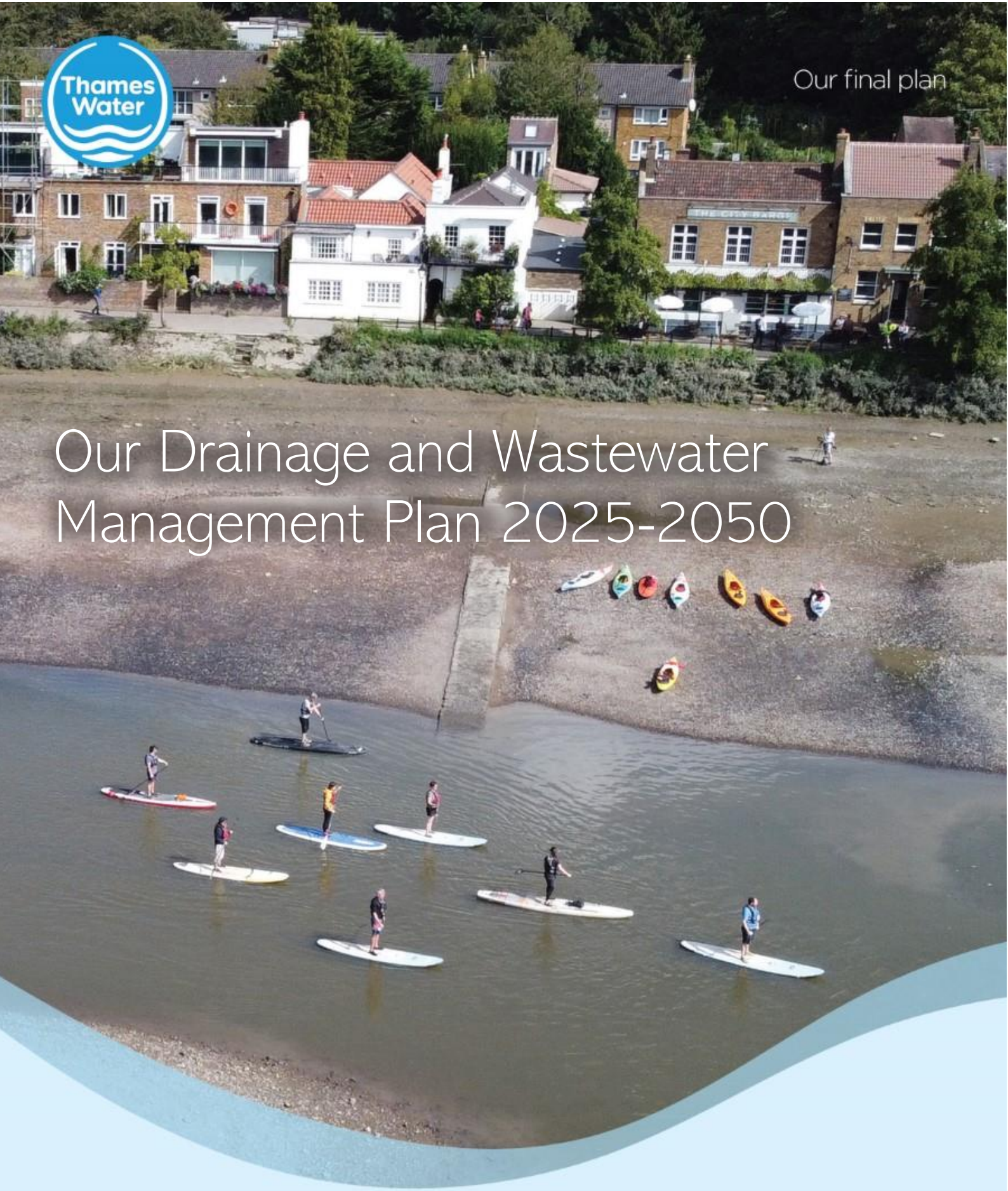


Our final plan

Our Drainage and Wastewater Management Plan 2025-2050

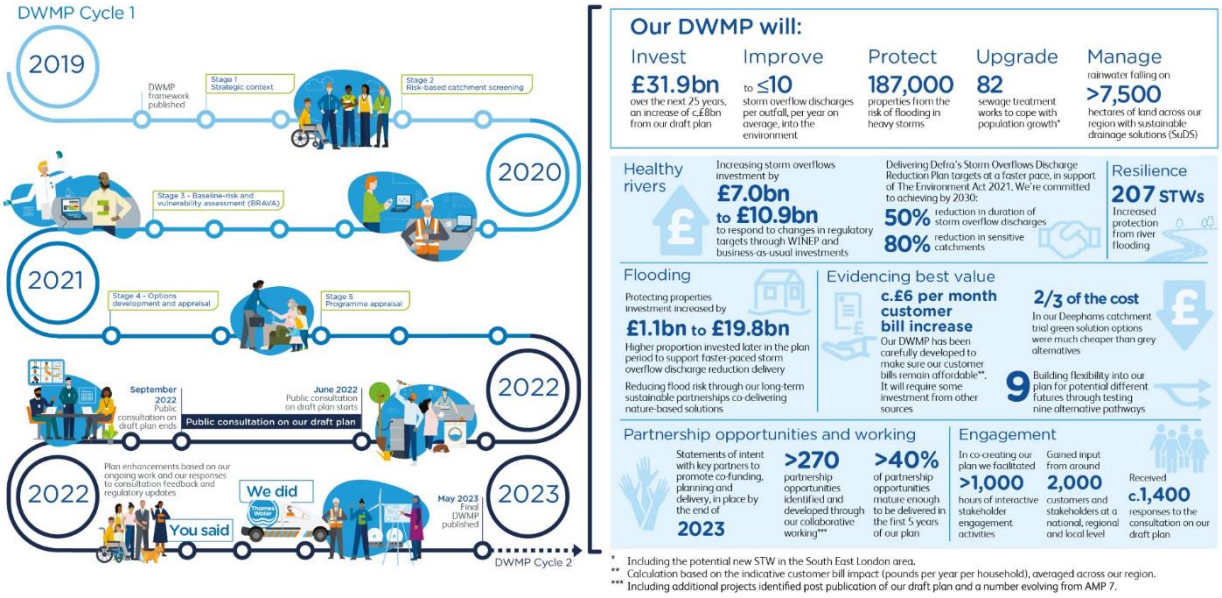
Technical Appendices

Appendix H – Customer Engagement: Part A, Draft DWMP

May 2023

Preface

We're proud to present our first Drainage and Wastewater Management Plan (DWMP) and encouraged by the level of positive feedback we've received. Over the last four years, we've engaged and worked collaboratively with around 2,000 of our customers and stakeholders, to deepen our shared understanding and develop new ways to manage drainage and wastewater across our region. We illustrate our DWMP Cycle 1 and its headlines below.



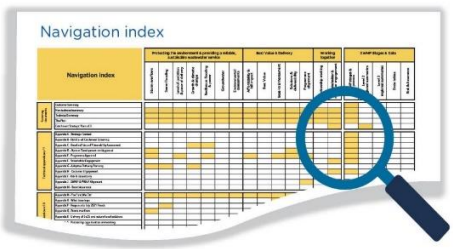
We've progressed and enhanced our DWMP since we published it for public consultation in June 2022. We were pleased to receive lots of positive comments and support on the quality and ambition of our draft plan as well as useful ideas for making our final DWMP even stronger.

We've updated our draft plan based on our ongoing DWMP work, regulatory updates and our responses to the consultation feedback wherever possible*. Our updates include providing more detail where you felt it was needed and creating new appendices to answer technical queries. For more details on how we've progressed our final plan and responded to the consultation feedback, please see our Non-technical summary and You said, We did Technical appendix.

* Some public consultation feedback didn't require further action or wasn't relevant to the DWMP process. Other feedback was relevant to future DWMP planning cycles and will be used to inform this work.

Navigating our documents

To help you navigate around our final DWMP document suite and find where key DWMP content features, we've placed a Navigation index at the back of this document.



Introduction

Our DWMP Customer Engagement has been completed in two parts;

- Part A (this document) – customer research completed during the development of our draft DWMP in 2021, and
- Part B (Technical Appendix V) – customer research completed during the consultation period in 2022

The customer research carried out in 2021 focused on understanding customer views and priorities for long-term drainage and wastewater management planning. The purpose of the research was to provide the evidence base to support the development of the preferred plan through the investment appraisal process. The high-level questions addressed by the research were:

- What do customers want from their drainage and wastewater service over next 25 years
- What are customers' preferences for the types of solutions that can be used to address long term challenges – including understanding if any of the potential solutions are unacceptable and why
- What are customers' priority weightings for the DWMP value criteria that are used to appraise candidate plans?

A combination of qualitative and quantitative research methods were used. The qualitative research focused on customers' expectations for drainage and wastewater services and their preferences for the different solutions, providing inputs to the optional appraisal stage. It was implemented via a series of online focus groups in May 2021. A total of 48 customers participated in the research in six separate groups, with three groups with varying profiles across socio-economic group (SEG) and age, plus separate groups for future, older and vulnerable customers. The session featured a mix of discussion topics and exercises.

The quantitative research applied a choice modelling approach to produce preference weights for the DWMP investment model value criteria. The research was implemented in June 2021 through a representative online survey of the Thames Water wastewater customer base, with 400 household respondents and 150 non-household respondents completing the survey.

The research materials (topic guide, questionnaire, show cards) for both the quantitative and qualitative research phases were developed with input from Customer Challenge Group (CCG) members. Consumer Council for Water (CCW) representatives also commented on the research materials in the development stage.

Drainage and Wastewater Management Plan – Customer Research

Thames Water

May 2022

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Disclaimer

Document evolution

Final Research Report	16/05/22	Reviewed by Allan Provins

eftec offsets its carbon emissions through a biodiversity-friendly voluntary offset purchased from the World Land Trust (http://www. carbonbalanced.org) and only prints on 100% recycled paper.

