodology, while improving cognitive validity.

The overall objective of this research was to provide NWG with customer insight on its key services, to inform how PCs and ODIs are set on those services. The aim was to develop an innovative research approach to achieve this objective, and to meet Ofwat's challenge of carrying out frontier-shifting research.

Overall design challenge

It is challenging to carry out customer research in the water sector for a number of reasons, which are summarised in the figure below.

Figure 1 Challenges in designing customer research



- Customers generally have limited experience in the service failures that NWG works to avoid and customers generally do not pay much attention to their water and wastewater services. This means that they will find it hard to relate to the issues presented in any surveys on water and wastewater services. As a result, survey respondents are much more likely to be affected by the context that is presented.
- As a result of these factors, customers are quite likely to use heuristics to answer the questions presented to them. They may use a rule of thumb such as always picking the status quo, or always picking the cheapest option.

- This means that although people may complete the survey and there are results to analyse, the cognitive validity of those results is likely to be relatively low.
- Underlying all of these challenges is the fact that it is not straightforward to simplify the questions that are posed to customers, in attempt to increase the cognitive validity of the research. This is because NWG needs relatively detailed, quantitative insights from its customers to inform its business plan, and simplified questions would not provide this necessary insight.

How we designed our research to address those challenges

It is not straightforward to address the challenges associated with carrying our customer research in the water sector. This means that there is a need to come up with new, innovative ways of designing research that directly address these challenges. We decided to separately design PCs and ODIs research as follows:

- getting customer valuations that are not necessarily maximum WTP values for PCs; and
- getting customer valuations for high levels of service to inform how ODIs are set.

Our innovative approach is focused on presenting service options to customers at cost, and asking them to choose between those service options, based on how much they value those services. This approach is innovative as it reduces the amount of information that customers are presented with, simplifies the questions that are posed to them, while still delivering NWG with the insights that it needs to develop its business plan.

Our design therefore strikes the right balance in designing research that has a high cognitive validity, while still delivering NWG with the detailed insights that it needs. We believe this is the best way to address the challenges that NWG faces.

We provide further details on our innovative design in the following section.

How we designed the PCs research

We gave customers a certain proportion of their bill to spend on the services included in the tool. The concept was that the customers had to spend (almost exactly) the amount that they have been given, and the more they chose to spend on each service, the higher level of service they would receive in that area. The results from this part of the research will show us customers' relative priorities across the service attributes included in the tool, and provide a relative strength of that prioritisation, as the tool is framed in monetary terms.

There are a number of advantages of this approach:

- it is based on prioritisation across services, but as it is framed in the context of customers' bills and the cost of delivering service improvements, it will deliver the quantitative insights that NWG needs for PR19, as explained in the next section;

- it is framed in the context of each customer's own bill, which is an amount of money that they should relate to (as opposed to the average bill, which may be quite different to the amount they actually pay);
- as we have included a separate piece of research relating specifically to ODIs, this piece of the research could be focused on realistic service levels that NWG could commit to and does not need to present higher levels of service performance or the higher levels of cost it would take to get there;
- it only includes one choice question, rather than the many questions you would typically find in a traditional WTP survey, as we were not attempting to estimate the maximum WTP; and
- as the monetary amounts shown in the research relate to the costs of delivering service improvements, the results can be directly to inform NWG's CBA.

Overall, this approach strikes the right balance between delivering results that have a higher cognitive validity, and also providing NWG with the insights that it needs to develop its business plan.

How we designed the ODIs research

Given Ofwat is expecting that NWG will include some rewards in its PR19 plan, we needed to design an approach that on the one hand offers customers the chance to provide their views on rewards (including saying they would prefer zero rewards), but that also delivers NWG with some non-zero valuations on high service levels. To directly address this challenge, we decided to design the research so that the ODIs research would include two distinct parts:

- one part would present customers with a fixed amount of money to allocate across the services attributes, based on how much they value the "best level of performance"[1]; and
- another part would first ask customers how much money they would be prepared to pay in total for rewards, and then ask customers to allocate their chosen amount of money across the service attributes, again based on how much they value the best level of service.

The advantages of this approach are as follows.

- It strikes the right balance between getting customer views on how large rewards should be and also ensuring that NWG will get the valuation evidence that it needs to set non-zero rewards, even if customers would in principle prefer not to have rewards.
- As all customers will complete the two parts, NWG will be able to triangulate between both pieces of evidence when it is setting its ODIs.

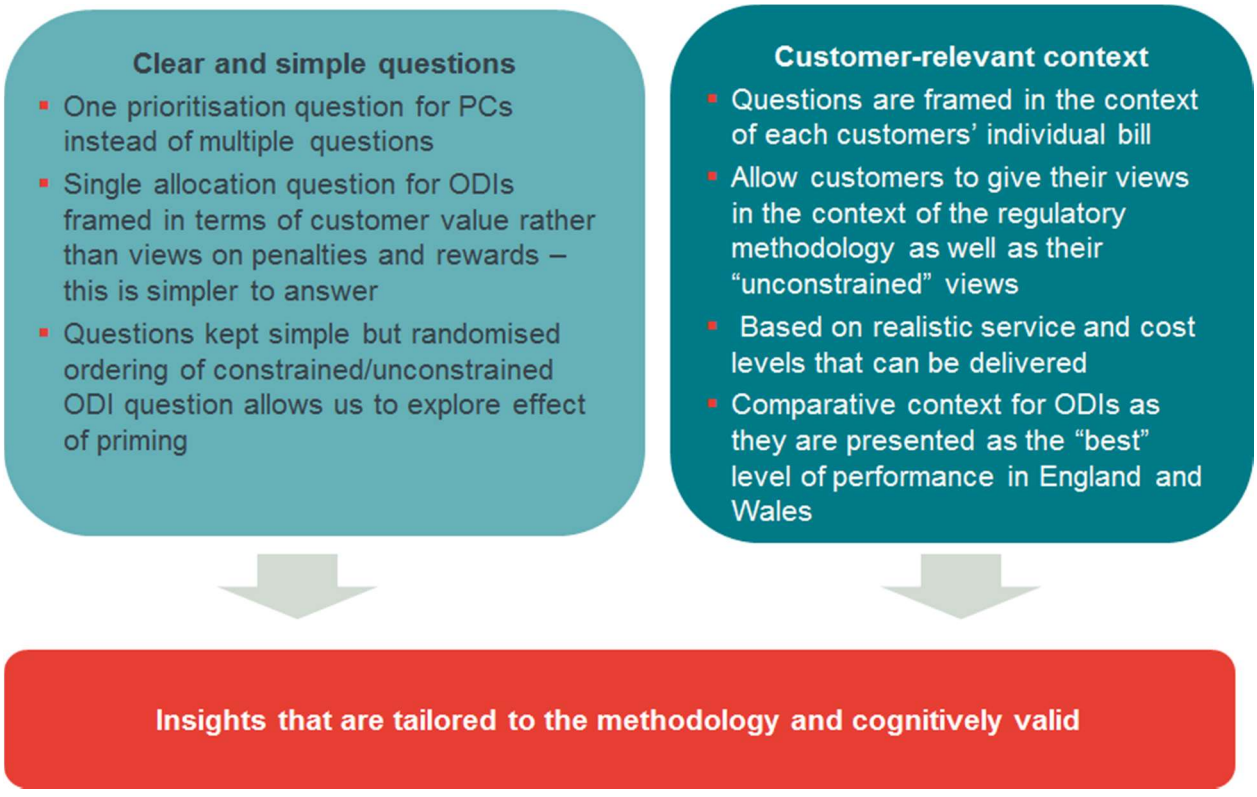
[1] The levels of service that were shown in the ODIs research reflected NWG's best estimate of what the best level of service will be on those service attributes in 2025 across England and Wales. This was either NWG's estimate of where the industry frontier will be at that point in time, or what they believe they could do if they pushed themselves in the areas where they expect to maintain their industry leading position.

- As some customers saw the constrained part first and others saw the unconstrained part first, we can explore whether the ordering of the two parts tended to affect customers' choices.
- Presenting the choice in terms of how much customers value the best level of service in England and Wales is a simpler, clearer question for customers to consider than being asked more directly about rewards and penalties (which can be confusing concepts for customers).
- Framing the choice in terms of how much customers value the best level of service in England and Wales includes some comparative context in the research, which therefore meets one of Ofwat's expectations for PR19 customer research.

Overall summary of our research design

We provide below an overall summary of our research design.

Figure 2 Summary of how we have designed the research



Overall, our research provides NWG with insights that are tailored specifically to Ofwat's PR19 expectations, and also delivers results that are cognitively valid. In addition, as the research is based on a more simple design, the research is more transparent than some other more complex approaches, such as traditional WTP. This means that it will be easier for internal and external stakeholders to review our design approach and to interpret our results, and to engage with NWG on this matter.

Headline results

In this section we present the results from the PCs and ODIs research. We summarise in the boxes below how the PCs and ODIs results should be interpreted.

INTERPRETATION OF PCs RESEARCH RESULTS

We asked customers to allocate a certain proportion of their bill across a range of services. The results from the PCs research therefore show customers' relative preferences and how they would prioritise the amount of money that they already pay. Also, as the monetary amounts shown on the sliders were related to NWG's costs, the PCs results show where customers value service levels at least as much as the cost of providing them.

As customers were allocating a proportion of their bills, the results do not provide any evidence that customers would be prepared to pay more for these levels of service.

We present two pieces of information below: the mean % of bills that customers allocated to each of the measures; and the point on the slider that this relates to (which is between 0% and 100%, where 0% is the bottom of the slider and 100% is at the top of the slider). This second piece of information helps us to get a better sense of which services were prioritised by customers, as the mean % of bill allocated to each service will be affected by customers' preferences and also the cost of delivering service improvements.

INTERPRETATION OF ODIs RESEARCH RESULTS

There are two elements to the ODIs research: the constrained task; and the unconstrained task. For the constrained task, customers had 6% of their bill to allocate across services, reflecting how much they would value the best level of performance on those service attributes. The results from the constrained task therefore show how customers would value this higher level of service, given they have been asked to allocate 6% of their bill in total. Whereas in the unconstrained task, customers could choose between 0% and 10% to allocate across the service attributes. The unconstrained task therefore gives us an indication as to how much customers would value the best level of service in total across all service attributes included in the online tool.

Figure 3 PCs research results – households

Service	Northumbrian Water		Essex and Suffolk Water	
	Mean % of bills	% point on the slider	Mean % of bills	% point on the slider
Discoloured water (number of contacts)	0.63%	62%	1.36%	49%
Interruptions to supply (average interruption over 3 hours)	0.02%	70%	0.05%	74%
Leakage (Mega litres)	0.76%	64%	0.21%	53%
Per capita consumption (litres per person per day)	0.51%	67%	1.09%	65%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.37%	76%	0.25%	74%
Pollution (number of incidents)	0.09%	81%		
Internal sewer flooding (number of incidents)	0.87%	51%		
Response time (average time to respond to sewer flooding incidents)	0.12%	62%		
Response times (average time to respond to a reported leak)			0.21%	62%

Figure 4 PCs research results – non-households

Service	Northumbrian Water		Essex and Suffolk Water	
	Mean % of bills	% point on the slider	Mean % of bills	% point on the slider
Discoloured water (number of contacts)	0.61%	50%	1.30%	47%
Interruptions to supply (average interruption over 3 hours)	0.03%	85%	0.06%	80%
Leakage (Mega litres)	0.81%	69%	0.22%	64%
Per capita consumption (litres per person per day)	0.47%	63%	1.07%	64%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.35%	71%	0.26%	78%
Pollution (number of incidents)	0.08%	68%		
Internal sewer flooding (number of incidents)	0.89%	53%		
Response time (average time to respond to sewer flooding incidents)	0.11%	62%		
Response times (average time to respond to a reported leak)			0.23%	62%

These results show that household and non-household customers from the same region have similar relative priorities. Customers in the Northumbrian region prioritised service improvements in pollution and wider catchment, while customers in Essex and Suffolk prioritised improvements in wider catchment and supply interruptions. We note that improvements in supply interruptions and pollution were relatively less costly, so this may be one of the reasons why service improvements in those areas were prioritised.

Figure 5 ODIs research results – constrained

Service	Mean % of bills – households		Mean % of bill – non-households	
	Northumbrian Water	Essex and Suffolk Water	Northumbrian Water	Essex and Suffolk Water
Discoloured water (number of contacts)	1.33%	1.59%	0.95%	1.35%
Interruptions to supply (average interruption over 3 hours)	0.47%	0.64%	0.69%	0.77%
Leakage (Mega litres)	0.75%	1.03%	0.82%	1.18%
Per capita consumption (litres per person per day)	0.62%	0.89%	0.66%	0.86%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	1.03%	1.20%	0.81%	1.08%
Pollution (number of incidents)	0.97%		0.72%	
Internal sewer flooding (number of incidents)	0.52%		0.52%	
Response time (average time to respond to sewer flooding incidents)	0.48%		0.66%	
Response times (average time to respond to a reported leak)		0.61%		0.76%

In the constrained ODIs research, customers from all samples valued the best level of service most on discoloured water. The best level of service on environmental issues and leakage are also valued highly across all of the samples. Northumbrian Water customers value the best level of service on internal sewer flooding and response time to flooding incidents least. This

compares to the PC research which showed Northumbrian Water customers prioritising internal sewer flooding. For Essex and Suffolk Water customers, the best level of service on response to a reported leak would be valued least.

Figure 6 ODIs research results – unconstrained

Service	Mean % of bills – households		Mean % of bill – non-households	
	Northumbrian Water	Essex and Suffolk Water	Northumbrian Water	Essex and Suffolk Water
Discoloured water (number of contacts)	0.52%	0.71%	0.32%	0.21%
Interruptions to supply (average interruption over 3 hours)	0.20%	0.32%	0.16%	0.19%
Leakage (Mega litres)	0.30%	0.46%	0.22%	0.17%
Per capita consumption (litres per person per day)	0.27%	0.35%	0.18%	0.08%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.38%	0.54%	0.14%	0.17%
Pollution (number of incidents)	0.37%		0.17%	
Internal sewer flooding (number of incidents)	0.23%		0.14%	
Response time (average time to respond to sewer flooding incidents)	0.20%		0.16%	
Response times (average time to respond to a reported leak)		0.27%		0.09%

In the unconstrained ODIs research, customers also valued the best level of service most on discoloured water. Environmental issues and leakage also remained important across the samples. The biggest change between the

constrained and unconstrained research is the overall percentage of the bill contributed to the services. The unconstrained research suggests that customers would prefer to contribute less than 6% of their bill to the best levels of service.