Contents

Part 1 – Qualitative Research

Part 2 – Quantitative Research

Part 1 Qualitative Research

Summary – Qualitative Research

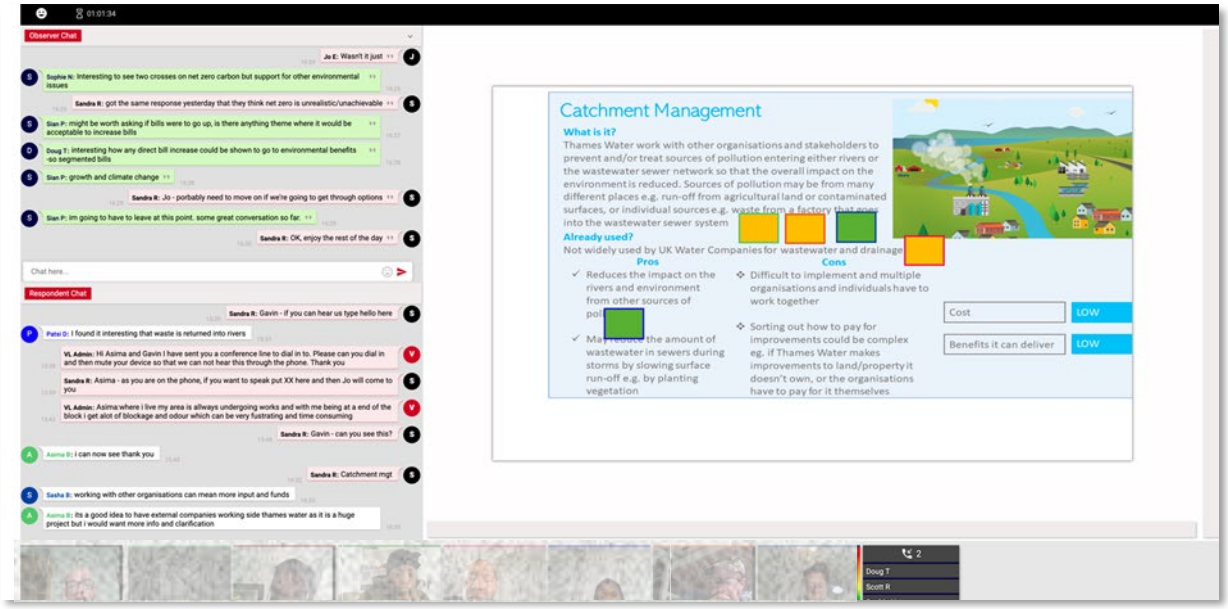
Drainage and wastewater services in the Thames Water region face many different challenges now and continuing into the future from changing climate, changing weather patterns, population growth, and growing demand for environmental protection. To meet these challenges, Thames Water, is working in partnership with stakeholders to develop a long-term plan - the Drainage and Wastewater Management Plan (DWMP) - to ensure a resilient and sustainable wastewater service for the next 25 years for London and the Thames Valley region.

The overall purpose of the customer research for Thames Water's Drainage and Wastewater Management Plan (DWMP) is to develop the evidence base on customer preferences and priorities to support long-term drainage and wastewater management planning. This report summarises the findings from the qualitative research conducted with household customers to understand their views on drainage and wastewater services, their priorities for future planning, and their preferences for future options and solutions to inform development of the DWMP.

Overview of the qualitative research process

The qualitative research was implemented online in May 2021 using the Visions Live platform (Figure S.1). A total of 48 customers participated in the research in six separate groups, with three mixed socio-economic group (SEG) and age groups, plus separate groups for future, older and vulnerable customers. The session featured a mix of discussion topics and exercises. Each group also completed a pre-read task to build the participants' knowledge before discussion in the session. The preparation and the online setting created high levels of engagement with a diverse mix of customers.

Figure S.1.1: Visions Live research platform



Note: Screen capture from Thames Water qualitative group.

High levels of engagement were demonstrated by participants throughout the sessions. Voting exercises and visual prompts enlivened the sessions, giving participants the opportunity to interact onscreen, and aid moderators in exploring views, particularly with quieter participants. The respondent chat functionality also offered the opportunity to capture the views of all participants. This was particularly beneficial during

the solutions and options part of the session, when the time available to discuss each option was limited. Overall participants were very positive about the sessions and their participation, with all recording that they were satisfied with the groups.

The content and materials prepared for the interactive sessions were developed with input and review from Thames Water input, along with feedback from Customer Challenge Group (CCG) members. CCWater representatives also commented on the research materials.

Overall, the qualitative research addressed the topic areas set out in Table S1.

Table S1: Focus areas for qualitative research

High-level topic	Main areas of focus for understanding customer views
Overview of drainage and wastewater	How the drainage and wastewater system works • Customers' views on combined and separated drainage systems • Understanding the potential impacts from the wastewater system
Priorities for drainage and wastewater services in future	Including: • Identifying future challenges for drainage and wastewater in the London and Thames Valley region • Understand customers' priorities for these challenges
Solutions and options	Acceptability of alternative options to deliver improvements • Customer support for the main types of solutions and the factors influencing this • Over thirty detailed interventions are being considered in the DWMP planning. These were grouped into sixteen options to be tested with customers.

Key findings

Initially participants had varying levels of awareness of drainage and wastewater issues. They could identify potential issues with the drainage and wastewater system, mostly focussed on blockages and the ageing Victorian infrastructure. Following some basic information and education, customers were able to give considered views on drainage and wastewater services and their expectations for the future. Customers typically preferred separate sewer systems but there was some recognition of the scale of challenge that would be required to change from combined to separate systems. The general feeling amongst participants was that Thames Water should work to reduce overflows from combined sewers and that Thames Water should address both flooding, particularly internal, and preventing spills from combined sewer overflows.

Customers identified a broad range of challenges for the drainage and wastewater system, focussed more on the sewer and drainage system rather than wastewater treatment. The key findings for customer priorities are:

- Plans must be affordable for all customers.
- Planning for the future is a key priority for customers and there is strong support for protecting the environment.
- Preventing wastewater flooding was a lower priority for participants relative to other challenges.
- Limiting traffic disruption is the only clear low priority for participants, with many struggling to select

their lower priority factors as they considered all are important.

Participants indicated that they supported Thames Water focussing the DWMP on the three challenges identified and agreed with stakeholders: namely population growth, weather pattern changes due to climate change, and the impact of urban creep and misconnections. They typically understood urban creep, though struggled to believe that misconnections were such a problem to be a priority.

Customers considered sixteen high-level options and scored their acceptability as a RAG rating:

Option is acceptable

Option is only acceptable in some cases/situations

Option is not acceptable

The key findings are:

- No options were either universally supported or rejected. Customers showed strongest support for options that they considered to be realistic to implement and/or already proven to work. Customers preferred options they considered were sensible and the right thing to do, such as managing rainwater (green infrastructure).
- Views on catchment management were mixed, with some participants supporting a natural solution approach whilst others were concerned about the effectiveness of relying on other parties.
- Participants supported larger 'new infrastructure' options, though their support tended to be more conditional as they recognised the practicalities of such options
- Customer support was more limited for options that they considered did not solve the underlying problem (flood mitigation for vulnerable properties and re-lining sewers) or options that they considered to be unproven and higher risk (real-time control in sewers, in-sewer treatment), or unrealistic to implement (alternative pathways for rainwater).

1.Introduction

Setting the scene

- Drainage and wastewater services in the Thames Water region face many different challenges now and continuing into the future from changing climate, changing weather patterns, population growth, and growing demand for environmental protection.
- To meet these challenges, Thames Water, is working in partnership with stakeholders to develop a long-term plan - the Drainage and Wastewater Management Plan (DWMP) - to ensure a resilient and sustainable wastewater service for the next 25 years for London and the Thames Valley region. This new approach has been jointly developed by regulators and industry bodies including Ofwat, Defra, the Environment Agency, the Consumer Council for Water and Water UK (representing the UK water companies).
- The DWMP will be published in 2023 and will be a long-term plan that identifies the actions needed to make sure that Thames Water can continue to deliver its services reliably and in a sustainable way, whilst also achieving improvements for customers, communities, and the environment.

1.1 Background

Thames Water is leading the development of the Drainage and Wastewater Management Plan (DWMP) for London and the Thames Valley region. The DWMP is a long-term costed plan, focused on partnership working, with the aim to identify the future risks and pressures for drainage and wastewater treatment systems and develop integrated solutions to address them. Thames Water are currently developing their first DWMP, based on the nationally agreed framework[1].

Thames Water have completed the strategic context stage of the planning process and identified nine future pressures that will impact on the first DWMP. Three have been prioritised for the first plan based on stakeholder feedback:

- Climate change
- Population growth
- Urban creep and misconnections

There is limited industry guidance on how customer research should inform the development of the DWMP. Overall, a combination of qualitative and quantitative customer evidence is required by Thames Water to support the development of the DWMP, with the purpose of: (a) testing the planning objectives that have been proposed in the initial stages of the planning process; and (b) incorporating customer preferences into the forthcoming programme appraisal stage.

[1] See: https://www.water.org.uk/policy-topics/managing-sewage-and-drainage/drainage-and-wastewater-management-plans/

1.2 Research aims

The main customer research questions and evidence needs for this stage of development of the DWMP are:

Research question	*Requirement*
A. What do customers want from their drainage and wastewater service over next 25 years?	Qualitative insight on customer needs and behaviour in context of long-term plan – to support the overall strategic context for the DWMP.
B. What are customers' preferences for the types of solutions that can be used to address long term challenges - are any solutions unacceptable to them and why?	Qualitative insight to understand level of customer support for the main types of solutions (e.g., "preferred"; "acceptable"; "unacceptable") – to support the options development stage of the plan.
C. What are customers' priorities (weight/ranking) for the "value criteria" that will be used to balance the plan?	Quantitative evidence (preference weights) - to input to the programme appraisal to help compare performance of alternative candidate plans.
D. What is the "preferred" plan for customers in terms of the trade-off between planning objectives (value criteria) and affordability?	Quantitative evidence (level of customer support) for a candidate plan / set of candidate plans – input to programme appraisal to help identify the "preferred" plan from a customer perspective.

A three-part approach for customer research has been set out to address these research questions and support the development of the DWMP:

- **Evidence review**: an initial desk-based exercise to provide a rapid review of the PR19 customer evidence base. This focused the planning objective (value criteria) and the extent to which customer weights can be specified from existing results.