1 CONTEXT AND OBJECTIVES OF THE RESEARCH

1.1 Context

Northumbrian Water Group (NWG) is required to publish its five-year business plan for the upcoming price control review (PR19) in September 2018. This business plan should be supported by customer research in a number of areas including:

- supporting investment choices;
- carrying out cost-benefit analysis (CBA) that relies on customer valuations to quantify the expected benefits for customers;
- setting outcomes targets (i.e. performance commitments or PCs); and
- setting financial incentives around those targets (i.e. outcome delivery incentives or ODIs).

In terms of the type of research that companies use to inform their plans, Ofwat published its customer engagement policy statement for PR19 in May 2016, which set out its expectations for companies' PR19 customer research. In this statement, Ofwat challenged companies to develop innovative research methods that could be used to complement more traditional WTP methods and alternative methods (such as revealed preferences, and also behavioural trials). In particular, Ofwat stated that for PR19 that it expects companies to "think about more innovative and frontier-shifting approaches to customer engagement".[2]

NWG has responded to this challenge from Ofwat, and decided not to carry out traditional WTP research for PR19. Instead, NWG commissioned a consortium (Frontier Economics, Explain Research, and Supercharge) to design a tailored research tool that delivers cognitively valid results, and the insights that NWG needs to meet Ofwat's expectations. This collaborative research team drew on the specific expertise and experience that Frontier Economics, Explain and Supercharge each brought.

1.2 Objective of research

The overall objective of this research was to provide NWG with customer insight on its key services, to inform how PCs and ODIs are set on those services. The aim was to develop an innovative research approach to achieve this objective, and to meet Ofwat's challenge of carrying out frontier-shifting research.

The remainder of this report sets out how we designed our research approach, and presents the results.

[2] Ofwat, 2016, Ofwat's customer engagement policy statement and expectations for PR19

2 HOW WE DESIGNED THE RESEARCH

2.1 Overall design challenge

There are a number of limitations with the more traditional WTP surveys that were generally used by water companies at PR14. For example, the surveys typically presented service attributes in relatively complex ways, which meant that it was hard for respondents to make informed choices, and increased the chance that respondents used heuristics (i.e. rule of thumb) to answer the questions. The cognitive validity of these traditional WTP surveys is therefore generally considered to be relatively low. While WTP methods still have a role to play, Ofwat has challenged companies to be more innovative in the way that they design their overall customer research programmes for PR19. This includes developing a wide evidence base, drawing on a number of customer research methods, and also including some innovative research methods in the overall programme.

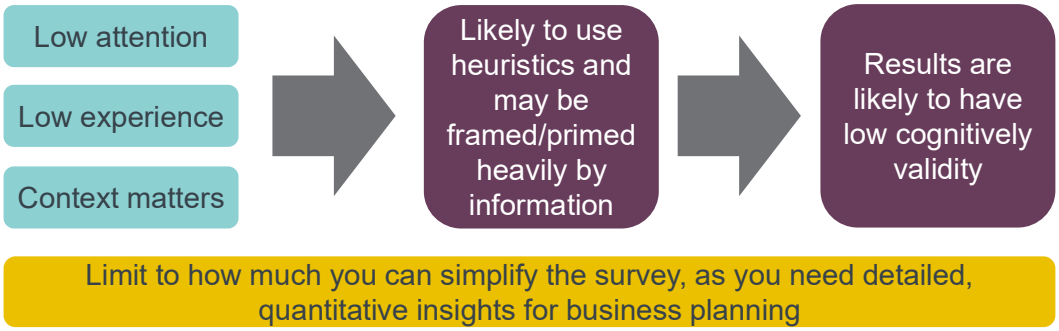
NWG's overall goal for this research was therefore to:

- address the limitations of traditional WTP surveys,
- meet Ofwat's expectations in relation to designing innovative customer research; and
- design a tool that delivers the insights that are needed to inform its business plan.

Design challenge

It is challenging to achieve those goals in practice for a number of reasons, which are summarised in the figure below.

Figure 7 Challenges in designing customer research



- Customers generally have limited experience in the service failures that NWG works to avoid. This is because the water and wastewater service that NWG provides is generally very good, so most customers receive uninterrupted services. Related to this, customers generally do not pay much attention to their water and wastewater services. As customers do not have much actual experience to draw on, and they do not generally consider these services much in their everyday lives, it means that they will find it hard to relate to the

issues presented in the survey. As a result, they are much more likely to be affected by the context that is presented in the surveys.

- As a result of these factors, customers are quite likely to use heuristics to answer the questions presented to them. They may use a rule of thumb such as always picking the status quo, or always picking the cheapest option, rather than looking through all of the information and making a reasoned choice in each instance. As customers are more likely to be affected by the context that is presented to them, this means that their answers may be more influenced by the ordering of questions (framing) or the information that is provided (priming), relative to being asked about services they are more familiar with. For example, they may always pick the option that is in the middle.
- This means that although people may complete the survey and there are results to analyse, the cognitive validity of those results is likely to be relatively low.
- Underlying all of these challenges is the fact that it is not straightforward to simplify the questions that are posed to customers, in attempt to increase the cognitive validity of the research. This is because NWG needs relatively detailed, quantitative insights from its customers to inform its business plan, and simplified questions would not provide this necessary insight.

We worked with NWG to design a customer research approach that directly addresses these challenges and delivers NWG the insight that it needs.

We explain in this section how we designed the overall research approach for this core part of NWG's research programme, including:

- how to design an innovative approach;
- how to deliver valuations for PCs and ODIs;
- services included in the tool;
- how we traded off using customer friendly language, and ensuring we delivered the insights NWG needs; and
- how we applied insights from Behavioural Economics (BE).

How to design an innovative approach that delivers meaningful valuations

As highlighted above, there are a number of challenges associated with designing customer research in the water sector, and it is not straightforward to address these challenges. This means that there is a need to come up with new, innovative ways of carrying out customer research that directly address these challenges, as much as is practically possible. These innovative approaches need to be designed in ways that address those challenges, so that the results of the research are more cognitively valid, and also so that the results deliver meaningful valuations that can be used to inform NWG's plan.

We decided the best way to strike the right balance between delivering cognitively valid results and meaningful valuations, is to focus on getting customer valuations that are not necessarily maximum WTP values. Our

innovative approach is focused on presenting service options to customers at cost, and asking them to choose between those service options, based on how much they value those services. This approach is innovative as it reduces the amount of information that customers are presented with, simplifies the questions that are posed to them, while still delivering NWG with the insights that it needs to develop its business plan. We provide further details on our innovative design in the following section.

We concluded that we could further increase the cognitive validity of the results by designing an interactive, online tool to facilitate our research. We set ourselves the ambition of designing an online tool that was an engaging experience for customers to take part in, and that did not follow the relatively complex structure of a more traditional customer survey. Our aim was that our online tool would allow us to present information in a more accessible way, to increase the level of engagement, and therefore increase the cognitive validity of the results further.

How to deliver valuations for PCs and ODIs

We recognised that while customer valuations will still play a role in the way that PCs are set at PR19, the balance has shifted more towards the importance of using customer valuations to set ODIs. This is because companies are now required to use a mixture of six different methods to set PCs, instead of mainly using CBA to set PCs. In contrast, Ofwat has clearly set the expectation that customer valuations must continue to be used directly to set ODIs. The balance has therefore shifted for PR19, such that customer valuations are now more important than ever for the way that ODIs are set.

Given this change in the regulatory methodology, we decided to split the research into two parts:

- one part to get valuations relating to setting PCs (PCs research); and
- one part to get valuations that could be used directly to set ODIs (ODIs research).

We felt that it was important that these two parts were kept separate in the online tool, as the two issues are distinct. In particular, questions around PCs are about what customers' priorities are across services, and what level of service NWG should *commit to delivering* for the proposed bill level. Whereas questions on ODIs focus on the amount of money customers are prepared to *pay more or less, if NWG delivers more or less than it has promised to deliver*.

In sections 2.2 and 2.3, we provide more detail on how the PCs research and the ODIs research, respectively, were designed.

Services included

We decided at the beginning of this work that the same service attributes would be included in both parts of the online tool. This was to provide some level of consistency across the two parts of the tool, and to reduce the amount of information that participants were presented with.

To decide which service attributes should be included in the online tool, we considered:

- what customers have reported are the most important services (in previous research);
- what areas NWG would need a particularly strong evidence base to support ODIs (e.g. for common measures that are more likely to have larger ODIs, such as supply interruptions);
- which areas NWG would like to have valuation data so that it can carry out CBA to inform the way that PCs are set; and
- how many service attributes should be included in the tool, as more than around 10 service attributes would materially reduce the cognitive validity of the research.

As a result, we agreed to include the service attributes shown in the figure below in the online tool for Northumbrian Water.

Figure 8 Services included in the online tool for Northumbrian Water[3]

Service area	Measure	Reason for inclusion
Drinking water quality	Number of customer contacts about discoloured water	Important service for customers, and NWG would need valuation evidence to cross-check bespoke PC
Interruptions to supply	Average minutes without supply per household (interruptions over 3 hours)	Ofwat common measure, so strong evidence required for ODIs
Leakage	Megalitres per day	
Water usage	Litres per person per day	
Wider environment	Improvements to rivers, coasts, and lakes that customers can access	Important service for customers, and NWG would need valuation evidence to cross-check bespoke PC
Response times	Average time to respond to a leak	
Internal sewer flooding	Number of sewer flooding incidents inside properties	Ofwat common measure, so strong evidence required for ODIs
Pollution	Number of pollution incidents (category 3)	

Trade-off between customer-friendly definitions and insights for the business plan

Once we had agreed on the service attributes that would be included in the tool, we also considered what the unit of measure should be for each service. While we were mindful that these measures should be defined clearly and ideally should be as customer-friendly as possible, we were also conscious that these measures should align to the PCs that NWG will likely set for PR19. Ensuring

[3] We included the same water service attributes for Essex and Suffolk Water, and excluded the two service attributes relating to sewerage services (internal sewer flooding and pollution) as NWG does not provide sewerage services in Essex and Suffolk.

that the measures are aligned with NWG's likely PCs would mean that the valuations and insight from the tool are as useful as possible for NWG when it develops its business plan. In some cases, for example water supply interruptions, we agreed to use the industry definition so that the measure in the survey was exactly aligned to NWG's PC, even though the common definition is not particularly customer friendly.

Application of insights from Behavioural Economics (BE)

We summarise in the table below how we have designed the research in a way that applies the insights and learning from BE.

Figure 9 Application of insights from BE

BE traits	How we designed our research to reflect this insight
Attention	We recognise that most customers, both household and non-household, rarely pay much attention to their water and wastewater service. This means that they are likely to find it hard to engage with the issues that are presented to them in this sort of research. To increase the cognitive validity of the results, we presented information to customers as clearly as possible, using infographics and providing simple descriptions of the information we wanted to share with customers.
Association	To help customers draw associations between the introductions they saw at the beginning of the research and the choice questions, we used the same infographics throughout the research.
Framing	We recognised that the order in which customers saw the service attributes may affect the answers that they gave. For example, customers may focus more on the services that they saw first, and assign more money to those services, which could bias the results. To increase the cognitive validity of the results, we therefore randomised the order in which the services were presented to customers in the research.
Priming	We recognise that customers could be primed by the information that they are presented with, which could affect the way that they answered the questions. For example, if customers were shown a bill level that they did not associate with, this may negatively affect the way that they felt about the survey, which in-turn could have affected their answers. To reduce the risk of this happening, we asked customers how much they pay for their water and wastewater services, and then presented monetary amounts in the context of their own bills.
Heuristics	The choice questions that are presented to customers in this type of research are generally complex, and it can be challenging for customers to engage with the questions as they relate to services that they often to do not think about and they have often not experienced the service failures. To reduce the risk that customers use heuristics (or rules of thumb) to answer the questions, we simplified the research as much as we could, while ensuring that we still delivered NWG with the insights that it needs. In particular, we designed an innovative approach where we asked customers to allocate a certain amount of money across services, rather than designing a more traditional WTP survey.
Reward	BE tells us that people are driven by rewards, and are also likely to favour short-term rewards. We recognised this in the way that we designed the research and the information that we provided to customers. For example, we abstracted from the fact that the service improvements will not be delivered for a while, and focused on getting customers' preferences now, to reduce the risk that we underestimated the utility they will get from service improvements in future.

2.2 Design and structure of the PCs research

The objectives of the PCs research were to:

- get customer valuations on a number of measures that NWG will set PCs on, so that NWG can carry out a CBA cross-check on where those PCs should be set;
- design a simple activity so that the cognitive validity of the research is higher than in traditional WTP surveys, recognising that this may mean the research does not deliver maximum WTP values; and
- present a real choice to customers and frame that choice in the context of the customers' own bills.

We set out in this section how we designed the PCs research, and also how the tool will deliver the insights that NWG needs for PR19.

2.2.1 Design of PCs research

We agreed to ask customers how much they are currently paying for their water (and sewerage) services, and then give them a certain proportion of that bill to spend on the services included in the tool. For example, customers may be told that they have £20 to spend across the eight services included in the tool. The concept was that the customers had to spend (almost exactly) the amount that they have been given, and the more they chose to spend on each service, the higher level of service they would receive in that area. The results from this part of the research will show us customers' relative priorities across the service attributes included in the tool, and provide a relative strength of that prioritisation, as the tool is framed in monetary terms.

There are a number of advantages of this approach:

- it is based on prioritisation across services, but as it is framed in the context of customers' bills and the cost of delivering service improvements, it will deliver the quantitative insights that NWG needs for PR19, as explained in the next section;
- it is framed in the context of each customer's own bill, which is an amount of money that they should relate to (as opposed to the average bill, which may be quite different to the amount they actually pay)[4];
- as we have included a separate piece of research relating specifically to ODIs, this piece of the research could be focused on realistic service levels that NWG could commit to and does not need to present higher levels of service performance or the higher levels of cost it would take to get there;
- it only includes one choice question, rather than the many questions you would typically find in a traditional WTP survey, as we were not attempting to estimate the maximum WTP; and

[4] If customers did not know their actual bill levels, the Explain team at the hall tests were able to look up the customer's actual bill levels in a database (based on the customer's home postcode) and so the customer could then insert their actual bill levels. If any further issues arose, the customer would have been advised to insert the average bill level.

- as the monetary amounts shown in the research relate to the costs of delivering service improvements, the results can be directly to inform NWG's CBA.