- **Qualitative research**: conducted with household customers of Thames Water to serve as a scene-setting and "priming" exercise with customers to explore their needs and views on solutions (Research Questions A and B).

- **Quantitative research**: a representative survey of customers in the Thames Water region to quantitively provide customer preference weights for the planning objectives (value criteria) (Research Question C) to inform the investment modelling underpinning the development of the DWMP.

Research Question D will be addressed by Thames Water in latter stages of the DWMP development process, once a candidate plan or set of candidate plans have been determined from the programme appraisal stage.

Part 1 of this report summarises the **qualitative research** findings. Part 2 documents the research methods and results for the customer survey along with a summary of the evidence review[2].

[2] eftec and ICS Consulting (2021) Drainage and Wastewater Management Plan – Customer Research, Part 3: Quantitative Research.

1.3 Scope of qualitative research

The scope for the qualitative research was developed following review of the DWMP development to date (particularly the strategic context) and discussions with Thames Water. The two broad topic areas to address were identified as: (a) customers' expectations for drainage and wastewater services in future; and (b) customers' preferences for the different options and solutions to inform the next stages of the planning process (option and programme appraisal). Based on this, several focus areas were outlined for research to explore with customers (Table 1.1).

Table 1.1: Focus areas for DWMP qualitative research

High-level topic	Main areas of focus for understanding customer views
Overview of drainage and wastewater	How the drainage and wastewater system works • Customers' views on combined and separated drainage systems • Understanding the potential impacts from the wastewater system
Priorities for drainage and wastewater services in future	Including: • Identifying future challenges for drainage and wastewater in the London and Thames Valley region • Understand customers' priorities for these challenges
Solutions and options	Acceptability of alternative options to deliver improvements • Customer support for the main types of solutions and the factors influencing this • Over thirty detailed interventions are being considered in the DWMP planning. These were grouped into sixteen options to be tested with customers.

1.4 Report structure

The remainder of this report is structured as follows:

- **Section 2** outlines the methodological approach for the qualitative research and its implementation, including learnings from adapting the approach to fit within the constraints of COVID-19 restrictions;
- **Section 3** outlines participants' initial perceptions and experience of drainage and wastewater services;
- **Section 4** summarises participants views on drainage and wastewater systems and impacts from it;
- **Section 5** presents participants' priorities for the drainage and wastewater service in future;
- **Section 6** summarises participants' views on the options that could be deployed or developed to meet the future challenges faced for drainage and wastewater systems; and
  Section 7 presents the key findings from the qualitative research to inform the next stage of the DWMP.

The main report content is supported by three appendices. Examples of the research materials (topic guides, pre-read, showcards, etc.) are provided for reference in Appendix A, with the summaries of all options considered by participants in Appendix C. Profile information on the deliberative group participants is provided in Appendix B.

2. Methodology

Summary

- The qualitative research was carried out online using a specialist engagement platform over six sessions. Each session was two hours in length, with a different group of customers for each session.
- The sessions featured a mix of discussion topics and exercises, including voting. Participants in the groups also completed a pre-reading task to build their background understanding.
- Overall participant feedback on the sessions was positive, indicating a high level of engagement in the research and interest in the topic areas.

2.1 Qualitative research approach

In designing the qualitative research component of the project, particular emphasis was placed on ensuring it would provide robust insights from customers that can be used with confidence by Thames Water for their drainage and wastewater planning needs, and as part of evidence supporting the development of innovative options. The research approach and all research materials (pre-read, topic guide, etc.) were developed with input from Thames Water, CCG members and CCWater representatives.

Before each session, participants were provided with pre-read materials, which explained drainage and wastewater systems, responsibilities for these systems, and introduced the DWMP process. Links to further reading, video content and regulator websites were also included.

The topic guide for the customer sessions was carefully structured to cover the research scope (Section 1.2) and to enable participants to build their understanding of the issues over the session. This was important to: (i) enable both preliminary, less 'informed' views to be heard; (ii) for participants to become more knowledgeable through the information provided in-session; and (iii) enable discussion and sharing of their understanding and reasoning with others in the groups. The topic guide outline is summarised in Box 2.1, and examples of the research materials are provided for reference in Appendix A.

2.2 Implementation

The focus group sessions were conducted in May 2021. Due to the ongoing COVID-19 pandemic and restrictions on in-person gatherings, the research was implemented online using the Visions Live platform (an online qualitative research host) (Figure 2.1). The groups were implemented in the same way as conventional in-person qualitative workshops, with the same approach to recruitment, participant discussions and stimuli. Nine customers were recruited for each group, in case of any late unavailability or technology problems preventing participation. The online groups were conducted with onscreen video so that all the participants could see each other and the moderator(s). This allowed participants to engage and interact more fully with each other and helped encourage conversation and discussion. It also enabled the moderator(s) to manage the group more effectively by visually monitoring the level of engagement and encouraging those who were quieter to contribute. The Visions Live platform also allowed Thames Water colleagues and other interested parties to observe so that they could hear customer views first-hand, and provided the opportunity for them to raise points for the moderators to probe further via the observer chat.

Box 2.1: Outline of topic guide and research process

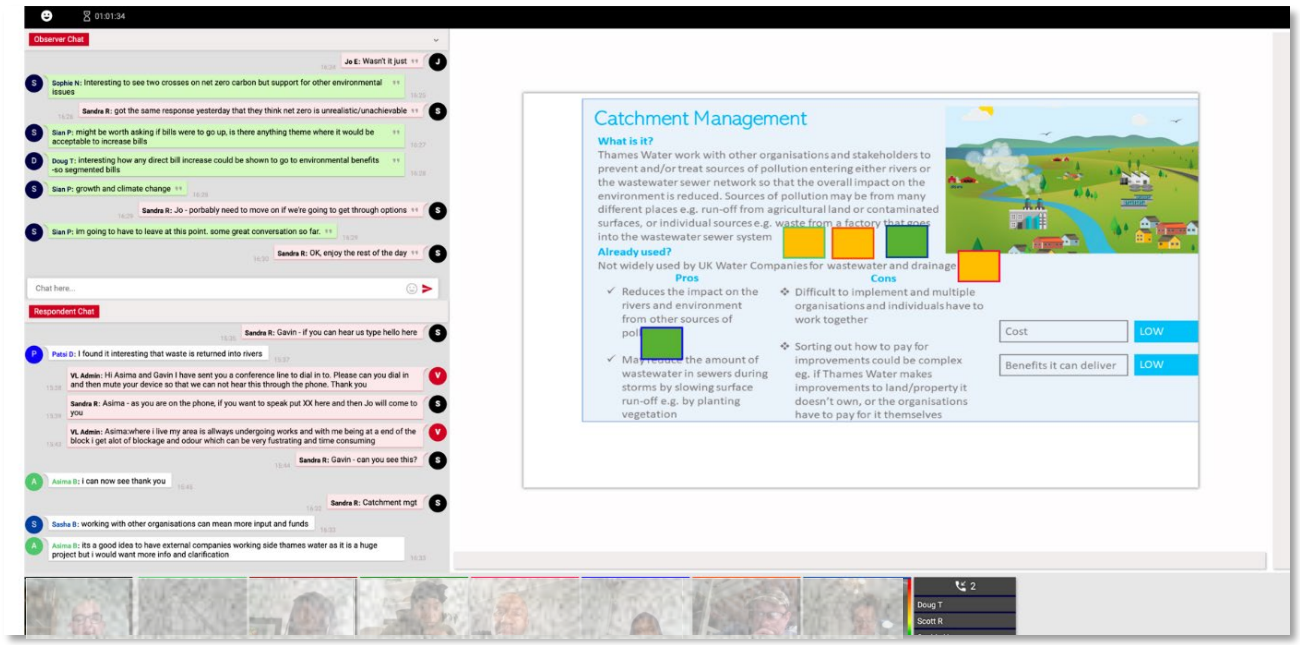
Pre-reading material

- Structure of the water industry and responsibilities of key organisations
- Overview of the drainage and wastewater system, including links to further reading and video materials
- Summary of Drainage and Wastewater Management Planning and what a DWMP aims to achieve

Topic Guide for focus group sessions

- Introduction and initial views on drainage and wastewater
  - Introduction to wastewater and customers' experiences of the drainage system
- Overview of drainage and wastewater
  - Building customers' understanding of combined and separate systems and the relative merits or disadvantages of each system
  - Understanding customers' views on the potential impacts from the drainage and wastewater system
- Customer preferences for their drainage and wastewater service in future
  - Understanding the challenges that will impact on the drainage and wastewater system in future
  - Customers' priorities for how the DWMP addresses them
- Solutions and options
  - Discussion of options, with voting and ranking exercises

Figure 2.1: Screenshot of the Visions Live platform



Each group was 2 hours in total and had a mix of ages and socio-economic profiles. Specific groups were included for elderly customers, future customers, and vulnerable customers (Table 2.1).

Table 2.1: Qualitative group sessions

Group	Date	Time
Elderly customers	Tuesday 11th May	3.30-5.30pm
Mix SEG	Tuesday 11th May	6.30-8.30pm
Future customers	Wednesday 12th May	6.30-8.30pm
Vulnerable customers	Thursday 13th May	3.30-5.30pm
Mix SEG	Thursday 13th May	6.30-8.30pm
Mix SEG	Monday 17th May	6.30-8.30pm

The session content was designed to include a mix of discussions with some voting exercises to both aid engagement and capture the strength of feeling of the participants, particularly those who may be quieter in the group environment. The outputs from the voting exercises are included in this report and are good indicators of participant views, in support of the qualitative research.

The overall sample size of 48 participants is reasonable in terms of understanding the degree of consistency in customers' views. That said, the qualitative research was not intended to provide differentiated results by customer segments. In this regard, results should only be interpreted as indicative and not statistically representative. Findings were reviewed to determine if there were any indications of variations in customers' views by SEG or between the specific groups of elderly, future and vulnerable customers, and are highlighted in the relevant section of this report in order to inform any future research.

Given the amount of material covered in the sessions, moderators did not include all votes in all sessions and, on occasion, a participant was unable to vote for an individual exercise due to temporary connection or technology issues. Sample sizes may therefore vary between polls. Materials and insights from this qualitative research have been used to inform the design of the Part 3 quantitative research.

2.3 Participant profile

Across the 48 participants there was a reasonable mix of customers when considering age, gender, socio-economic and ethnicity. Further information is provided in Appendix B.

Given the nature of the research, it was also important that the participants experienced the range of surrounding environments experienced by Thames Water customers and represented a range of attitudes towards the environment. Figure 2.2 confirms the participants covered the range of geographical locations served by Thames Water, and housing location.

Figure 2.2: Qualitative group participants – percentage by location (n = 48)

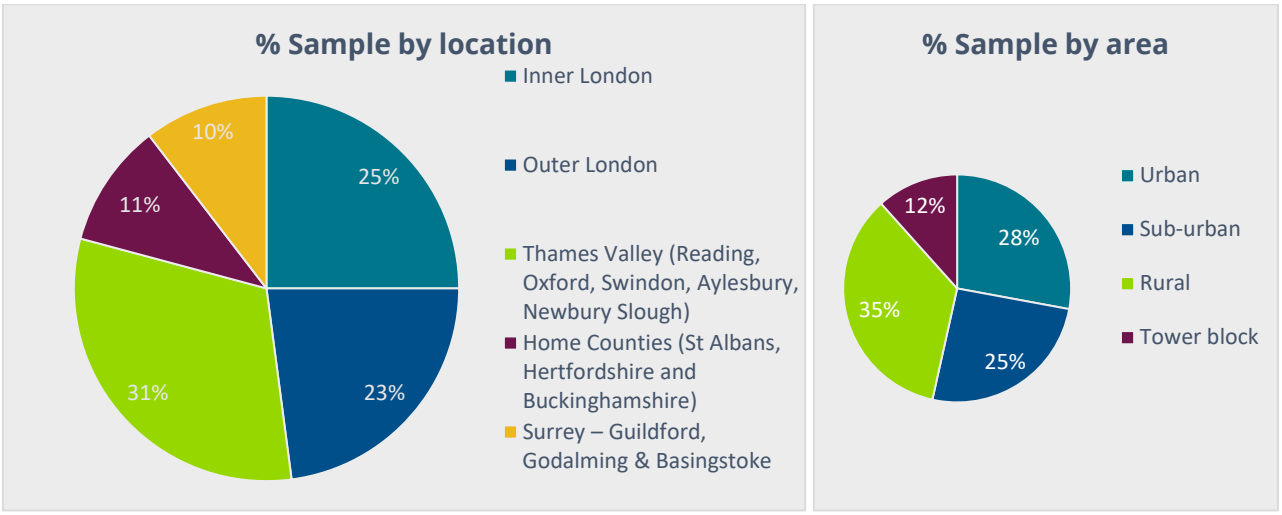
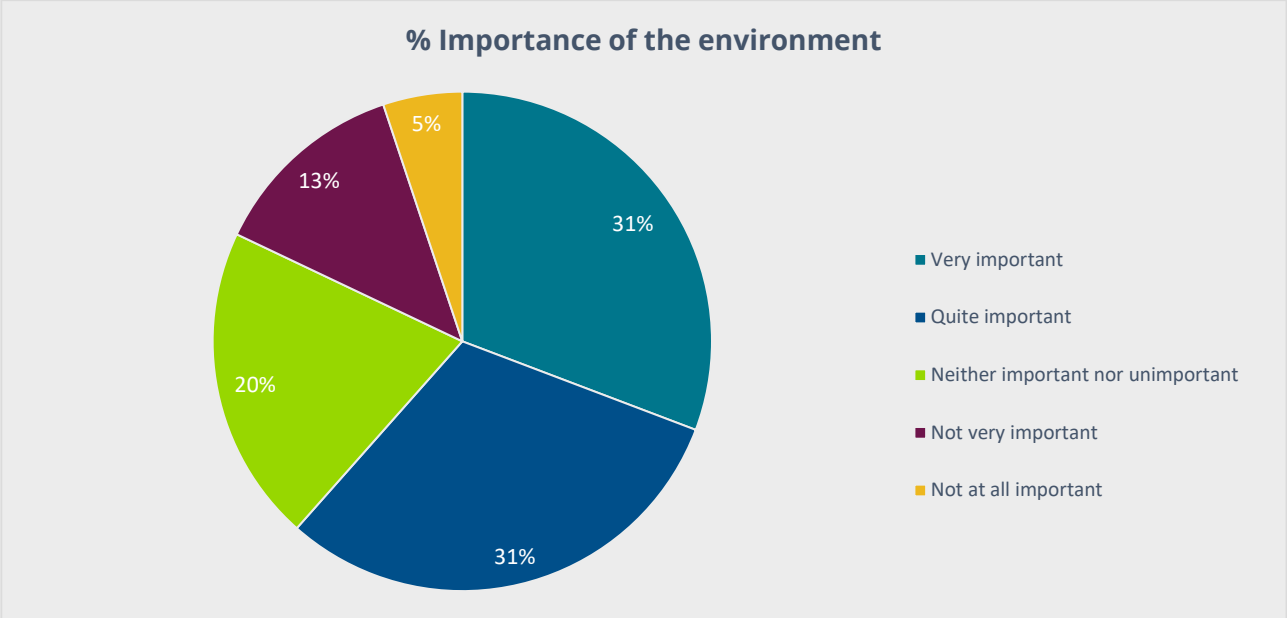


Figure 2.3 indicates the participants held a range of attitudes towards the importance of the environment.

Figure 2.3: Qualitative group participants – importance of environment (n=39)



2.4 Learnings from the qualitative research process

The ongoing COVID-19 pandemic and its associated restrictions means there are significant constraints on how research can be conducted with customers - particularly for traditional qualitative research methods - and required the use of an online platform. During the research we found that:

- **Use of the on-line video platform**: even where customers were inexperienced with using the technology, after the first voting exercise they typically became comfortable and adept at completing the exercises.

- **Content and coverage**: considerable ground was covered during the sessions, demonstrating that

video engagement was effective in terms of allowing a similar level of topic areas and materials to be covered with participants to in-person groups. However, it was noted that the energy levels of the groups did tend to decrease after approximately 1.5 hrs and so we would recommend that in future consideration is given to the length of the session.

- **Representation**: there was a good mix of customers within each company group. The online format enabled engagement with groups of both vulnerable and older customers from across the Thames Water region, which would have been unlikely for in-person groups.

- **Engagement**: high levels of engagement were demonstrated by participants throughout the sessions. The voting exercises and visual prompts enlivened the sessions, giving participants the opportunity to interact onscreen, and aid moderators to explore views, particularly with quieter participants. The respondent chat also offered the opportunity to capture the views of all participants (Figure 2.4); this was particularly beneficial during the solutions and options part of the session, when the time available to discuss each option was limited.

Figure 2.4: Use of the participant chat to support the qualitative sessions

Notes: Screen captures from qualitative group.

Participant feedback on the qualitative sessions was very positive (**Figure 2.5**) and helps demonstrates that: (i) an online approach for qualitative research is an appropriate channel for the range of customers engaged; and (ii) that the group discussions and the materials presented were understood and considered to be interesting, informative, and engaging by participants.

Figure 2.5: Participant satisfaction with qualitative research sessions (n= 31)

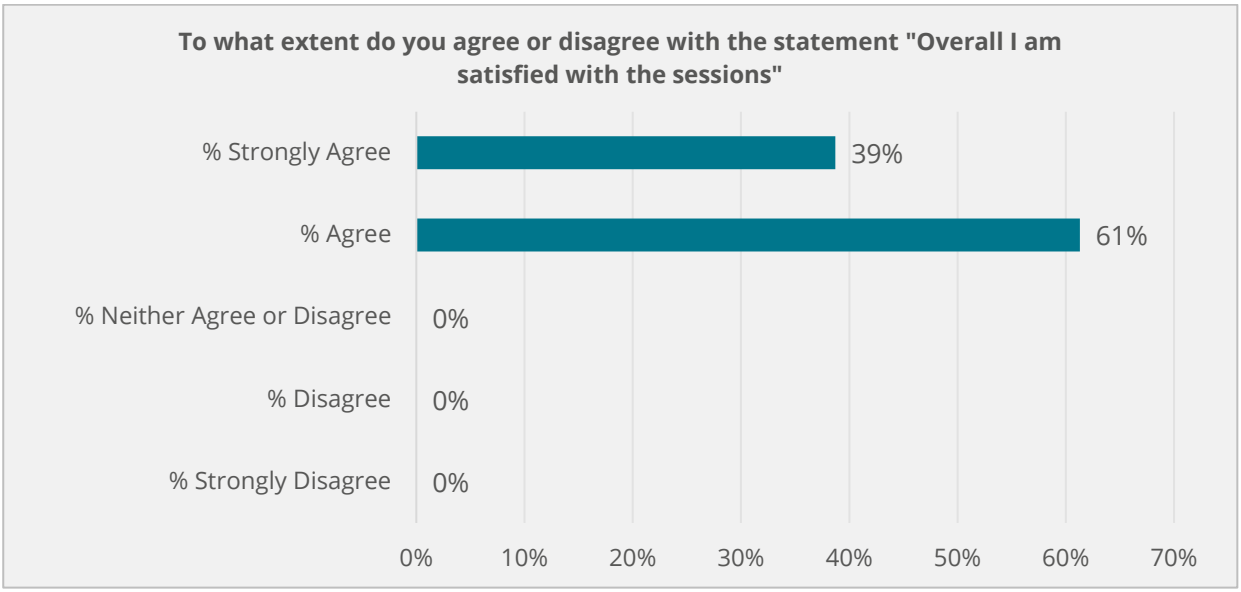
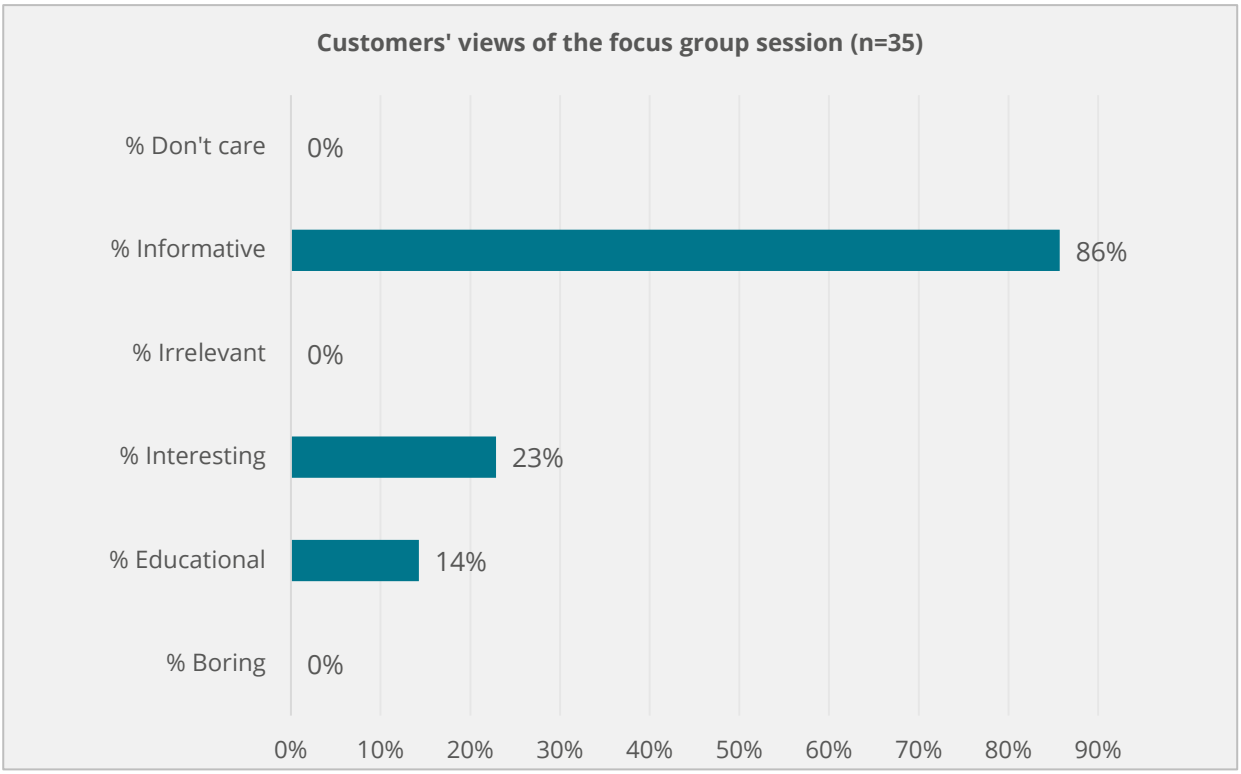