We believe that this it is a frontier-shifting approach, as it delivers the insights that NWG needs to inform its business plan, while achieving results with a higher cognitive validity. NWG will use the results from his more meaningful research as the core evidence base for developing its business plan, which means that its business plan will be most informed by research with higher cognitive validity.

In the remainder of this section, we provide screen shots to show the overall design of the PCs research, and to illustrate the experience that customers had.

The tool first introduced customers to NWG, and then to the service attributes that were included in the tool. The introduction to the service attributes included a short description of these areas, and also provided some infographics. We used the same infographics throughout the tool, so that customers could draw links between the introduction and the activities.[5] The image below illustrates the infographics that were included for two of the service attributes in the tool.

Figure 10 Example infographics

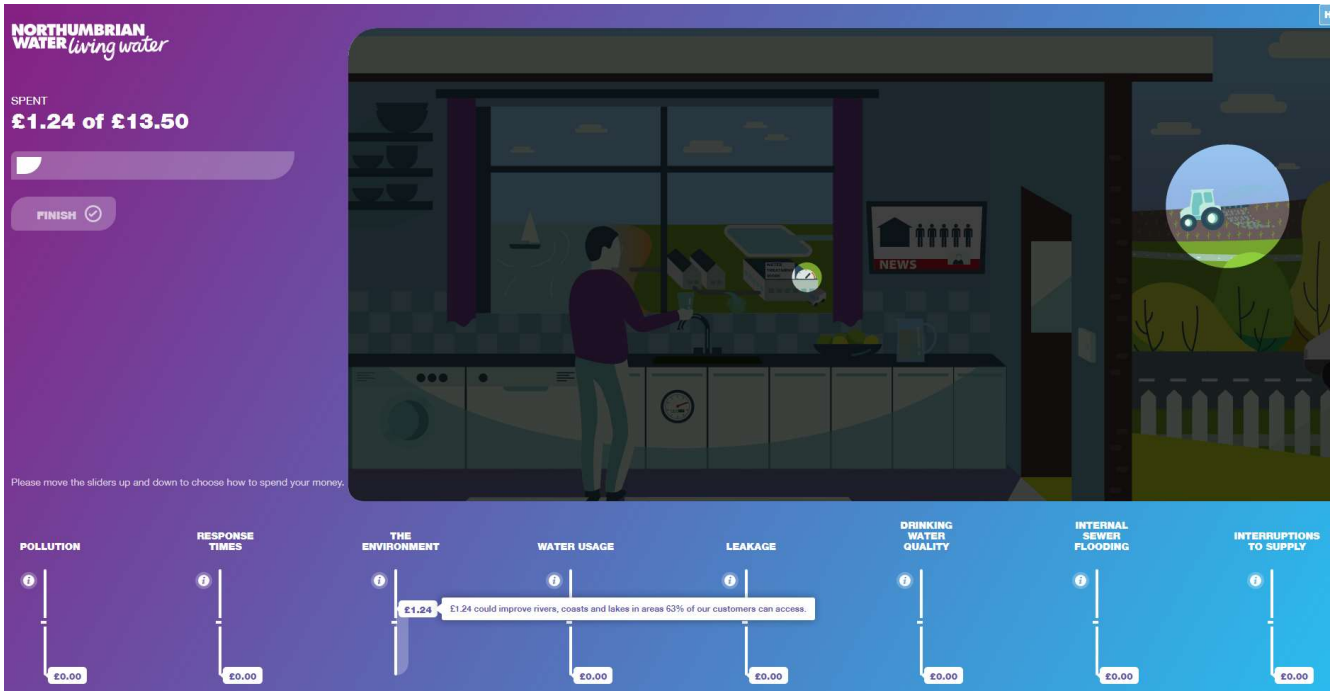
After this general introduction, customers were asked what they currently pay for their water (and sewerage bills), and then they were introduced to the PCs research. This included the following explanation:

- customers were shown the amount of money they have to spend on service attributes;
- they were introduced to the slider tools for each service, which they could move up and down for each service, depending on how much of it they would like and how much they would like to spend on it;
- they were shown the pop-up next to each of the sliders, which explained what service level you get for how much money (where this money was the bill impact of delivering the extra service improvement); and
- they were shown that the main image on screen would change as they spent more money on each of the services.

[5] However, we made some changes to the images that were used in the PCs research for non-households, as the images that were designed were centred around a household kitchen, and it was felt that these images should be adapted for the business audience.

The image below illustrates the sliders that customers could use to choose which service level they would like in each area, and shows how the relevant part of the main image lit up to clearly illustrate how their service might change.

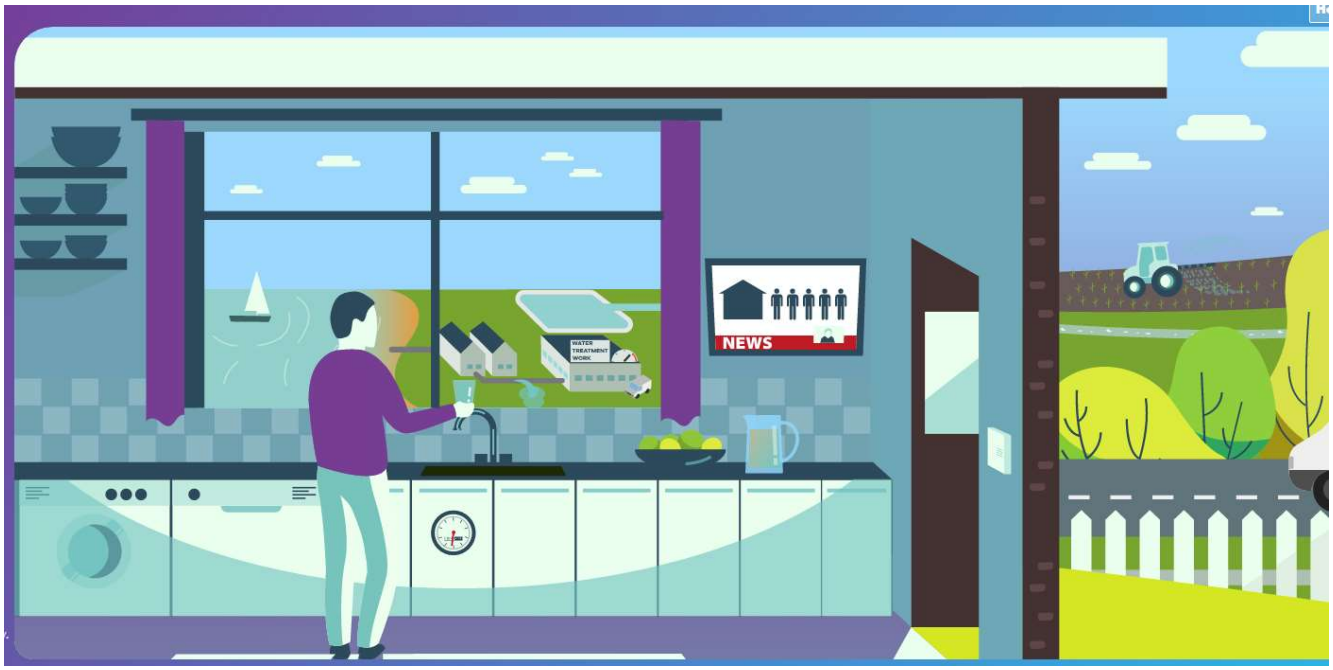
Figure 11 PCs research



Source: Supercharge

We also show below the full image that was included in the PCs research.

Figure 12 Main image in PCs research



Source: Supercharge

Once customers had used the money that they had to spend, they were told that they could finish this part of the research, if they were happy with their choices.

They were shown a summary of the service levels that they had selected, and asked if they would like to make any changes. Once this research was done, respondents could move onto the ODIs research.

Finally, we considered how we should frame the timing of these service improvements, and whether we should include references to inflation. We noted that the challenge with this research is that NWG would ideally like customers' views in 2020 about what NWG should do then, but in practice NWG needs to ask customers this question now (due to the regulatory cycle). This therefore means that NWG has two choices in this regard:

- ask customers now what they would like to have now, and assume they would have the same preferences in 2020; or
- ask customers now what they would like to have in 2020.

We decided to go with the first option, as we feel that abstracting from the timing of these service improvements and inflation makes the research considerably easier for customers to complete. This therefore reduces the risk that customers use heuristics to answer the question, and ultimately increases the cognitive validity of the research. It also reduces the risk that customers discount their answers, due to the timing of the service improvements, and reduces the chance that we underestimate the utility customers would get from the improvements in the future. In addition, we note that concerns around not referencing inflation are more relevant in cases where customers are asked how much extra they are prepared to spend on their water services. As we were asking customers to allocate a fixed pot of money across services, there is no obvious downside of not including inflation in the explanations.

2.2.2 How the PCs research will deliver the insights for PR19

The PCs research will deliver customer valuations for each of the service attributes included in the tool. We provide more detail in this section on how the customer valuations should be interpreted, and how NWG can use those insights to set PCs.

Customer valuations

Stated preference WTP surveys are designed to elicit the maximum amount that customers are willing to pay for varying degrees of service improvements on a range of service attributes. This involves offering customers a number of packages to choose between, with each package showing the level of service they would get on each attribute and the cost of that package, and repeating this choice task a number of times with different sets of packages. This design allows researchers to estimate the maximum WTP for each of the service attributes, and for a number of different service levels.

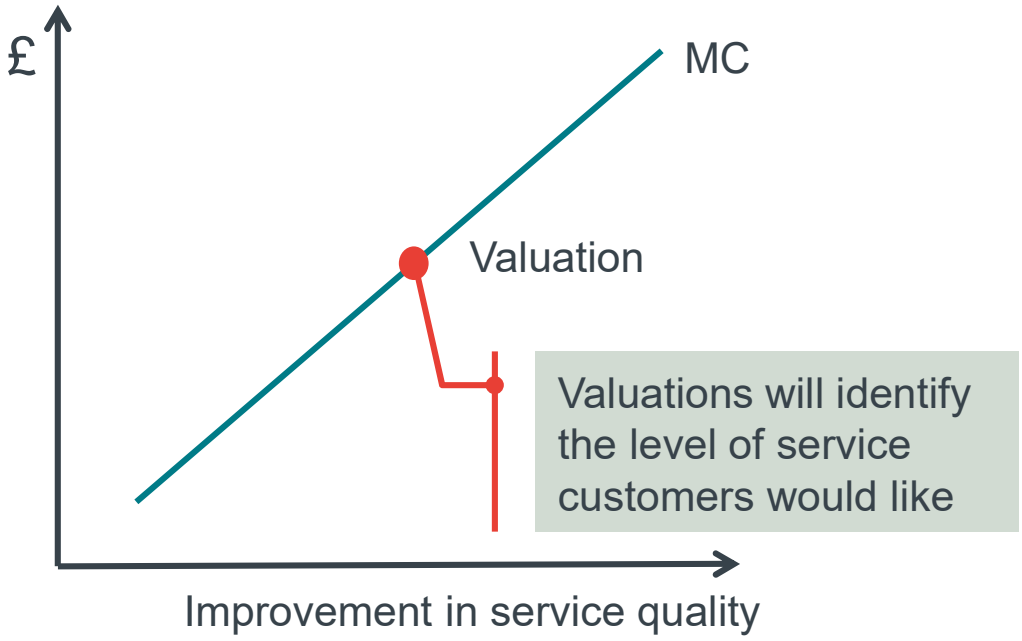
To increase the cognitive validity of our research, we wanted to simplify the information provided to customers and the questions we posed to customers. This meant that we did not want to include the number of choice tasks that are generally included in a survey that estimates maximum WTP. We therefore decided to design our research so that we focus on finding out whether

customers value a service improvement at least as much as the cost of delivering it, and recognised that this meant we would not get estimates of customers' maximum WTP.

To achieve this, we set the monetary amounts that were presented to customers on the sliders at the amounts of money that those customers would have to pay to receive that service level. For example, one point on the slider might show £2 for 100 customer contacts on discoloured water, while a point further up the slider might show £2.50 for 80 customer contacts on discoloured water. These calculations were informed by the amount that it would cost NWG to deliver the service levels shown on the sliders, and how those total cost translate into bill impacts.

The valuation results from our research therefore show us the point where customers value service improvements at least as much as the costs. This is illustrated in the figure below.

Figure 13 Customer valuation results from the PCs research



Note: MC=marginal costs

The information presented to customers on the sliders will effectively trace out the marginal cost of delivering service improvements, and customers will have chosen which level of service they would like, given the cost of the possible service levels. The results of this online tool can therefore be used directly by NWG in its CBA to determine what the optimal level of service is, given the cost of delivering service improvements and given customers' valuations.

However, given the way that we have designed our research to increase the cognitive validity of the results, we will not have traced out the equivalent of the marginal benefit curve, as we will not have estimated customers' maximum WTP. This is because we will not know if customers would have been prepared to pay more than the costs of delivering a given level of service. For example, we could find that a customer chose to spend £2 of their bill on reducing the number of

discoloured water contacts, which equated to a certain level of service. But we will not know whether this customer would have been prepared to buy this same level of service for only £2, or more than £2.

How NWG can use these valuations to set PCs

This approach will deliver the insights that NWG needs to inform the way that its PCs are set, and it was not necessary for NWG to get maximum WTP values from its PCs research. This is because, while the maximum WTP values might have provided useful insight on how much customers would like NWG to go further, and therefore inform how ODIs are set, this is not necessary information for NWG to get from its PCs research, as we have designed a separate piece of ODIs research.

The customer valuations from the PCs research will provide insight for NWG in the following ways.

- The results from our PCs research will directly inform NWG's CBA, as they will illustrate which point customers would like NWG to deliver on its marginal cost curve. To put it another way, the results will show where customers' valuations are at least as much as the cost of service delivery. This CBA evidence can be used to support and/or cross-check the PC levels that are implied by the other methods for setting PCs, such as the levels implied by comparative information.
- In addition to that, Ofwat has also challenged companies to carry out more innovative customer research. We considered how a maximum WTP survey could be adapted to increase the cognitive validity of the results, and felt that while improvements could be made, the cognitive validity would always be limited due to the nature of the research. This is because the nature of the research is such that respondents need to be shown a range of possible service levels, at different possible prices, so that the maximum WTP can be estimated. We therefore believe that the approach we have designed here has advantages over more traditional WTP surveys, as the results have higher cognitive validity.

On balance therefore, we decided that designing customer research that delivers customer valuations in a cognitively valid way, would best meet Ofwat's expectations for PR19. It will deliver the insights that NWG needs to set PCs, and also presents the best opportunity for NWG to run innovative research.