Figure 2.6: Participant views on qualitative research sessions (n= 35)



3. Initial views on drainage and wastewater

Summary of findings

- Participants had varying levels of awareness of drainage and wastewater. They were positive about the pre-reading exercise and demonstrated an increased level of understanding in preparation for the sessions.
- A small number of participants had experienced service impacts linked to blocked pipes or sewers, or odour from drainage or wastewater treatment

The sessions began by determining the participants' initial knowledge, experience and perceptions of drainage and wastewater.

3.1 Initial perceptions and experience of the drainage and wastewater system

Participants had varying levels of awareness of drainage and wastewater. They were positive about the pre-reading exercise and demonstrated an increased level of understanding in preparation for the sessions. Participants had varying levels of awareness, with many saying wastewater and drainage is not something they typically considered.

"It's not something I've given too much thought."

Female, Aged <30, Future

"I thought you flushed the toilet, and it just goes somewhere...."

Female, Aged 65+, SEG AB

Participants generally found the pre-reading interesting and easy to understand. Some participants used the links to additional information and video clips to improve their knowledge.

"Really informative, lots of things I actually didn't know. Interesting thing about fatbergs, and how the water gets waste into various things, so it was quite an eye opener, I did learn a lot."

Female, Aged 65+, SEG AB

"I didn't know that the overflow got returned straight back to the water systems. I didn't know that. I thought all the wastewater got treated. But obviously they can only deal with so much. That was something I learned."

Male, Aged 31-45, SEG DE, Vulnerable

"Yeah, I looked at a National Geographic one about wastewater treatment plant, which was interesting."

Male, Aged 31-45, SEG AB

"I learnt an awful lot, and I guess, I hadn't really given it a huge amount of thought before. I do have some concerns about various issues, but we can talk about those later perhaps, but I thought it was very informative."

Female, Aged 65+, SEG AB

Some participants were more informed, particularly by recent press coverage of environmental issues such as storm overflow discharges.

"It's quite a lot in the news recently that there's been upwards of 50 to 60 days per year where they discharge raw sewage into the Thames."

Male, Aged 46-64, SEG AB

A minority of participants had experienced service impacts linked to blocked pipes or sewers, or odour from drainage or wastewater treatment. A minority of participants stated that they had experienced service impacts. These were typically linked to blockages in shared drainage pipes or sewers causing wastewater to back-up. A few customers highlighted that they had experienced odour impacts, with all examples explained as an intermittent/transient issue.

"In my previous flat in London in Putney, some of the flats were getting water backing up through the toilets and drainage and it turned out that one of the pipes that was flowing away from the property, tree roots had grown through it, so it wasn't flowing effectively. So we had quite a lot of back-and-forth with the guy whose property that was on, with Thames Water, with drainage clearing people trying to work out whose responsibility it was and how it could get fixed."

Female, Aged 31-45, SEG C1C2

"I actually live quite close to a sewage treatment works... it impacts us with the smell and stuff like that once in a while on a windy day."

Male, Aged 46-64, SEG C1C2

"I haven't actually experience much myself, it's all just handled like clockwork. But at the top of the high road, ... I guess it's them fixing up the pipes because it's very smelly. That's my only experience with witnessing stuff going on."

Female, Aged 18-30, SEG DE, Vulnerable

As only a small number of participants had directly experienced any issues with the drainage and wastewater service, the customers were not considered to be unduly biased by previous experience.

4. Overview of drainage and wastewater

Summary of findings

- Participants typically preferred separated systems but there was some recognition of the scale of challenge that would be required to change from a combined system.
- The general feeling amongst participants was that Thames Water should work to reduce overflows from combined sewers.
- Participants could identify potential issues with the drainage and wastewater system, mostly focussed on blockages and the ageing Victorian infrastructure.
- Participants considered that Thames Water should address both flooding, particularly internal, and preventing spills from combined sewer overflows.

Participants were provided with basic information to introduce how the drainage and wastewater system works, with some areas served by combined networks and other areas having fully separated systems.

4.1 Views on combined and separate systems

Participants typically preferred separate systems but there was some recognition of the scale of challenge that would be required to change from combined to separate systems. Whilst some participants were aware of combined sewer overflows, many did not appreciate how the systems work prior to being informed via the pre-reading exercise. Given this basic information, participants were able to give considered views on the relative benefits and issues with each type of drainage system. Box 4.1 provides an example of one group discussing the combined sewer system, illustrating how customers did consider the wider implications of the combined system.

In principle customers tended to prefer separate systems, although a few recognised that separate systems also have challenges.

"The one point about the pollution thing, I don't feel that road runoff is as innocent as all that really, because we drive petrol and diesel cars all over the road, and when it hasn't rained for a while and it's been nice and dry, and then it rains, you see all the oil in the road, coming up out of the tarmac. So that road runoff is quite polluted as well."

Male, Aged 31-45, SEG DE

Box 4.1: Example conversation on combined sewer systems

The general feeling amongst the participants was Thames Water should work to reduce overflows from combined sewers. Even when mitigating factors including screens and dilution were explained, this did not soften attitudes towards reducing discharges from combined sewer overflows.

"I think it was in the local press and TV as well, there was reporting that there was at least 56 days of the year where raw sewage and effluent has been discharged into the river Thames. And that's due to a number of factors. Some due to obviously heavy rainfall, and in your research study report there it talked about the mixture of wastewater runoff and surge storm water, and also kind of drainage, soil water, being combined. And then actually just causing an overflow."

Male, Aged 46-64, SEG AB

"...but it's still wastewater, no matter how much it could be potentially diluted."

Male, Aged 31-45, SEG AB

"...my heart breaks for you that you've not been able to play in the rivers. I moved out from London 18 months ago, so I was near the Thames for 15 years and it's dark and grimy. Now I'm out back to the most beautiful rivers where you can see all the way to the bottom and all summer here in lockdown the kids and teenagers were playing in them, people were treating it like the beach. That's what a river should be."

Female, Aged 31-45, SEG C1C2

4.2 Impacts from drainage and wastewater

Participants could identify potential issues, mostly focussed on blockages and the ageing Victorian infrastructure. Customers were asked for their initial thoughts on potential impacts from drainage when things go wrong. As previously noted, their levels of knowledge were mixed but typically groups identified potential issues due to blockages, difficulties mending underground pipes, the ageing Victorian infrastructure and climate change, in some cases recognising the impact on changing rainfall patterns.

"Oil is a problem. A lot of people dump oil down the drains. That solidifies and blocks the drains. I know that it's a very old water system that we're dealing with."

Male, Aged 31-45, SEG DE

"...with the system being like underground it looks like, it's probably a bit hard to repair. It'll take a while."

Female, Aged 18-30, SEG C1C2

"The Victorian infrastructure can collapse."

Male, Aged 46-64, SEG C1C2

"Also, if the overflow system is blocked or if it's just too full, sometimes you do get days and days of rain, or weeks' worth of rain in a day, then pipes can damage, that can cause flooding in the streets and on the roads."

Female, Aged 31-45, SEG DE

"*If the world's heating up and we're having less rainfall, in certain areas, then it might be easier on the drainage system. But it's so unpredictable, global warming. That's the difficulty we face with it. Population growth, cities grow*"

Male, Aged 31-45, SEG DE

Participants considered that Thames Water should address both flooding, particularly internal, and preventing spills from combined sewer overflows. The participants were then shown the potential causes of problems with the drainage system (Figure 4.1) and the potential impacts that these problems can cause in terms of internal and external flooding (Figure 4.2), or wastewater releases into the environment from storm or emergency overflows.

Figure 4.1: Causes of sewer flooding showcard

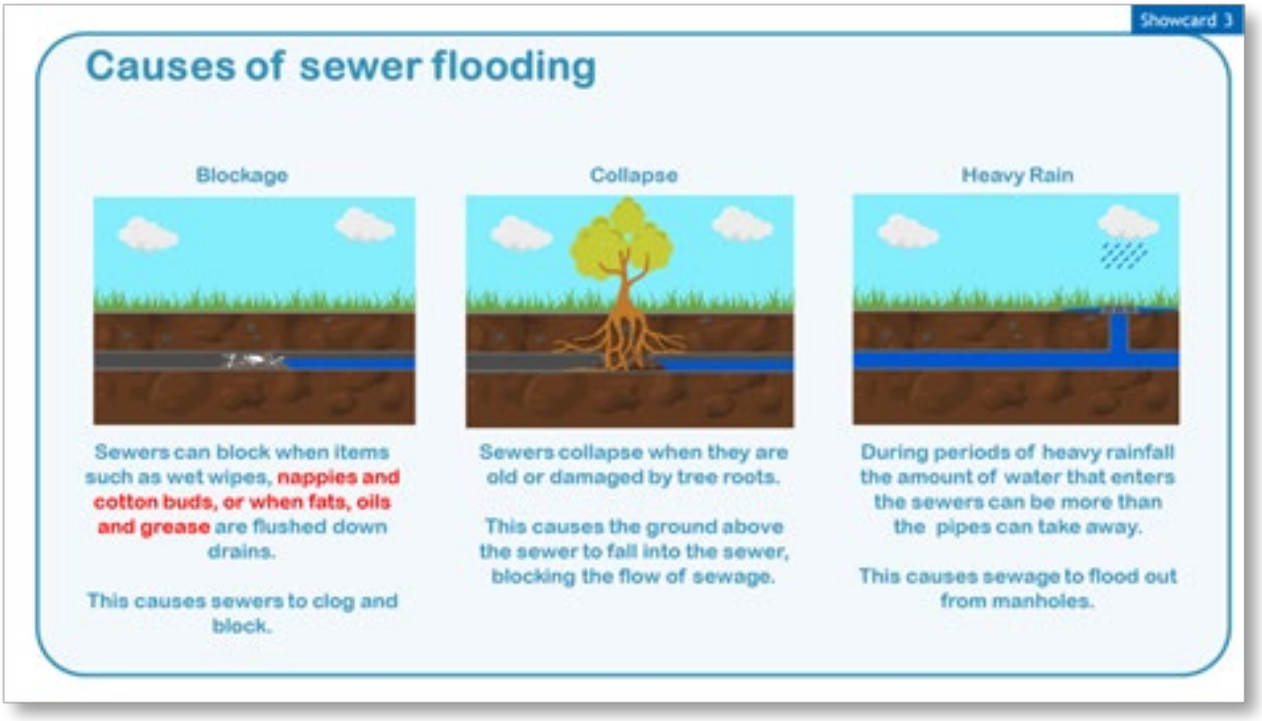
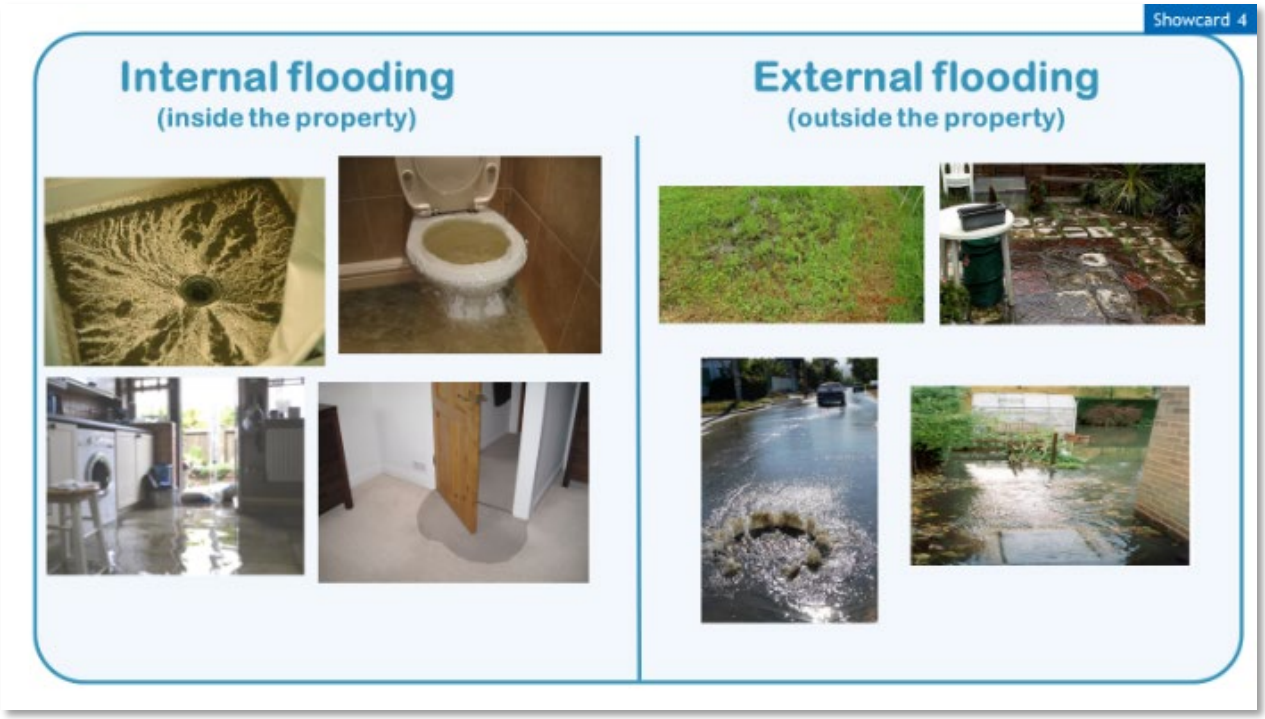


Figure 4.2: Internal and external flooding showcard



Participants had mixed responses to the posed trade-off question "what should Thames Water prioritise – resolving flooding or preventing spills from combined sewer overflows?" Some felt that the environment must be protected, whilst others felt that sewer flooding, particularly internal, is unacceptable (Box 4.2).

Box 4.2: Example conversation on the priorities for flooding verses pollution

"Even though it might not be favourable for the environment, but if that's the choice you're gonna make I'd say going into the river is more favourable than that [flooding]."
Male, Aged 18-30, SEG C1C2

"I disagree, it's going to have a catastrophic impact to the environment, and I don't think that's acceptable, because at the end of the day that's our waste, you know. We need to come up with a better solution."
Female, Aged 18-30, SEG AB

""It's a bit of a – not a trick question – but as in no one's going to say that they want internal flooding, but…it'll be bad for the environment, it would be destroying biodiversity."
Female, Aged 31-45, SEG C1C2

Overall, the consensus was that both should be addressed.

"I think as a customer, you'd want your home and your property to be protected as a priority…. that being said I still want clean waterways for nature"
Male, Aged 18-30, SEG AB

"I agree, I don't think there should be a compromise."
Male, Aged 31-44, SEG AB

Overall, participants across all groups seemed environmentally conscious, and were able to offer considered views as their understanding of the potential impacts of wastewater discharges developed.

5. Priorities for the future

Summary of findings

- Participants identified a broad range of challenges for the drainage and wastewater system, focussed more on the sewer and drainage system rather than wastewater treatment.
- There was a clear and consistent message that plans must be affordable for all customers, but planning for the future was a key priority for participants and there was strong support for protecting the environment. Preventing wastewater flooding was a lower priority.
- Limiting traffic disruption was the only clear low priority for participants, with many struggling to select their lower priority factors as they considered all are important.
- Participants indicated that they supported Thames Water focussing the DWMP on the three challenges – population growth, weather pattern changes due to climate change and the impact of urban creep and misconnections. They typically understood urban creep, though struggled to believe that misconnections were such a problem to be a priority.

This section summarises findings in relation to customers' priorities for the drainage and wastewater system. To understand views on drainage and wastewater planning, the sessions explored what participants saw as the future challenges for Thames Water. Voting exercises were used to help establish some relative priorities across different outcomes and constraints for the DWMP.

5.1 Future challenges for drainage and wastewater

Participants identified a broad range of challenges for the drainage and wastewater system, but focussed more on the sewer and drainage system rather than wastewater treatment. Participants were asked about the challenges for the wastewater system. Unprompted common themes identified were:

- Misuse of the drainage system leading to blockages / fatbergs – there was notable awareness of the issues surrounding inappropriate disposal of fats, wet wipes and plastics and the need for education of customers.
- Population growth and development, including more hard surfaces (urban creep).
- Impacts of climate change - there appears to be an increasing understanding of the high-level implications of climate change and participants generally commented that weather patterns are changing (i.e., they have recognised this change in recent years).
- Ageing infrastructure – London's Victorian sewers was often cited as an example.

"Wet wipes, oil, the stuff that leads to fatbergs."

Female, Aged 18-30, SEG AB

"I'm very conscious of what goes down the drain, particularly in our household, with regards to food down the drain, whether it's bits of food or even oil, I know from the culture I come from and my other half's culture, they'll just get lumps of oil down the drain. But we shouldn't be doing that, so I tend to just collect them separately and dispose of them safely in our local recycling centre."

Male, Aged 31-45, SEG C1C2

"You're almost just matching a like-for-like with the growth in population and urban creep and everything else with it."

Male, Aged 31-45, SEG C1C2

"I think the most important is that we plan for the future in terms of climate change, because that's going to have a devasting effect, and it has to be a top priority."

Female, Aged 65+, SEG AB

"It's obvious that the infrastructure that's in place was built by the Victorians, over 100 years ago, therefore it's not always going to be fit for purpose and it's got to be replaced."