To ensure that we achieved these objectives, and that the research delivers the insights NWG needs, we carefully considered the amount of money that should be shown to customers in the PCs research, and also what service levels should be presented. We discussed this issue with NWG, and agreed on the following principles.

- We agreed that the base level at the bottom of the sliders should be NWG's forecast service level in 2020. We also agreed that the mid-point of the slider should equate to NWG's possible PC level, which was generally informed by the expected upper-quartile level in 2025, and the top of the slider should be a level of service above that but still at a realistic level that NWG could potentially commit to as a PC level. The intention was that all the service

levels on the slider could be possible PC levels, and therefore below the level of service NWG would need to provide to receive a reward (as we wanted to separate this research from the ODIs research, and the service levels that were considered there).

- The amount of money that customers had to spend on these services was the cost of the mid-point of the sliders, plus an additional 20% on top of that cost. This amount of money was then converted into bill terms. The logic for this was that customers could afford to buy the mid-point on all services, if they so wished, which meant that the choices were realistic, as this is the possible level of service that NWG will commit to, given its costs and bill levels. It also meant that customers could not afford to buy the top level of service in all areas, so they had to carry out some form of prioritisation.
- The prices shown on the sliders reflected the costs of delivering those service levels. For some measures, this meant that the cost per unit changed after the level of service went above the mid-point, due to non-linearity in the cost of production. It also meant that it was clear to customers that service improvements in some areas were a lot more costly than service improvements in other areas.

Overall, this meant that the information presented to customers was realistic, and allowed them to have a genuine choice over how their money should be spent. Also, as the service levels were aligned to possible PC levels, the results will provide insight that will help NWG to cross-check where its PCs should be set.

2.3 Design and structure of the ODIs research

The objectives of the ODIs research were to:

- ask customers how much money they are prepared to pay, in total rewards, for higher levels of service provision across all service measures included in the tool;
- ask customers how much they would value higher levels of service on each individual measure;
- design the research in a way that is simple for customers to understand and increase the cognitive validity of the research; and
- strike the right balance between seeking customers' views, while delivering NWG with the insights that it needs to develop its business plan.

We set out in this section how we designed the tool, and also how the tool will deliver the insights that NWG needs for PR19.

2.3.1 Design of research

Ofwat stated in its PR19 final methodology statement[6] that companies are required to use a bottom-up approach to setting financial ODIs at PR19. This means that the ODIs should be based on companies' marginal costs of delivering

[6] Ofwat (2017), Delivering Water 2020: our methodology for the 2019 price review, Appendix 2 Delivering outcomes for customers, p. 90-91

service improvements, and customer valuations of those service improvements. We understand that Ofwat was keen to maintain this bottom-up approach, rather than using a more top-down approach, to ensure that PR19 ODIs were informed directly by customer evidence. In addition to that expectation, while Ofwat has removed the overall RoRE caps and collars, it has set an indicative RoRE range of +/- 1% - 3%, which implies that Ofwat is expecting companies to include at least some rewards.[7] The challenge for NWG therefore is to set ODIs, including rewards, based on customer valuations, even though NWG's previous customer research generally suggests that its customers do not agree with rewards in principle.

In terms of this research, the regulatory context means that we needed to design an approach that on the one hand offers customers the chance to provide their views on rewards (including saying they would prefer zero rewards), but that also delivers NWG with some non-zero valuations on high service levels. To directly address this challenge, we decided to design the research so that the ODIs research would include two distinct parts:

- one part (the constrained part) would present customers with a fixed amount of money to allocate across the services attributes, based on how much they value the "best level of performance" (see definition below) on those service attributes; and
- another part (the unconstrained part) would first ask customers how much money they would be prepared to pay in total for rewards, and then ask customers to allocate their chosen amount of money across the service attributes, again based on how much they value the best level of service.

In both cases, customers were asked to allocate the total money to service attributes according to how much they would value receiving the "best service performance" (in England and Wales) on that attribute. The levels of service that were shown in the ODIs research reflected NWG's best estimate of what the best level of service will be on those service attributes in 2025 across England and Wales. This was either NWG's estimate of where the industry frontier will be at that point in time, or what they believe they could do if they pushed themselves in the areas where they expect to maintain their industry leading position.

All customers completed both parts of the ODIs research, and each customer was randomly assigned to one part first. This means that some customers saw the constrained part first, while others saw the unconstrained part first.

The advantages of this approach are as follows.

- It strikes the right balance between getting customer views on how large rewards should be and also ensuring that NWG will get the valuation evidence that it needs to set non-zero rewards, even if customers would in principle prefer not to have rewards.
- As all customers will complete the two parts, we will have customer valuation evidence from both a constrained and unconstrained approach. This will allow

[7] Ofwat (2017), Delivering Water 2020: our methodology for the 2019 price review, Appendix 2 Delivering outcomes for customers, p. 77

NWG to triangulate between both pieces of evidence when it is setting its ODIs.

- As some customers saw the constrained part first and others saw the unconstrained part first, we can explore whether the ordering of the two parts tended to affect customers' choices.
- Presenting the choice in terms of how much customers value the best level of service in England and Wales is a simpler, clearer question for customers to consider than being asked more directly about rewards and penalties (which can be confusing concepts for customers). It also focuses the research on the fundamental question, which is getting customer valuations for certain levels of performance.
- Framing the choice in terms of how much customers value the best level of service in England and Wales includes some comparative context in the research, which therefore meets one of Ofwat's expectations for PR19 customer research.

As the same service attributes were included in both the PCs and ODIs activities, we didn't include a general introduction at the beginning of the ODIs research (although customers could click on an information button to get a reminder of what the service attributes were). The first screen that customers saw in the ODIs research was therefore an explanation screen, including the following points:

- customers were told that they were now taking part in a second part of research, which involved a different question to what was included in the first part of the research, and they were introduced to the fact that NWG will get rewards if it delivers the best level of services;
- it was explained that the key question for them now was how much those rewards should be for each service attribute, if NWG provided the best water (and sewerage) service in England and Wales on those attributes; and
- customers were also told that their bill will be lower in future, and that they could use this saving to effectively pay for the rewards that NWG would get, if it delivered the best level of service.

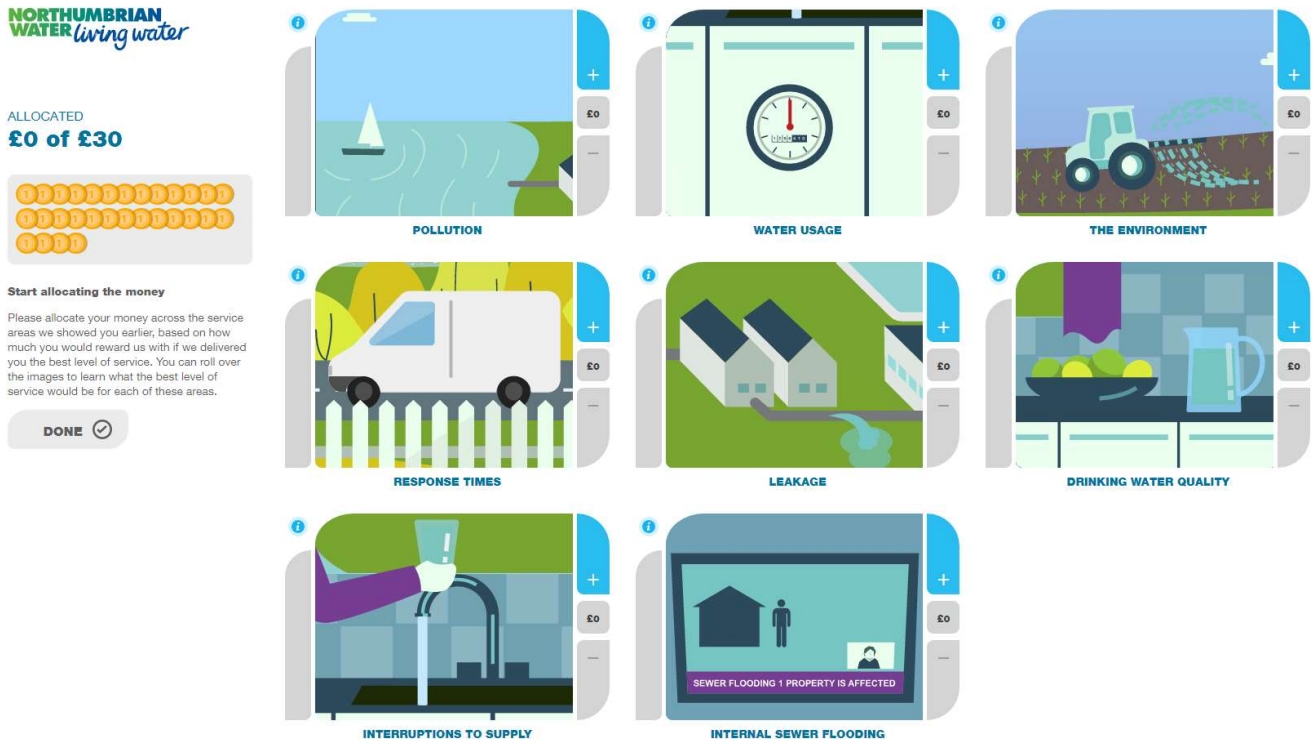
If customers were first taking part in the constrained activity, they were told that they had a fixed amount of money (e.g. £x) to allocate across the service attributes. This fixed amount of money was set equal to 6.5% of customers' bills (as that roughly equates to 3% of RoRE, which is the upper end of Ofwat's indicative range for ODIs). As we were showing figures to customers in the context of their own bills, this 6.5% was translated into a personal monetary amount for each respondent.

If customers were first taking part in the unconstrained activity, they were asked how much of the saving on their bill they were prepared to use to pay for rewards. In this part, customers could enter a value anywhere between £0 and £y, where £y equated to 10% of their current bill (which is NWG's estimate of the amount that bills will come down by).

Regardless of whether customers were completing the constrained or unconstrained part of the ODIs research, they then had to allocate coins (where

each coin represented £1)[8] across the service attributes included in the tool. However, the number of coins each customer had depended on the scale of a customer's bill, and whether they were taking part in either the unconstrained or constrained part (and if unconstrained, how much customers chose for total rewards). The screenshot below shows the images that customers saw and the activity that they needed to carry out.

Figure 14 ODIs research



Customers could hover over each of the images to get a description of what the service level would be, if NWG were to provide the best water and sewerage services. This is illustrated in the example below.

[8] We note that in the non-household tool, 6.5%-10% of wholesale bills could amount to a relatively large absolute amount of money. We therefore designed the non-household tool so that each coin amounted to 1% of the saving in the customers' wholesale bill, rather than representing £1. This meant that customers in the constrained part would have 65 coins to allocate, where each amounted to 1% of their wholesale bill saving, and customers in the unconstrained part could choose between 0 and 100 coins, again where one coin amounted to 1% of the saving in their wholesale bill.

Figure 15 Service level shown in ODIs research

The layout and experience of the core ODIs research was the same across the constrained and unconstrained parts. Whichever part a customer completed first, they would then be shown the other part of the research. Before finalising each part, a summary of the choices made was shown, and customers were asked to confirm if they were happy with this choice.

We designed the core of the ODIs research in the following ways.

- Customers could click on the +/- buttons to easily move their coins around, depending on how much they would value receiving the best level of service on those service attributes. The pile of coins on the left hand side of the screen depicted how much money the customers had left to spend.
- When a customer hovered over the images, they could see the service level that amounts to the best level of service in England and Wales. They could also click on the 'i' button to get a reminder of the description of the service attribute. This design ensured that customers had all the information that they needed to make their choices, and provided this information in a clear and simple way.
- The infographics that were shown in the ODIs research matched those that were shown in the PCs research. This design would have made it easier for respondents to draw associations between the two activities, and to recognise the service attributes from the upfront introduction to the tool.
- At the same time, we were keen to emphasise to customers that the questions being asked in the ODIs research, and the service levels being presented, were distinct from those in the PCs research. To help illustrate this, at least sub-consciously in the respondents' minds, we used a different background colour on the ODIs screen relative to the PCs screen.

2.3.2 How the ODI research will deliver the insights for PR19

As we explained earlier in this report, customer valuations are important for the way that ODIs will be set at PR19NWG therefore needed to design customer research that would deliver it with customer valuations that could be used to inform the way that ODIs are set. In addition, while Ofwat has removed the cap on rewards and penalties, it has set an indicative RoRE range of +/- 1% - 3%.

Our research will deliver insights relating to how ODIs should be set in a number of ways.

- The results from the constrained part of the ODIs research show customers' relative valuations for the best levels of service on the service attributes included in the online tool. These valuations will illustrate the relative importance of the best levels of service across the service attributes, including the strength of those relativities, but they will not necessarily match with customers' overall view of how large rewards will be.
- The results from the unconstrained part of the ODIs research show customer valuations for best levels of service, reflecting both the relative importance of the best levels of service across the service attributes, and also how much customers have reported that they would value the best level of service in total.

NWG will be able to use this information to set its ODIs on the service attributes that are included in the tool. In doing so, NWG may choose to reflect only the results from the constrained part of the tool, the unconstrained part of the tool, or a combination of the two sets of results. As the service levels shown in the ODIs research relate to the "best level of service", this means that the valuation results relate to the service levels that NWG would need to provide in order to get the maximum possible level of reward. NWG can use this to set its maximum possible rewards and also use the unit customer valuations to set reward rates.

We also ensured that the amounts of money that were shown in the tool reflected reality. As the service levels were those which NWG would need to deliver in order to achieve the maximum possible reward, we set the monetary pot in the constrained part at 3% of RoRE, as that is the top of Ofwat's indicative RoRE range. In the unconstrained part, we allowed customers to choose a monetary pot of £0, so that we could assess how many customers are not prepared to pay for any rewards. We also framed the unconstrained part of the tool as how much of the expected saving in bills customers are prepared to use to fund rewards. NWG has estimated that its bills are likely to be around 10% lower in future, so we presented this to customers in a personal monetary amount to them, and asked them in the unconstrained part how much of that saving they were prepared to use to fund rewards.

Overall, the design of the ODIs research means that NWG will have useful insights on customer valuations that will allow it to set maximum rewards within Ofwat's indicative RoRE range, and to set reward rates. It also means that NWG will have a sense of how much customer support there is for rewards in general, and how much customers would value the best level of service across the service attributes included in this tool.

We recognise that the research was focused on rewards, and that ultimately NWG will also need to set penalties that are based on customer valuations. However, we decided to design the research in a way that was simple and delivered results with high cognitive validity. We therefore decided to focus on rewards, as that reduces the complexity of the questions that need to be presented to customers, and also because NWG has previously struggled to get useful insight from its research relating to rewards. We believe that it would be pragmatic to assume that the per unit valuations across rewards and penalties are symmetric, so that NWG will still be able to use the results from this research to inform how its penalties are set. Overall, the design we chose strikes the right balance between delivering results with high cognitive validity, and that provide the regulatory insights that NWG needs.

3 RESULTS

In this section we present the results from our research, both for household and non-household customers, and across both the PCs and ODIs research. We present the results separately for Northumbrian Water, and Essex and Suffolk Water, as the bills are different in these two geographic regions and because the customers were shown different packages of services in the research.

For the household research, we have the following five samples. We have one sample for non-households.

- **Hall tests.** This is our main household sample. The research was carried out by Explain and we have re-weighted the sample so that it is representative of the households within NWG's two regions.[9]
- **Flo results.** This part of the research was carried out by NWG on board their customer engagement vehicle "Flo". This sample is not representative, and we have kept it separate from the Hall tests as the experience customers received during this part of the research may have been different from those who took part in the Hall tests.
- **Service failure.** We were interested to test whether customers who have experienced a service failure in the last twelve months would respond differently to the research. We therefore specifically targeted a small sample of customers who have recently experienced a service failure.
- **Low income.** Affordability and financial vulnerability are key themes for PR19, and so we were keen to understand whether low income customers (those in socio-economic grades D and E) have different views to the main sample.
- **Future customers.** Some future customers completed our research. While these results have been excluded from our other samples, we were interested to assess what future customers' views are on NWG's service performance. We have therefore included this set of customers as a separate sample in our reporting.[10]

Further details on our fieldwork methodology are included in Annex 1 of this report.

In the remainder of this section, we present the mean valuations for our main household sample (Hall tests) and the non-household sample for both the PCs and ODIs research. We present more detailed results in Annex 2, including the median/25th/75th percentile results for each sample, and also the results for the other household samples.

[9] We have re-weighted the sample for the following characteristics: socio-economic grade; age; and gender.

[10] These customers have been identified as those who are not currently bill payers (either directly or through their rent) and are aged between 18 and 29.

3.1 PCs research

In this section we present the results from the PCs research. We summarise in the box below how the results should be interpreted.

INTERPRETATION OF PCs RESEARCH RESULTS

We asked customers to allocate a certain proportion of their bill across a range of services. The results from the PCs research therefore show customers' relative preferences and how they would prioritise the amount of money that they already pay. Also, as the monetary amounts shown on the sliders were related to NWG's costs, the PCs results show where customers value service levels at least as much as the cost of providing them.

As customers were allocating a proportion of their bills, the results do not provide any evidence that customers would be prepared to pay more for these levels of service.

For each household sample we present three pieces of information, which we explain further below.

- **Mean % of bill.** This result shows the average amount that customers allocated to each service attribute, as a proportion of their total bill. We calculated this by dividing the amount of money that customers selected for each service attribute (i.e. the amount they selected for each slider) by the total bill amount that they reported paying.
- **Mean valuation (£ per property).** This result shows the average monetary amount that customers allocated to each service attribute, in terms of the average NWG bill. We calculated this by multiplying the percentage figures (i.e. the amount customers allocated to each service attribute divided by their bill) by NWG's average bill level for that region. For example, if one customer had allocated 2% of their bill to service attribute 1, we multiplied that 2% by £390 for the Northumbrian Water results to get a monetary amount in NWG average bill terms. We then averaged these monetary amounts for each customer to get the average monetary amount across all customers.
- **% of slider.** This result shows the point on the slider that the mean % of bill relates to. This number is between 0% and 100%, where 0% is the bottom of the slider and 100% is at the top of the slider. This piece of information helps us to get a better sense of which services were prioritised by customers, as the mean % of bill allocated to each service will be affected by customers' preferences and also the cost of delivering service improvements.

We only present the 'mean % of bill' and the % of slider for the non-household sample, as there is a larger range in the size of non-household bills, which means that the mean valuation in average bill terms would be less meaningful for non-households.

3.1.1 Household results

Hall test results

Figure 16 Northumbrian Water – PCs Hall test results (mean valuations)

Service	Mean % of bill	Mean valuation (£ per property per year)	% of slider
Discoloured water (number of contacts)	0.63%	2.44	62%
Interruptions to supply (average interruption over 3 hours)	0.02%	0.10	70%
Leakage (Mega litres)	0.76%	2.98	64%
Per capita consumption (litres per person per day)	0.51%	2.01	67%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.37%	1.44	76%
Pollution (number of incidents)	0.09%	0.34	81%
Internal sewer flooding (number of incidents)	0.87%	3.41	51%
Response time (average time to respond to sewer flooding incidents)	0.12%	0.46	62%

Source: Sample size=784

These results show that customers generally selected similar levels on each of the sliders. If anything customers appeared to prioritise improvements on pollution and wider catchment, although we note that delivering improvements in pollution incidents was not particularly costly. While customers allocated the highest monetary amount to internal sewer flooding, this measure had the lowest point selected on the slider. This could be because while avoiding internal sewer flooding is important to customers, it is expensive to deliver service improvements on this measure.

Figure 17 Essex and Suffolk Water – PCs Hall test results (mean valuations)

Service	Mean % of bill	Mean valuation (£ per property per year)	% of slider
Discoloured water (number of contacts)	1.36%	3.33	49%
Interruptions to supply (average interruption over 3 hours)	0.05%	0.13	74%
Leakage (Mega litres)	0.21%	0.51	53%
Per capita consumption (litres per person per day)	1.09%	2.67	65%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.25%	0.62	74%
Response times (average time to respond to a reported leak)	0.21%	0.53	62%

Source: Sample size=739

Customers in Essex and Suffolk appeared to prioritise service improvements on wider catchment and interruptions to supply, although we note that improvements to supply interruptions were relatively less costly.

Other household samples

We have compared the mean % of bill that was allocated to each of the services across the different household groups. There are a few statistically significant differences across the household groups for Northumbrian Water, but no statistically significant differences across the household groups for Essex and Suffolk Water.

We summarise below the differences in the results for Northumbrian Water that were statistically significant.[11] These differences are all relative to the mean results for the Hall test sample.

- **Flo:** contributed a lower % of their bill to discoloured water and water usage, and contributed more to internal sewer flooding.
- **Future customers:** contributed less towards leakage, and contributed more to pollution incidents.
- **Service failure customers:** contributed a larger % of their bill to leakage and less to response times to flooding.

[11] We have presented differences that are statistically significant at the 5% level.

It is of interest to note that there were no statistically significant differences between the Hall test results and the results for the low income group.

Finally, we note that the sample sizes for some of the other household groups are relatively small, so we would advise caution when interpreting these differences.

3.1.2 Non-household results

Figure 18 Northumbrian Water – PCs non-household results (mean valuations)

Service	Mean % of bill	% of slider
Discoloured water (number of contacts)	0.61%	50%
Interruptions to supply (average interruption over 3 hours)	0.03%	85%
Leakage (Mega litres)	0.81%	69%
Per capita consumption (litres per person per day)	0.47%	63%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.35%	71%
Pollution (number of incidents)	0.08%	68%
Internal sewer flooding (number of incidents)	0.89%	53%
Response time (average time to respond to sewer flooding incidents)	0.11%	62%

Source: Sample size=77

The non-household results for Northumbrian Water are consistent with those from the household sample; the percentage of their bills allocated to each service attribute is similar across the household and non-household samples. For example, non-household customers have also prioritised improvements in pollution and wider catchment.

Figure 19 Essex and Suffolk Water – PCs non-household results (mean valuations)

Service	Mean % of bill	% of slider
Discoloured water (number of contacts)	1.30%	47%
Interruptions to supply (average interruption over 3 hours)	0.06%	80%
Leakage (Mega litres)	0.22%	64%
Per capita consumption (litres per person per day)	1.07%	64%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.26%	78%
Response times (average time to respond to a reported leak)	0.23%	62%

Source: Sample size=40

The same is also true for the non-household results for Essex and Suffolk Water; the percentage of their bills allocated to each service attribute is similar across the household and non-household samples.

3.2 ODIs research

In this section we present the results from the ODIs research. We summarise in the box below how the results should be interpreted.

INTERPRETATION OF ODIs RESEARCH RESULTS

There are two elements to the ODIs research: the constrained task; and the unconstrained task. For the constrained task, customers had 6% of their bill to allocate across services, reflecting how much they would value the best level of performance on those service attributes. The results from the constrained task therefore show how customers would value this higher level of service, given they have been asked to allocate 6% of their bill in total. Whereas in the unconstrained task, customers could choose between 0% and 10% to allocate across the service attributes. The unconstrained task therefore gives us an indication as to how much customers would value the best level of service in total across all service attributes included in the online tool.

As for the PCs results, for the household sample we present two pieces of information, which we explain further below. We present each of these two pieces of information for the constrained task and the unconstrained task separately.

- **Mean % of bill.** This result shows the average amount that customers allocated to each service attribute, as a proportion of their total bill. We calculated this by dividing the amount of money that customers reported they

value the best level of service, by the total bill amount that they reported paying.

- **Mean valuation (£ per property).** This result shows the average monetary amount that customers allocated to each service attribute, in terms of the average NWG bill. We calculated this by multiplying the percentage figures (i.e. the amount customers allocated to each service attribute divided by their bill) by NWG's average bill level for that region. For example, if one customer had allocated 0.5% of their bill to service attribute 1, we multiplied that 0.5% by £390 for the Northumbrian Water results to get a monetary amount in NWG average bill terms. We then averaged these monetary amounts for each customer to get the average monetary amount across all customers.

We only present the 'mean % of bill' for the non-household sample, as there is a larger range in the size of non-household bills, which means that the mean valuation in average bill terms would be less meaningful for non-households.

3.2.1 Household results

Constrained results – Hall tests

Figure 20 Northumbrian Water – ODIs constrained, Hall test results (mean valuations)

Service	Mean % of bill	Mean valuation (£ per property per year)
Discoloured water (number of contacts)	1.33%	5.20
Interruptions to supply (average interruption over 3 hours)	0.47%	1.84
Leakage (Mega litres)	0.75%	2.91
Per capita consumption (litres per person per day)	0.62%	2.43
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	1.03%	4.00
Pollution (number of incidents)	0.97%	3.80
Internal sewer flooding (number of incidents)	0.52%	2.04
Response time (average time to respond to sewer flooding incidents)	0.48%	1.87

Source: Sample size=784

These results suggest that customers value the best level of service most on discoloured water, and secondly on environmental issues. Pollution is the third most important service attribute.

Figure 21 Essex and Suffolk Water – ODIs constrained, Hall test results (mean valuations)

Service	Mean % of bill	Mean valuation (£ per property per year)
Discoloured water (number of contacts)	1.59%	3.88
Interruptions to supply (average interruption over 3 hours)	0.64%	1.56
Leakage (Mega litres)	1.03%	2.53
Per capita consumption (litres per person per day)	0.89%	2.18
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	1.20%	2.94
Response times (average time to respond to a reported leak)	0.61%	1.48

Source: Sample size=739

Customers in Essex and Suffolk Water value the best level of service most on discoloured water, with wider catchment, and leakage being the second and third most important service areas in terms of delivering the best level of service.

Unconstrained results – Hall tests

For the Hall tests in Northumbrian Water, the average amount that customers included in the unconstrained ODIs research was 2.48% of their bills.

Figure 22 Northumbrian Water – ODIs unconstrained, Hall test results (mean valuations)

Service	Mean % of bill	Mean valuation (£ per property per year)
Discoloured water (number of contacts)	0.52%	2.04
Interruptions to supply (average interruption over 3 hours)	0.20%	0.77
Leakage (Mega litres)	0.30%	1.18
Per capita consumption (litres per person per day)	0.27%	1.07
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.38%	1.49
Pollution (number of incidents)	0.37%	1.45
Internal sewer flooding (number of incidents)	0.23%	0.91
Response time (average time to respond to sewer flooding incidents)	0.20%	0.77

Source: Sample size=784

While the overall amount of money included in the unconstrained task was lower than the amount given in the constrained research, customers' relative preferences across the service attributes appear similar to the constrained research. Customers value the best level of service most on discoloured water, and then on environmental issues, as they did in the constrained research.

For the Hall tests in Essex and Suffolk Water, the average amount that customers included in the unconstrained ODIs research was 2.65% of their bills, which is similar to the figure for Northumbrian Water. The table below shows the mean results for the unconstrained ODIs research for Essex and Suffolk Water.

Figure 23 Essex and Suffolk Water – ODIs unconstrained, Hall test results (mean valuations)

Service	Mean % of bill	Mean valuation (£ per property per year)
Discoloured water (number of contacts)	0.71%	1.73
Interruptions to supply (average interruption over 3 hours)	0.32%	0.79
Leakage (Mega litres)	0.46%	1.12
Per capita consumption (litres per person per day)	0.35%	0.86
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.54%	1.32
Response times (average time to respond to a reported leak)	0.27%	0.67

Source: Sample size=739

As for the customers in the Northumbrian region, the choices made within the unconstrained version of the ODIs research reflect the choices made in the constrained version of the research.

While the choices made within the constrained and unconstrained ODIs tasks were relatively similar across both regions, it is also interesting to consider how customers appeared to choose the amount of money to include in the unconstrained task. Across both regions, the average amount that customers included in the unconstrained ODI research was different depending on whether customers saw the unconstrained or constrained task first.

Northumbrian Water customers chose to include 4.65% of their current bill in the unconstrained task, if they did the unconstrained session first, but only 0.59% if they did the constrained session first. Similarly, Essex and Suffolk Water customers chose 4.84% of their current bill, if they saw the unconstrained session first, compared to 0.49% if they saw the constrained session first. One possible interpretation of this is that when customers were first presented with an amount of money they felt was too great in the constrained task (i.e. 6% rather than around 4.5%) they then chose to "punish" NWG in their choices in the unconstrained task. Whereas when customers were not primed by any amount and faced the open question in the unconstrained task first, they were more comfortable in offering up a larger amount of money. This pattern held true across all the household samples.

Other household samples

We compared the mean % of bill allocated to each of the services in the ODIs research across the household samples. We highlight below the differences that

were statistically significant.[12] All of these differences are described relative to the results for the Hall test sample.