Female, Aged 65+, SEG AB

5.2 Customers' priority areas for the 25-year DWMP

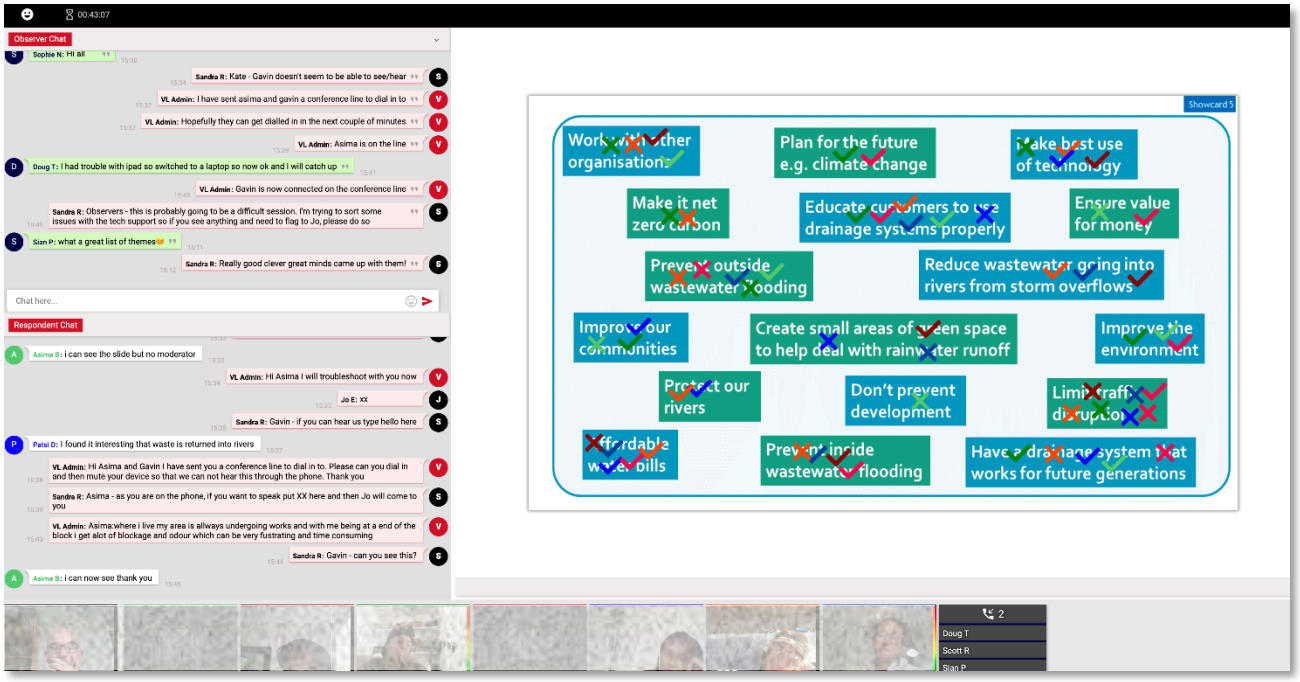
Following the initial open discussions, participants were presented with the different themes that Thames Water could consider when planning for drainage and wastewater services in the 25-year DWMP.

Figure 5.1: Range of factors to be considered by Thames Water in developing their DWMP

Participants in the first two online groups were asked to rank six key themes. Following review, the remaining groups were provided with a more extensive range of themes in order to build a wider understanding of customers' priorities (Figure 5.1). Participants were asked to select the five factors they considered the most important to focus on when developing the plan and the three factors which should have the least focus, recognising that all factors are important. Figure 5.2 shows an example of the voting

exercise[3]. Results from the voting exercise are summarised in Figure 5.3 in terms of customer priorities for the drainage and wastewater system.

Figure 5.2: Example of customer voting exercise to select their priority factors for the DWMP



There was a clear and consistent message that plans must be affordable for all customers. Participants consistently identified affordability for all customers as the key factor when developing plans, with over 70% of participants selecting this as one of their top 5 factors. There was a more mixed response to ensuring value for money, with some participants viewing it as a priority, particularly if bills were to increase, whereas others were less interested provided their bills were affordable.

"Cost! I think for me, I mean I know that we have to have water, but the Thames Water bill when it comes through every year, I do sort of raise my eyebrows, at nearly £400 a year, for the flat, and put down metering and all of that but I'm terrified the bill's going to be even more. But I think, I mean it's all good and well to say we need to upgrade, and we need to change the aging Victorian water system, but if it means my bill's going to double, then I want a very clear idea of where my money's going and how it's being spent, and it's not going to some CEO's paycheck at the end of the day."

Male, Aged 46–64, SEG C1C2

"a 'cross' for 'ensure value for money' because everybody can perceive value for money differently, but not everybody can afford their water bill, and so that's something that everybody should be entitled to, able to have clean water."

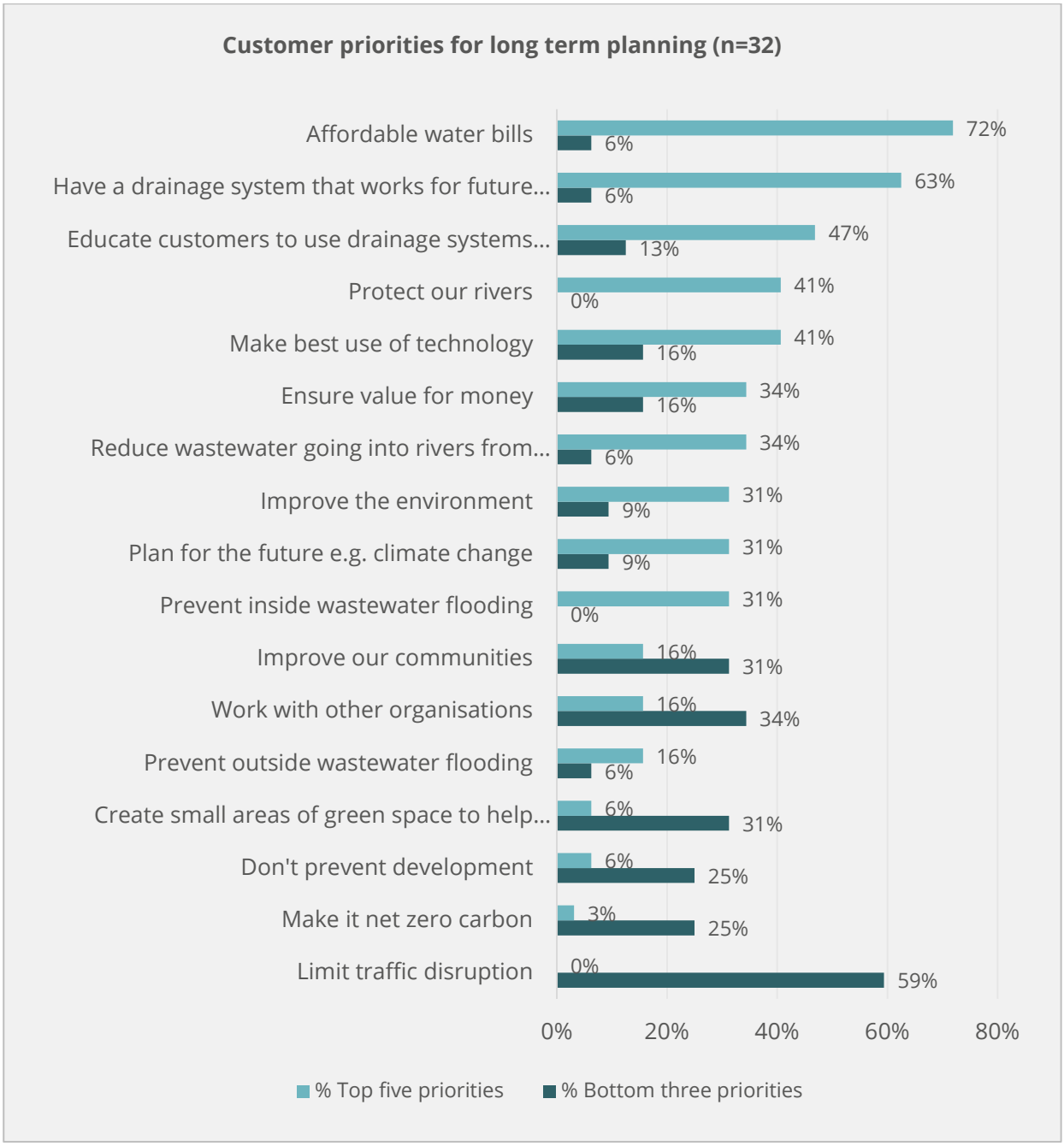
Female, Aged 18-30, SEG AB

[3] Note that participants were unable to see the votes of any other participants until the exercise was completed and the results were shared by the moderator.

"From the consumer perspective, you want to know that you're getting value for your money and part of that would be more affordable water bills. So as the bills are less, your value for money goes up."

Male, Aged 18-30, SEG AB

Figure 5.3: Summary of customer priorities for the 25-year DWMP (n=32)



*Percentage of participants who selected the factor as one of their top five priorities

Some customers did feel that dealing with the potential impacts of the drainage system were more important than cost alone.

"I think there's bigger priorities than getting a cheaper bill. I think how it affects you personally, as in, flooding in your house, how it affects the environment, is much more important than saying, I want my bill to be cheaper."

Male, Aged 31-45, SEG DE, Vulnerable

Review of customer preferences by SEG indicates a much lower proportion of customers in SEG DE selected affordability as one of their higher priority challenges. The sample sizes are too small to draw any conclusions, but this suggests it may be an area that would benefit from further exploration with customers, for example once the potential impact on bills is available.

Planning for the future is a key priority for customers and there is strong support for protecting the environment. Participants were also keen to see Thames Water embrace a long-term focus within their plans to ensure there is a drainage system that works for future generations. Linked to this priority is the views that it is essential that the system is also used correctly, with customer education also scoring highly.

There was also strong support for protecting the river environment. It is noted that this was selected as a priority area by more customers than the more general factor to improve the environment; this may be due to the discussions being focussed on the impact on the river environment rather than a wider discussion of the environmental impacts of drainage and wastewater, including treatment. Participants also ranked protecting rivers higher than reducing wastewater discharges from storm overflows, indicating their priority is to protect the river environment rather than reduce the amount of wastewater discharged per se.

"All day long, future-proofing for me."

Female, Aged 31-45, SEG C1C2

"I agree with educating customers, and also working with other organisations. I think if Thames Water, all the organisations work together, they can educate customers, plan for the future, have a drainage system that works for future generations."

Male, Aged 31-45, SEG C1C2

"Ensuring wastewater is treated and returned safely to the environment seems to be the priority and correctly, that should be the case."