- **Flo:**
  - Customers allocated less in the unconstrained research overall in Essex and Suffolk, compared to other household samples (1.26% compared to 2.65% in Hall tests). This meant that customers allocated relatively less to interruptions to supply, leakage, water usage and wider catchment.
  - In the constrained research, customers in Essex and Suffolk also allocated less to supply interruptions and water usage.
  - In the Northumbrian Water region, customers allocated more to sewer flooding in the constrained research.
- **Future customers:**
  - In the unconstrained and constrained research, customers allocated relatively less to leakage in both the Northumbrian Water and Essex and Suffolk Water regions.
  - In the constrained research, customers in the Northumbrian Water region allocated less to less to discoloured water and more to supply interruptions. Also in the constrained research, customers in the Essex and Suffolk region allocated more to response times for fixing a leak.
- **Service failure customers:**
  - In the unconstrained research, customers in the Northumbrian Water region allocated more to leakage.
  - In the constrained research, customers in the Northumbrian Water region allocated more to leakage and less to wider catchment.

As for the PCs research, it is of interest to note that there were no statistically significant differences between the Hall test results and the results for the low income group.

Finally, we note that the sample sizes for some of the other household groups are relatively small, so we would advise caution when interpreting these differences.

[12] We report statistical significance at the 5% significance level.

3.2.2 Non-household results

Figure 24 Northumbrian Water – ODIs constrained, non-household results (mean valuations)

Service	Mean % of bill
Discoloured water (number of contacts)	0.95%
Interruptions to supply (average interruption over 3 hours)	0.69%
Leakage (Mega litres)	0.82%
Per capita consumption (litres per person per day)	0.66%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.81%
Pollution (number of incidents)	0.72%
Internal sewer flooding (number of incidents)	0.52%
Response time (average time to respond to sewer flooding incidents)	0.66%

Source: Sample size=77

The choices made by non-households in the ODIs research reflect those of the household customers in this region. Non-household customers also appear to value the best level of service most on discoloured water, leakage and wider catchment.

Figure 25 Essex and Suffolk Water – ODIs constrained, non-household results (mean valuations)

Service	Mean % of bill
Discoloured water (number of contacts)	1.35%
Interruptions to supply (average interruption over 3 hours)	0.77%
Leakage (Mega litres)	1.18%
Per capita consumption (litres per person per day)	0.86%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	1.08%
Response times (average time to respond to a reported leak)	0.76%

Source: Sample size=40

As for Northumbrian Water, the choices made by customers in the Essex and Suffolk region reflected those of households in the region.

Figure 26 Northumbrian Water – ODIs unconstrained, non-household results (mean valuations)

Service	Mean % of bill
Discoloured water (number of contacts)	0.32%
Interruptions to supply (average interruption over 3 hours)	0.16%
Leakage (Mega litres)	0.22%
Per capita consumption (litres per person per day)	0.18%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.14%
Pollution (number of incidents)	0.17%
Internal sewer flooding (number of incidents)	0.14%
Response time (average time to respond to sewer flooding incidents)	0.16%

Source: Sample size=77

Non-households in the Northumbrian region chose to allocate 1.49% in total in the unconstrained task. The choices made within the unconstrained task are similar to those in the constrained task, with discoloured water and leakage appearing important to customers.

Figure 27 Essex and Suffolk Water – ODIs unconstrained, non-household results (mean valuations)

Service	Mean % of bill
Discoloured water (number of contacts)	0.21%
Interruptions to supply (average interruption over 3 hours)	0.19%
Leakage (Mega litres)	0.17%
Per capita consumption (litres per person per day)	0.08%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.17%
Response times (average time to respond to a reported leak)	0.09%

Source: Sample size=40

Non-households in the Essex and Suffolk region chose to allocate 0.91% in total in the unconstrained task.

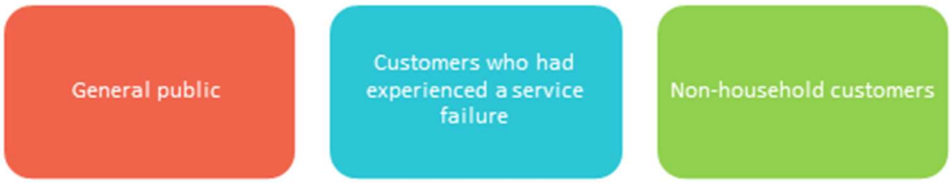
As for the household samples, the total amount that non-household customers chose in the unconstrained research was lower if they completed the constrained activity first. Northumbrian Water customers chose to include 3.72% of their current bill in the unconstrained task, if they did the unconstrained session first, but only 0.21% if they did the constrained session first. Similarly, Essex and

Suffolk Water customers chose 2.21% of their current bill, if they saw the unconstrained session first, compared to 0.04% if they saw the constrained session first.

ANNEX 1: FIELDWORK METHODOLOGY

The research was broken into three strands as shown in the figure below.

Figure 28 Strands of PR19 customer research



We provide below some further detail on each of these three strands.

General public – Hall tests

The approach for the general public survey was designed to ensure robustness and be representative of the Northumbrian Water and Essex & Suffolk Water populations. We note that only bill payers (either those who directly pay their bill, or pay through their rent) were included in the main results, and the results for future customers are reported as a separate sample.

A face to face approach was adopted for this strand of the research in order to enable respondents to interact with the tool directly and draw on assistance from the Explain team where required. This was particularly important when considering the inclusion of vulnerable groups in the sample who were less able to complete the task independently and thus a side by side interview was conducted by an Explain researcher in these instances.

A hall test methodology was used for this strand of the research. This involved inviting customers off the street into an accessible venue to complete the online tool. This enabled respondents to sit in a comfortable environment and take the time to consider their answers. Respondents were also offered a £5 high street voucher for taking part in order to broaden the population of customers willing to take the time to participate.

The figure below shows how these tests were conducted.

Figure 29 Hall tests

The research focused on busy towns and cities as these locations offer the opportunity to draw on respondents from a wide catchment area and the methodology was successful in engaging a wide range of customers in vulnerable circumstances for this reason. The figure below shows where the Hall tests took place.

Figure 30 Locations for the Hall tests

In order to ensure the sample was as representative as possible, quotas were set in terms of gender, age and socio-economic group. The hall test methodology allowed these quotas to be tightly managed.

The Hall tests resulted in the following samples:

- main representative sample; and
- a sample of future customers.

General public – Flo

To supplement the hall test methodology and ensure outreach to smaller communities, the general public sample was also supplemented by interviews which were conducted by NWG staff from their customer engagement vehicle Flo.

Figure 31 Flo – NWG's engagement vehicle

The NWG team visited the locations shown in the figure below.

Figure 32 Locations visited by Flo

The results from this research provide an additional household sample, separate from the main representative sample.

Customers who have experienced a service failure

In order to ensure inclusion of customers who had experienced a service failure aligned to the investment areas considered in the tool, an additional strand of research was designed.

An online survey was used for this strand of the research in order to allow customers to complete the activities in the comfort of their own home enabling them to consider their answers carefully. NWG provided a database of customers who were emailed a link to the tool with those who completed the activities awarded with a £5 high street voucher for having taken part.

The results from this research provide an additional household sample, only including those customers who have been affected by service failures.

Non-household customers

Non-household customers are generally more time poor and therefore harder to reach, and so careful consideration was taken to design the most appropriate methodology for this group. An online survey was distributed to this group as this methodology enables respondents to participate at a time and location convenient to them whilst maintaining the ability for the respondent to interact with the tool directly.

ANNEX 2: FURTHER RESULTS

PCs research

Hall test

Figure 33 Northumbrian Water – PCs Hall test results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.63%	2.44	0.58%	2.26	0.49%	1.90	0.84%	3.28
Interruptions to supply (average interruption over 3 hours)	0.02%	0.10	0.02%	0.09	0.01%	0.03	0.04%	0.14
Leakage (Mega litres)	0.76%	2.98	0.74%	2.89	0.50%	1.95	1.00%	3.89
Per capita consumption (litres per person per day)	0.51%	2.01	0.49%	1.90	0.29%	1.13	0.70%	2.72
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.37%	1.44	0.35%	1.36	0.23%	0.91	0.48%	1.87
Pollution (number of incidents)	0.09%	0.34	0.08%	0.32	0.06%	0.24	0.11%	0.45
Internal sewer flooding (number of incidents)	0.87%	3.41	0.82%	3.18	0.53%	2.05	1.14%	4.46
Response time (average time to respond to sewer flooding incidents)	0.12%	0.46	0.11%	0.42	0.06%	0.22	0.16%	0.63

Source: Sample size=784

Figure 34 Essex and Suffolk Water – PCs Hall test results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.36%	3.33	1.21%	2.96	0.87%	2.12	1.71%	4.19
Interruptions to supply (average interruption over 3 hours)	0.05%	0.13	0.05%	0.12	0.01%	0.04	0.08%	0.20
Leakage (Mega litres)	0.21%	0.51	0.20%	0.48	0.13%	0.33	0.28%	0.69
Per capita consumption (litres per person per day)	1.09%	2.67	0.94%	2.31	0.67%	1.63	1.33%	3.26
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	0.25%	0.62	0.23%	0.57	0.16%	0.39	0.33%	0.80
Response times (average time to respond to a reported leak)	0.21%	0.53	0.20%	0.49	0.07%	0.18	0.30%	0.73

Source: Sample size=739

Flo research

Figure 35 Northumbrian Water – PCs Flo results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.58%	2.27	0.68%	2.65	0.63%	2.44	0.69%	2.71
Interruptions to supply (average interruption over 3 hours)	0.02%	0.09	0.03%	0.10	0.00%	0.01	0.04%	0.16
Leakage (Mega litres)	0.78%	3.03	0.83%	3.25	0.64%	2.51	1.08%	4.21
Per capita consumption (litres per person per day)	0.45%	1.74	0.47%	1.82	0.21%	0.82	0.75%	2.92
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.36%	1.42	0.44%	1.73	0.31%	1.20	0.47%	1.82
Pollution (number of incidents)	0.09%	0.36	0.10%	0.41	0.09%	0.36	0.11%	0.41
Internal sewer flooding (number of incidents)	0.97%	3.79	1.05%	4.08	0.86%	3.36	1.34%	5.21
Response time (average time to respond to sewer flooding incidents)	0.10%	0.41	0.12%	0.48	0.03%	0.13	0.18%	0.70

Source: Sample size=104

Figure 36 Essex and Suffolk Water – PCs Flo test results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.39%	3.39	1.56%	3.81	1.45%	3.56	1.56%	3.81
Interruptions to supply (average interruption over 3 hours)	0.05%	0.12	0.05%	0.13	0.01%	0.02	0.09%	0.22
Leakage (Mega litres)	0.21%	0.51	0.25%	0.62	0.22%	0.54	0.25%	0.62
Per capita consumption (litres per person per day)	1.07%	2.61	1.00%	2.46	0.67%	1.65	1.31%	3.21
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	0.26%	0.64	0.32%	0.78	0.26%	0.63	0.32%	0.79
Response times (average time to respond to a reported leak)	0.22%	0.55	0.24%	0.59	0.09%	0.23	0.38%	0.94

Source: Sample size = 29

Service failures

Figure 37 Northumbrian Water – PCs Service failure results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.60%	2.36	0.67%	2.60	0.62%	2.43	0.69%	2.70
Interruptions to supply (average interruption over 3 hours)	0.02%	0.09	0.03%	0.12	0.00%	0.02	0.04%	0.15
Leakage (Mega litres)	0.85%	3.33	0.88%	3.44	0.74%	2.88	1.08%	4.21
Per capita consumption (litres per person per day)	0.46%	1.81	0.47%	1.84	0.30%	1.18	0.67%	2.60
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.34%	1.32	0.39%	1.51	0.29%	1.13	0.46%	1.81
Pollution (number of incidents)	0.09%	0.34	0.10%	0.40	0.08%	0.30	0.10%	0.41
Internal sewer flooding (number of incidents)	0.90%	3.49	0.93%	3.64	0.78%	3.03	1.11%	4.34
Response time (average time to respond to sewer flooding incidents)	0.10%	0.39	0.12%	0.48	0.07%	0.26	0.18%	0.69

Source: Sample size = 109

Figure 38 Essex and Suffolk Water – PCs Service failures test results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.42%	3.48	1.47%	3.61	1.39%	3.40	1.52%	3.74
Interruptions to supply (average interruption over 3 hours)	0.04%	0.11	0.04%	0.10	0.01%	0.03	0.09%	0.21
Leakage (Mega litres)	0.19%	0.46	0.24%	0.58	0.20%	0.48	0.25%	0.62
Per capita consumption (litres per person per day)	1.07%	2.62	0.99%	2.42	0.89%	2.19	1.10%	2.70
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	0.23%	0.56	0.26%	0.64	0.21%	0.52	0.32%	0.79
Response times (average time to respond to a reported leak)	0.16%	0.39	0.24%	0.59	0.00%	0.00	0.24%	0.59

Source: Sample size =26

Low income

Figure 39 Northumbrian Water – PCs Low income results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.64%	2.51	0.69%	2.67	0.64%	2.51	0.69%	2.71
Interruptions to supply (average interruption over 3 hours)	0.02%	0.09	0.03%	0.11	0.01%	0.02	0.04%	0.16
Leakage (Mega litres)	0.76%	2.97	0.80%	3.10	0.61%	2.39	1.05%	4.10
Per capita consumption (litres per person per day)	0.52%	2.03	0.55%	2.13	0.36%	1.39	0.77%	3.00
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.36%	1.39	0.40%	1.55	0.31%	1.21	0.47%	1.82
Pollution (number of incidents)	0.08%	0.33	0.10%	0.38	0.08%	0.30	0.11%	0.41
Internal sewer flooding (number of incidents)	0.88%	3.42	0.96%	3.73	0.71%	2.78	1.11%	4.34
Response time (average time to respond to sewer flooding incidents)	0.12%	0.47	0.12%	0.48	0.07%	0.26	0.18%	0.70

Source: Sample size =327

Figure 40 Essex and Suffolk Water – PCs Low income test results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.36%	3.33	1.46%	3.57	1.34%	3.28	1.55%	3.80
Interruptions to supply (average interruption over 3 hours)	0.05%	0.12	0.05%	0.13	0.01%	0.03	0.09%	0.22
Leakage (Mega litres)	0.20%	0.49	0.24%	0.58	0.21%	0.51	0.25%	0.62
Per capita consumption (litres per person per day)	1.11%	2.72	1.04%	2.56	0.86%	2.12	1.29%	3.17
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	0.24%	0.58	0.27%	0.67	0.20%	0.49	0.32%	0.79
Response times (average time to respond to a reported leak)	0.23%	0.56	0.24%	0.59	0.09%	0.23	0.38%	0.94

Source: Sample size =252

Future customers

Figure 41 Northumbrian Water – PCs Future customers results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.64%	2.50	0.67%	2.62	0.64%	2.51	0.69%	2.71
Interruptions to supply (average interruption over 3 hours)	0.03%	0.10	0.03%	0.10	0.01%	0.05	0.04%	0.16
Leakage (Mega litres)	0.67%	2.61	0.66%	2.59	0.57%	2.21	0.81%	3.14
Per capita consumption (litres per person per day)	0.54%	2.09	0.55%	2.15	0.40%	1.57	0.71%	2.78
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.39%	1.52	0.42%	1.64	0.35%	1.37	0.47%	1.82
Pollution (number of incidents)	0.09%	0.37	0.10%	0.41	0.09%	0.34	0.11%	0.41
Internal sewer flooding (number of incidents)	0.92%	3.59	0.93%	3.64	0.82%	3.19	1.06%	4.14
Response time (average time to respond to sewer flooding incidents)	0.13%	0.51	0.12%	0.48	0.12%	0.48	0.18%	0.70

Source: Sample size = 82

Figure 42 Essex and Suffolk Water – PCs Future customers test results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.41%	3.46	1.47%	3.60	1.39%	3.41	1.56%	3.81
Interruptions to supply (average interruption over 3 hours)	0.05%	0.13	0.05%	0.12	0.02%	0.04	0.09%	0.22
Leakage (Mega litres)	0.20%	0.50	0.23%	0.57	0.21%	0.51	0.25%	0.62
Per capita consumption (litres per person per day)	1.00%	2.46	0.97%	2.37	0.79%	1.94	1.16%	2.84
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	0.27%	0.67	0.32%	0.79	0.25%	0.61	0.32%	0.79
Response times (average time to respond to a reported leak)	0.23%	0.56	0.24%	0.59	0.09%	0.23	0.38%	0.94

Source: Sample size=59

Non-household

Figure 43 Northumbrian Water – PCs non-household results

Service	Mean (% of bill)	Median (% of bill)	25th percentile (% of bill)	75th percentile (% of bill)
Discoloured water (number of contacts)	0.61%	0.67%	0.64%	0.69%
Interruptions to supply (average interruption over 3 hours)	0.03%	0.03%	0.01%	0.04%
Leakage (Mega litres)	0.81%	0.83%	0.67%	1.01%
Per capita consumption (litres per person per day)	0.47%	0.50%	0.33%	0.62%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.35%	0.36%	0.31%	0.45%
Pollution (number of incidents)	0.08%	0.10%	0.08%	0.11%
Internal sewer flooding (number of incidents)	0.89%	0.98%	0.74%	1.11%
Response time (average time to respond to sewer flooding incidents)	0.11%	0.12%	0.07%	0.18%

Source: Sample size = 77

Figure 44 Essex and Suffolk Water – PCs non-household test results

Service	Mean (% of bill)	Median (% of bill)	25th percentile (% of bill)	75th percentile (% of bill)
Discoloured water (number of contacts)	1.30%	1.46%	1.24%	1.53%
Interruptions to supply (average interruption over 3 hours)	0.06%	0.07%	0.02%	0.09%
Leakage (Mega litres)	0.22%	0.24%	0.23%	0.25%
Per capita consumption (litres per person per day)	1.07%	0.97%	0.76%	1.29%
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	0.26%	0.28%	0.24%	0.32%
Response times (average time to respond to a reported leak)	0.23%	0.24%	0.10%	0.38%

Source: Sample size = 40

ODIs research

Hall test

Figure 45 Northumbrian Water – ODIs constrained, Hall test results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.33%	5.20	1.09%	4.24	0.44%	1.71	1.79%	7.00
Interruptions to supply (average interruption over 3 hours)	0.47%	1.84	0.22%	0.87	0.00%	0.00	0.79%	3.10
Leakage (Mega litres)	0.75%	2.91	0.55%	2.13	0.00%	0.00	1.02%	3.96
Per capita consumption (litres per person per day)	0.62%	2.43	0.37%	1.44	0.00%	0.00	0.93%	3.61
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	1.03%	4.00	0.86%	3.36	0.22%	0.84	1.49%	5.80
Pollution (number of incidents)	0.97%	3.80	0.77%	3.01	0.21%	0.81	1.38%	5.40
Internal sewer flooding (number of incidents)	0.52%	2.04	0.30%	1.18	0.00%	0.00	0.76%	2.96
Response time (average time to respond to sewer flooding incidents)	0.48%	1.87	0.23%	0.88	0.00%	0.00	0.75%	2.93

Source: Sample size=784

Figure 46 Northumbrian Water – ODIs unconstrained, Hall test results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.52%	2.04	0.00%	0.00	0.00%	0.00	0.64%	2.50
Interruptions to supply (average interruption over 3 hours)	0.20%	0.77	0.00%	0.00	0.00%	0.00	0.00%	0.00
Leakage (Mega litres)	0.30%	1.18	0.00%	0.00	0.00%	0.00	0.34%	1.34
Per capita consumption (litres per person per day)	0.27%	1.07	0.00%	0.00	0.00%	0.00	0.16%	0.63
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.38%	1.49	0.00%	0.00	0.00%	0.00	0.38%	1.49
Pollution (number of incidents)	0.37%	1.45	0.00%	0.00	0.00%	0.00	0.42%	1.65
Internal sewer flooding (number of incidents)	0.23%	0.91	0.00%	0.00	0.00%	0.00	0.00%	0.00
Response time (average time to respond to sewer flooding incidents)	0.20%	0.77	0.00%	0.00	0.00%	0.00	0.00%	0.00

Source: Sample size=784

Figure 47 Essex and Suffolk Water – ODIs constrained, Hall test results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.59%	3.88	1.21%	2.96	0.60%	1.47	2.10%	5.13
Interruptions to supply (average interruption over 3 hours)	0.64%	1.56	0.47%	1.16	0.00%	0.00	0.95%	2.32
Leakage (Mega litres)	1.03%	2.53	0.71%	1.74	0.00%	0.00	1.40%	3.43
Per capita consumption (litres per person per day)	0.89%	2.18	0.63%	1.54	0.00%	0.00	1.31%	3.21
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	1.20%	2.94	0.84%	2.05	0.20%	0.48	1.68%	4.13
Response times (average time to respond to a reported leak)	0.61%	1.48	0.36%	0.88	0.00%	0.00	0.88%	2.16

Source: Sample size=739

Figure 48 Essex and Suffolk Water – ODIs unconstrained, Hall test results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.71%	1.73	0.00%	0.00	0.00%	0.00	0.93%	2.27
Interruptions to supply (average interruption over 3 hours)	0.32%	0.79	0.00%	0.00	0.00%	0.00	0.31%	0.76
Leakage (Mega litres)	0.46%	1.12	0.00%	0.00	0.00%	0.00	0.50%	1.24
Per capita consumption (litres per person per day)	0.35%	0.86	0.00%	0.00	0.00%	0.00	0.41%	1.00
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	0.54%	1.32	0.00%	0.00	0.00%	0.00	0.55%	1.35
Response times (average time to respond to a reported leak)	0.27%	0.67	0.00%	0.00	0.00%	0.00	0.27%	0.65

Source: Sample size=739

Flo research

Figure 49 Northumbrian Water – ODIs constrained, Flo results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.19%	4.63	0.82%	3.20	0.00%	0.00	1.62%	6.31
Interruptions to supply (average interruption over 3 hours)	0.50%	1.95	0.00%	0.00	0.00%	0.00	0.77%	3.00
Leakage (Mega litres)	0.92%	3.57	0.68%	2.66	0.00%	0.00	1.28%	5.00
Per capita consumption (litres per person per day)	0.54%	2.12	0.00%	0.00	0.00%	0.00	0.98%	3.82
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	1.07%	4.18	0.98%	3.84	0.00%	0.00	1.51%	5.89
Pollution (number of incidents)	0.99%	3.85	0.80%	3.13	0.00%	0.00	1.41%	5.48
Internal sewer flooding (number of incidents)	0.77%	2.99	0.54%	2.12	0.00%	0.00	1.28%	5.00
Response time (average time to respond to sewer flooding incidents)	0.41%	1.59	0.00%	0.00	0.00%	0.00	0.69%	2.69

Source: Sample size = 104

Figure 50 Northumbrian Water – ODIs unconstrained, Flo results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.57%	2.21	0.00%	0.00	0.00%	0.00	0.43%	1.67
Interruptions to supply (average interruption over 3 hours)	0.18%	0.71	0.00%	0.00	0.00%	0.00	0.00%	0.00
Leakage (Mega litres)	0.38%	1.49	0.00%	0.00	0.00%	0.00	0.31%	1.21
Per capita consumption (litres per person per day)	0.18%	0.68	0.00%	0.00	0.00%	0.00	0.00%	0.00
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.43%	1.68	0.00%	0.00	0.00%	0.00	0.25%	0.97
Pollution (number of incidents)	0.51%	2.00	0.00%	0.00	0.00%	0.00	0.35%	1.37
Internal sewer flooding (number of incidents)	0.29%	1.13	0.00%	0.00	0.00%	0.00	0.00%	0.00
Response time (average time to respond to sewer flooding incidents)	0.15%	0.57	0.00%	0.00	0.00%	0.00	0.00%	0.00

Source: Sample size = 104

Figure 51 Essex and Suffolk Water – ODIs constrained, Flo results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.70%	4.16	1.50%	3.68	0.42%	1.02	2.67%	6.53
Interruptions to supply (average interruption over 3 hours)	0.42%	1.03	0.21%	0.51	0.00%	0.00	0.67%	1.63
Leakage (Mega litres)	1.47%	3.60	0.82%	2.00	0.42%	1.02	1.79%	4.38
Per capita consumption (litres per person per day)	0.61%	1.50	0.41%	1.00	0.00%	0.00	1.04%	2.55
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	1.36%	3.33	1.25%	3.06	0.33%	0.82	2.04%	5.00
Response times (average time to respond to a reported leak)	0.67%	1.64	0.41%	1.00	0.00%	0.00	0.91%	2.23

Source: Sample size = 29

Figure 52 Essex and Suffolk Water – ODIs unconstrained, Flo results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.64%	1.58	0.00%	0.00	0.00%	0.00	0.42%	1.02
Interruptions to supply (average interruption over 3 hours)	0.07%	0.18	0.00%	0.00	0.00%	0.00	0.00%	0.00
Leakage (Mega litres)	0.17%	0.42	0.00%	0.00	0.00%	0.00	0.00%	0.00
Per capita consumption (litres per person per day)	0.06%	0.14	0.00%	0.00	0.00%	0.00	0.00%	0.00
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	0.17%	0.42	0.00%	0.00	0.00%	0.00	0.00%	0.00
Response times (average time to respond to a reported leak)	0.15%	0.37	0.00%	0.00	0.00%	0.00	0.00%	0.00

Source: Sample size = 29

Service failures

Figure 53 Northumbrian Water – ODIs constrained, Service failures results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.27%	4.96	0.99%	3.84	0.60%	2.34	1.61%	6.29
Interruptions to supply (average interruption over 3 hours)	0.55%	2.16	0.51%	2.01	0.00%	0.00	0.78%	3.05
Leakage (Mega litres)	0.93%	3.64	0.82%	3.21	0.49%	1.92	1.22%	4.75
Per capita consumption (litres per person per day)	0.74%	2.88	0.57%	2.21	0.00%	0.00	1.10%	4.29
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.77%	3.00	0.73%	2.83	0.25%	0.97	1.21%	4.72
Pollution (number of incidents)	0.88%	3.42	0.77%	3.00	0.39%	1.53	1.24%	4.82
Internal sewer flooding (number of incidents)	0.67%	2.63	0.54%	2.09	0.05%	0.21	0.97%	3.79
Response time (average time to respond to sewer flooding incidents)	0.48%	1.85	0.42%	1.62	0.00%	0.00	0.75%	2.92

Source: Sample size =109

Figure 54 Northumbrian Water – ODIs unconstrained, Service failures results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.61%	2.37	0.00%	0.00	0.00%	0.00	0.85%	3.33
Interruptions to supply (average interruption over 3 hours)	0.21%	0.83	0.00%	0.00	0.00%	0.00	0.26%	1.02
Leakage (Mega litres)	0.47%	1.83	0.00%	0.00	0.00%	0.00	0.78%	3.04
Per capita consumption (litres per person per day)	0.33%	1.28	0.00%	0.00	0.00%	0.00	0.65%	2.52
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.48%	1.88	0.00%	0.00	0.00%	0.00	0.69%	2.68
Pollution (number of incidents)	0.47%	1.84	0.00%	0.00	0.00%	0.00	0.80%	3.12
Internal sewer flooding (number of incidents)	0.26%	1.02	0.00%	0.00	0.00%	0.00	0.41%	1.60
Response time (average time to respond to sewer flooding incidents)	0.20%	0.77	0.00%	0.00	0.00%	0.00	0.23%	0.88

Source: Sample size = 109

Figure 55 Essex and Suffolk Water – ODIs constrained, Service failures results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.68%	4.12	1.66%	4.08	0.92%	2.26	2.41%	5.90
Interruptions to supply (average interruption over 3 hours)	0.64%	1.57	0.62%	1.51	0.00%	0.00	0.96%	2.35
Leakage (Mega litres)	1.35%	3.30	1.14%	2.80	0.63%	1.54	1.64%	4.02
Per capita consumption (litres per person per day)	0.86%	2.11	0.64%	1.57	0.45%	1.10	1.21%	2.97
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	1.06%	2.59	1.06%	2.60	0.44%	1.08	1.69%	4.14
Response times (average time to respond to a reported leak)	0.65%	1.59	0.55%	1.36	0.36%	0.88	0.83%	2.04

Source: Sample size =26

Figure 56 Essex and Suffolk Water – ODIs unconstrained, Service failures results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.95%	2.34	0.67%	1.64	0.00%	0.00	1.59%	3.90
Interruptions to supply (average interruption over 3 hours)	0.44%	1.09	0.00%	0.00	0.00%	0.00	0.65%	1.60
Leakage (Mega litres)	0.65%	1.60	0.43%	1.05	0.00%	0.00	1.36%	3.33
Per capita consumption (litres per person per day)	0.25%	0.61	0.00%	0.00	0.00%	0.00	0.49%	1.20
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	0.48%	1.18	0.28%	0.67	0.00%	0.00	0.61%	1.50
Response times (average time to respond to a reported leak)	0.30%	0.74	0.00%	0.00	0.00%	0.00	0.51%	1.24

Source: Sample size =26

Low income

Figure 57 Northumbrian Water – ODIs constrained, Low income results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.46%	5.68	1.28%	5.00	0.51%	2.00	2.04%	7.97
Interruptions to supply (average interruption over 3 hours)	0.48%	1.85	0.00%	0.00	0.00%	0.00	0.77%	3.00
Leakage (Mega litres)	0.83%	3.23	0.51%	2.00	0.00%	0.00	1.12%	4.35
Per capita consumption (litres per person per day)	0.62%	2.43	0.48%	1.86	0.00%	0.00	1.02%	3.96
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.95%	3.71	0.77%	3.00	0.00%	0.00	1.30%	5.06
Pollution (number of incidents)	0.92%	3.60	0.77%	3.00	0.00%	0.00	1.28%	5.00
Internal sewer flooding (number of incidents)	0.54%	2.12	0.26%	1.00	0.00%	0.00	0.77%	3.00
Response time (average time to respond to sewer flooding incidents)	0.45%	1.77	0.19%	0.74	0.00%	0.00	0.77%	3.00

Source: sample size =327

Figure 58 Northumbrian Water – ODIs unconstrained, Low income results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.56%	2.19	0.00%	0.00	0.00%	0.00	0.61%	2.40
Interruptions to supply (average interruption over 3 hours)	0.18%	0.72	0.00%	0.00	0.00%	0.00	0.00%	0.00
Leakage (Mega litres)	0.33%	1.29	0.00%	0.00	0.00%	0.00	0.23%	0.91
Per capita consumption (litres per person per day)	0.20%	0.79	0.00%	0.00	0.00%	0.00	0.00%	0.00
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.34%	1.34	0.00%	0.00	0.00%	0.00	0.26%	1.00
Pollution (number of incidents)	0.32%	1.24	0.00%	0.00	0.00%	0.00	0.26%	1.00
Internal sewer flooding (number of incidents)	0.21%	0.84	0.00%	0.00	0.00%	0.00	0.00%	0.00
Response time (average time to respond to sewer flooding incidents)	0.18%	0.71	0.00%	0.00	0.00%	0.00	0.00%	0.00

Source: Sample size =327

Figure 59 Essex and Suffolk Water – ODIs constrained, Low income results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.59%	3.90	1.33%	3.26	0.82%	2.00	2.04%	5.00
Interruptions to supply (average interruption over 3 hours)	0.72%	1.75	0.68%	1.67	0.00%	0.00	1.21%	2.96
Leakage (Mega litres)	0.98%	2.40	0.82%	2.00	0.00%	0.00	1.30%	3.17
Per capita consumption (litres per person per day)	1.00%	2.46	0.82%	2.00	0.00%	0.00	1.34%	3.27
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	1.06%	2.59	0.82%	2.00	0.00%	0.00	1.63%	4.00
Response times (average time to respond to a reported leak)	0.61%	1.49	0.41%	1.00	0.00%	0.00	0.94%	2.29

Source: Sample size =252

Figure 60 Essex and Suffolk Water – ODIs unconstrained, Low income results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.67%	1.65	0.00%	0.00	0.00%	0.00	1.19%	2.92
Interruptions to supply (average interruption over 3 hours)	0.28%	0.69	0.00%	0.00	0.00%	0.00	0.41%	1.00
Leakage (Mega litres)	0.43%	1.06	0.00%	0.00	0.00%	0.00	0.41%	1.00
Per capita consumption (litres per person per day)	0.31%	0.76	0.00%	0.00	0.00%	0.00	0.41%	1.00
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	0.49%	1.21	0.00%	0.00	0.00%	0.00	0.43%	1.06
Response times (average time to respond to a reported leak)	0.32%	0.80	0.00%	0.00	0.00%	0.00	0.40%	0.99

Source: Sample size = 252

Future customers

Figure 61 Northumbrian Water – ODIs constrained, Future customers results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.12%	4.35	1.05%	4.11	0.77%	3.00	1.54%	6.00
Interruptions to supply (average interruption over 3 hours)	0.62%	2.43	0.55%	2.16	0.23%	0.89	0.98%	3.82
Leakage (Mega litres)	0.52%	2.03	0.51%	2.00	0.23%	0.91	0.77%	3.00
Per capita consumption (litres per person per day)	0.69%	2.70	0.70%	2.74	0.26%	1.00	0.98%	3.83
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	1.12%	4.35	0.92%	3.60	0.51%	2.00	1.28%	5.00
Pollution (number of incidents)	0.92%	3.61	0.77%	3.02	0.49%	1.93	1.28%	4.98
Internal sewer flooding (number of incidents)	0.55%	2.16	0.51%	2.00	0.26%	1.00	0.77%	3.00
Response time (average time to respond to sewer flooding incidents)	0.59%	2.30	0.55%	2.13	0.00%	0.00	0.77%	3.00

Source: Sample size =82

Figure 62 Northumbrian Water – ODIs unconstrained, Future customers results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.39%	1.51	0.00%	0.00	0.00%	0.00	0.57%	2.24
Interruptions to supply (average interruption over 3 hours)	0.22%	0.87	0.00%	0.00	0.00%	0.00	0.26%	1.00
Leakage (Mega litres)	0.18%	0.70	0.00%	0.00	0.00%	0.00	0.25%	0.99
Per capita consumption (litres per person per day)	0.32%	1.26	0.00%	0.00	0.00%	0.00	0.51%	2.00
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.39%	1.51	0.00%	0.00	0.00%	0.00	0.47%	1.82
Pollution (number of incidents)	0.30%	1.16	0.00%	0.00	0.00%	0.00	0.50%	1.93
Internal sewer flooding (number of incidents)	0.19%	0.73	0.00%	0.00	0.00%	0.00	0.26%	1.00
Response time (average time to respond to sewer flooding incidents)	0.22%	0.84	0.00%	0.00	0.00%	0.00	0.26%	1.00

Source: Sample size =82

Figure 63 Essex and Suffolk Water – ODIs constrained, Future customers results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	1.57%	3.85	1.63%	4.00	1.19%	2.90	2.04%	5.00
Interruptions to supply (average interruption over 3 hours)	0.72%	1.76	0.63%	1.53	0.32%	0.77	0.96%	2.36
Leakage (Mega litres)	0.76%	1.87	0.82%	2.00	0.13%	0.31	1.12%	2.76
Per capita consumption (litres per person per day)	0.92%	2.26	0.82%	2.00	0.41%	1.00	1.24%	3.03
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	1.35%	3.31	1.39%	3.40	0.79%	1.94	1.86%	4.56
Response times (average time to respond to a reported leak)	0.92%	2.25	0.82%	2.00	0.27%	0.66	1.22%	3.00

Source: Sample size =59

Figure 64 Essex and Suffolk Water – ODIs unconstrained, Future customers results

Service	Mean (% of bill)	Mean (£)	Median (% of bill)	Median (£)	25th p'tile (% of bill)	25th p'tile (£)	75th p'tile (% of bill)	75th p'tile (£)
Discoloured water (number of contacts)	0.91%	2.22	0.50%	1.24	0.00%	0.00	1.08%	2.66
Interruptions to supply (average interruption over 3 hours)	0.29%	0.71	0.00%	0.00	0.00%	0.00	0.41%	1.00
Leakage (Mega litres)	0.31%	0.76	0.00%	0.00	0.00%	0.00	0.51%	1.24
Per capita consumption (litres per person per day)	0.44%	1.07	0.00%	0.00	0.00%	0.00	0.74%	1.81
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	0.73%	1.78	0.00%	0.00	0.00%	0.00	0.88%	2.16
Response times (average time to respond to a reported leak)	0.33%	0.82	0.00%	0.00	0.00%	0.00	0.56%	1.38

Source: Sample size =59

Non-household

Figure 65 Northumbrian Water – ODIs constrained, Non-household results

Service	Mean (% of bill)	Median (% of bill)	25th percentile (% of bill)	75th percentile (% of bill)
Discoloured water (number of contacts)	0.95%	1.00%	0.50%	1.30%
Interruptions to supply (average interruption over 3 hours)	0.69%	0.60%	0.30%	1.00%
Leakage (Mega litres)	0.82%	0.70%	0.50%	1.00%
Per capita consumption (litres per person per day)	0.66%	0.50%	0.20%	0.90%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.81%	0.80%	0.50%	1.00%
Pollution (number of incidents)	0.72%	0.70%	0.30%	1.00%
Internal sewer flooding (number of incidents)	0.52%	0.50%	0.20%	0.80%
Response time (average time to respond to sewer flooding incidents)	0.66%	0.50%	0.20%	1.00%

Source: Sample size = 77

Figure 66 Northumbrian Water – ODIs unconstrained, Non-household

Service	Mean (% of bill)	Median (% of bill)	25th percentile (% of bill)	75th percentile (% of bill)
Discoloured water (number of contacts)	0.32%	0.00%	0.00%	0.10%
Interruptions to supply (average interruption over 3 hours)	0.16%	0.00%	0.00%	0.10%
Leakage (Mega litres)	0.22%	0.00%	0.00%	0.30%
Per capita consumption (litres per person per day)	0.18%	0.00%	0.00%	0.10%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.14%	0.00%	0.00%	0.10%
Pollution (number of incidents)	0.17%	0.00%	0.00%	0.20%
Internal sewer flooding (number of incidents)	0.14%	0.00%	0.00%	0.10%
Response time (average time to respond to sewer flooding incidents)	0.16%	0.00%	0.00%	0.00%

Source: Sample size =77

Figure 67 Essex and Suffolk Water – ODIs constrained, Non-household test results

Service	Mean (% of bill)	Median (% of bill)	25th percentile (% of bill)	75th percentile (% of bill)
Discoloured water (number of contacts)	1.35%	1.40%	0.70%	1.65%
Interruptions to supply (average interruption over 3 hours)	0.77%	0.80%	0.38%	1.00%
Leakage (Mega litres)	1.18%	1.00%	0.48%	1.50%
Per capita consumption (litres per person per day)	0.86%	1.00%	0.00%	1.40%
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	1.08%	0.90%	0.50%	1.50%
Response times (average time to respond to a reported leak)	0.76%	0.55%	0.18%	1.00%

Source: Sample size =40

Figure 68 Essex and Suffolk Water – ODIs unconstrained, Non-household test results

Service	Mean (% of bill)	Median (% of bill)	25th percentile (% of bill)	75th percentile (% of bill)
Discoloured water (number of contacts)	0.21%	0.00%	0.00%	0.13%
Interruptions to supply (average interruption over 3 hours)	0.19%	0.00%	0.00%	0.10%
Leakage (Mega litres)	0.17%	0.00%	0.00%	0.10%
Per capita consumption (litres per person per day)	0.08%	0.00%	0.00%	0.00%
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	0.17%	0.00%	0.00%	0.10%
Response times (average time to respond to a reported leak)	0.09%	0.00%	0.00%	0.00%

Source: Sample size = 40

Hall test results – split by unconstrained / constrained first

Figure 69 Northumbrian Water – household ODI results split by unconstrained / constrained first

Service	Constrained values (% of average bill)		Unconstrained values (% of average bill)	
	Constrained first	Unconstrained first	Constrained first	Unconstrained first
Discoloured water (number of contacts)	1.47%	1.18%	0.12%	0.98%
Interruptions to supply (average interruption over 3 hours)	0.45%	0.50%	0.05%	0.37%
Leakage (Mega litres)	0.72%	0.78%	0.05%	0.59%
Per capita consumption (litres per person per day)	0.69%	0.54%	0.06%	0.52%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	1.02%	1.03%	0.11%	0.70%
Pollution (number of incidents)	1.02%	0.92%	0.09%	0.69%
Internal sewer flooding (number of incidents)	0.54%	0.50%	0.05%	0.45%
Response time (average time to respond to sewer flooding incidents)	0.52%	0.44%	0.06%	0.36%

Source: Sample size = 784

Figure 70 Essex and Suffolk Water – household ODI results split by unconstrained / constrained first

Service	Constrained values (% of average bill)		Unconstrained values (% of average bill)	
	Constrained first	Unconstrained first	Constrained first	Unconstrained first
Discoloured water (number of contacts)	1.75%	1.42%	0.11%	1.31%
Interruptions to supply (average interruption over 3 hours)	0.63%	0.64%	0.05%	0.59%
Leakage (Mega litres)	1.14%	0.92%	0.08%	0.84%
Per capita consumption (litres per person per day)	0.90%	0.88%	0.06%	0.65%
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	1.26%	1.14%	0.14%	0.94%
Response times (average time to respond to a reported leak)	0.57%	0.64%	0.05%	0.50%

Source: Sample size = 739

Non-household results – split by unconstrained / constrained first

Figure 71 Northumbrian Water – non-household ODI results split by unconstrained / constrained first

Service	Constrained values (% of average bill)		Unconstrained values (% of average bill)	
	Constrained first	Unconstrained first	Constrained first	Unconstrained first
Discoloured water (number of contacts)	1.02%	0.83%	0.03%	0.84%
Interruptions to supply (average interruption over 3 hours)	0.64%	0.78%	0.03%	0.37%
Leakage (Mega litres)	0.88%	0.72%	0.04%	0.54%
Per capita consumption (litres per person per day)	0.66%	0.67%	0.00%	0.49%
Wider catchment (% of customers who can access improved rivers, coasts and lakes)	0.92%	0.62%	0.03%	0.33%
Pollution (number of incidents)	0.75%	0.66%	0.03%	0.43%
Internal sewer flooding (number of incidents)	0.46%	0.62%	0.03%	0.34%
Response time (average time to respond to sewer flooding incidents)	0.66%	0.68%	0.03%	0.38%

Source: Sample size = 77

Figure 72 Essex and Suffolk Water – non-household ODI results split by unconstrained / constrained first

Service	Constrained values (% of average bill)		Unconstrained values (% of average bill)	
	Constrained first	Unconstrained first	Constrained first	Unconstrained first
Discoloured water (number of contacts)	1.20%	1.58%	0.01%	0.52%
Interruptions to supply (average interruption over 3 hours)	0.65%	0.96%	0.00%	0.46%
Leakage (Mega litres)	1.18%	1.19%	0.02%	0.39%
Per capita consumption (litres per person per day)	0.96%	0.70%	0.00%	0.21%
Wider catchment (% of customers that can access improved rivers, coasts and lakes)	1.13%	0.99%	0.00%	0.41%
Response times (average time to respond to a reported leak)	0.88%	0.58%	0.00%	0.22%

Source: Sample size = 40

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