Male, Aged 65+, SEG C1C2

Some customers noted that there was overlap between some factors and considered that ensuring a drainage system that works for future generations will also address the potential impacts.

"If you've selected 'have a drainage system that works for future generations' that should combine all those responses. So, you should automatically have a system that doesn't flood, internally and externally."

Male, Aged 46-64, SEG AB

Preventing wastewater flooding was a lower priority for participants. Although no participants selected preventing internal flooding as one of their lower priorities, only three in ten prioritised it, despite previous discussions indicating they considered preventing internal flooding to be a high priority. Participants' scoring was consistent that preventing wastewater discharges from storm overflows were of equal priority. Whilst some customers indicated that they considered other factors would encompass this, the lower level of support does indicate customers' recognition of the competing pressures. Participants also did not prioritise preventing external flooding. This was typically due to a lower priority than internal flooding and was also influenced by perceptions of how realistic it was to prevent.

"In my head if it was a trade-off between outside and inside, I'd rather it was outside. Maybe because I would assume that that wouldn't be my problem, and that would be maybe like a council thing to sort of pay for and fix. Whereas if it was inside, I'm assuming that I'd have to, you know, sort that out with insurance and all that sort of stuff."

Female, Aged 18-30, SEG C1C2

"Prevent outside wastewater flooding? I don't think they realistically can do that. I think a lot of the stuff is not very realistic. You're going to have outside wastewater flooding if it rains heavy."

Male, Aged 31-45, SEG DE

Limiting traffic disruption was the only clear low priority for participants, with many struggling to select their lower priority factors as they considered all are important. Figure 5.4 shows the planning factors ranked by their lower priority customer scores. Customers typically accept traffic disruption is an inevitable part of maintaining and improving the network. This was the most common factor to feature in participants' bottom three priorities.

"I would much rather have disruption due to them fixing a pipe that's blatantly leaking water down the road causing an environmental hazard. I would rather be in a traffic jam for that than because they've closed the roads on a silly whim."

Male, Aged 31-45, SEG DE

There were no consistent reasons for customers selecting other factors as their lower priorities, with many citing personal preferences and difficulties in deciding any factors to be less important.

"I couldn't do 3 X's because I think a lot of those things that you've got there are all really good points. So, it's been difficult to say don't do any of them."

Female, Aged 45-64, SEG AB

"No [I couldn't select crosses], it is a bit challenging isn't it."

Male, Aged 18-30, SEG DE

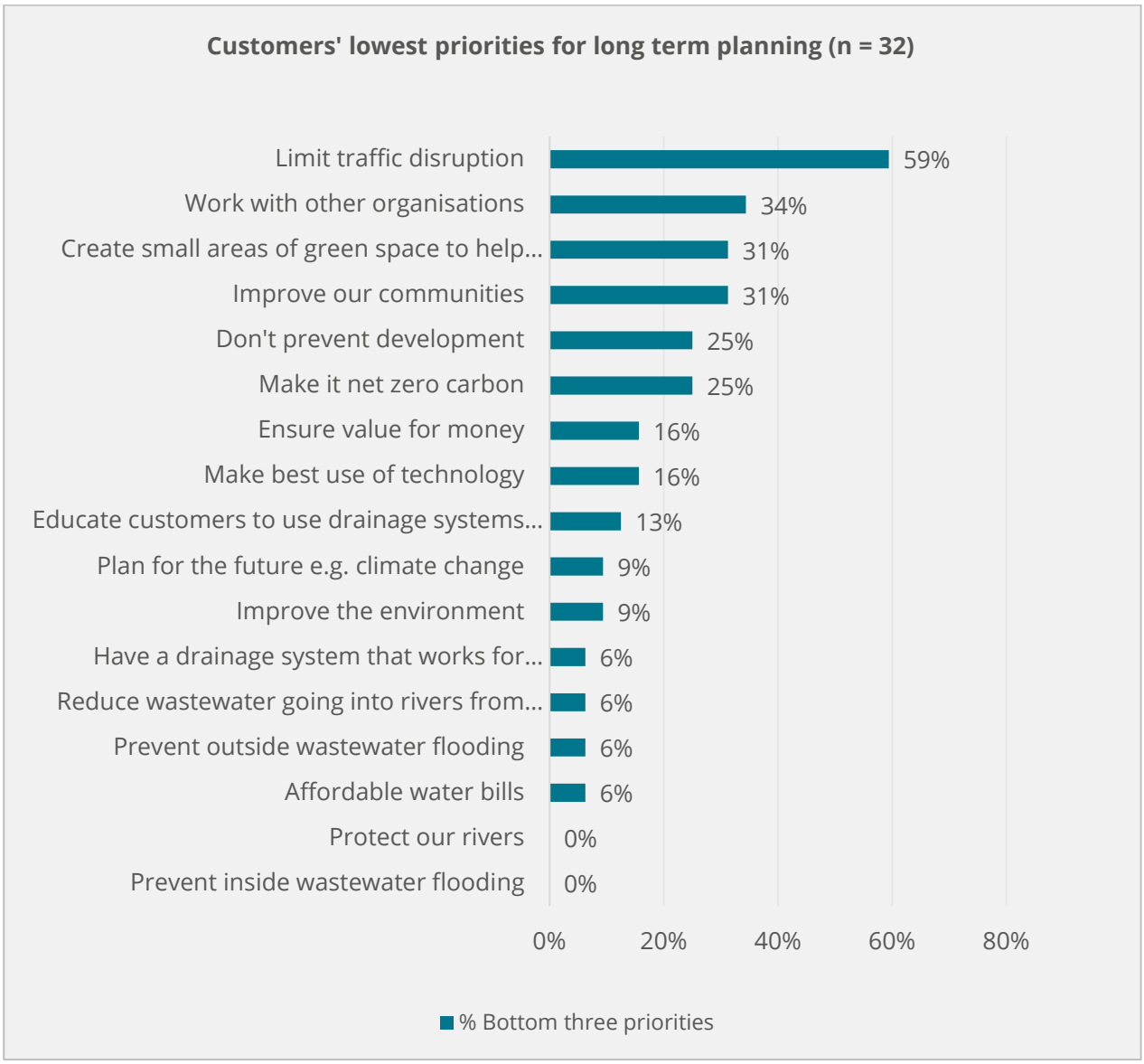
Net zero carbon was explored further with customers to understand it's relatively low ranking. A number of participants had not linked drainage and wastewater with carbon emissions, indicating that further

information and education may be required for customers to provide a more balanced and informed view. That said, some customers did not consider a net zero carbon target to be realistic.

"I just didn't see that that would be realistic goal out of everything. It was hard for me to find things to put crosses on, but I thought that's probably going to be quite impossible, so let's cross that out."

Female, Aged 18-29, SEG DE

Figure 5.4: Customers' lowest priorities for the 25-year plan (n=32)



*Percentage of participants who selected the factor as one of their bottom three priorities

Customers from the first two groups gave the six themes presented to them the same priority order. The priority order from the first two groups was:

1. Ensure wastewater is treated and returned safely to the environment from wastewater treatment works (equivalent to 'protect our rivers').
2. Reduce the amount of wastewater going into rivers from sewers through storm overflows.

3. Prevent wastewater flooding inside a property.
4. Working with other organisations to deliver solutions that best help meet everyone's objectives.
5. Prevent wastewater flooding outside a property.
6. Create small areas of green space that can be used by nature and help deal with rainwater runoff.

These priorities are consistent with the findings from the other four groups.

5.3 Thames Water's three most pressing challenges

Thames Water have worked with stakeholders to identify the three most pressing challenges for the first iteration of the DWMP, which are agreed as population growth, changes in weather patterns due to climate change and the impact of urban creep and misconnections. These were shared with customers to determine their support and assess participants' understanding of urban creep and misconnections

Participants indicated that they supported Thames Water focussing the DWMP on these three challenges. They typically understood urban creep, though struggled to believe that misconnections were such a problem to be a priority. Participants typically understood the concept of urban creep which provided an important context for the discussion of options.

> *"I've been thinking of population growth and urban creep that goes hand in hand. I lived in London all my life; it went from 6–7 to eight million now. You can imagine how much they've grown in that area alone, never mind Berkshire, where I live, I've moved out here and created that essential population growth. That's probably something they're [Thames Water] already focusing on, so it's like [name removed] said, be one step ahead of the game...."*
>
> Male, Aged 31-45, SEG C1C2

Many but not all customers struggled to believe misconnections were a problem, believing building controls would stop this source of pollution. One customer had direct experience of pollutants being traced back to misconnections from a local river.

> *"But how often would that be happening? Because you kind of think people who would be putting in a dishwasher or washing machine would do their job properly and fit it correctly, so I'm kind of thinking it's very rare that things like that happen?"*
>
> Female, Aged 31-45, SEG C1C2

> *"I was just going to say that there's obviously regulations that should prevent that in a separated system, building regulations should prevent that in terms of new installations"*
>
> Male, Aged 46-64, SEG AB

> *"You can do your own washing machine. This happened where I am recently. Just near where I am in the Kennet Valley, the River Kennet here has had quite a lot of chemical-looking bubbles on it, they're trying to identify how far up the river it goes on the assumption that somebody has plugged something into the wrong pipe."*
>
> Female, Aged 31-45, SEG C1C2

6. Views on DWMP options

Summary of findings

- No options were either universally supported or rejected by participants. The strongest support was shown for options that were thought to be realistic to implement and/or already proven to work. Participants preferred options they considered were sensible and the right thing to do such as managing rainwater (green infrastructure).
- Views on catchment management were mixed, with some participants supporting a natural solution approach whilst others were concerned about the effectiveness of relying on other parties.
- Participants supported larger 'new infrastructure' options, though their support tended to be more conditional as they recognised the practicalities of such options.
- Support was more limited for options that participants felt did not solve the underlying problem or options that they considered to be unproven and higher risk.
- When considering the options as part of a set, the preferred options were:
  - Separating the combined sewer system (most popular option), followed by rainwater collection and reuse (reducing the amount of wastewater in the wastewater sewer system).
  - Options that increase the capacity of the network – increasing capacity of existing sewers and building new connecting sewers/tunnels (managing the wastewater system efficiently).
  - Options that optimise the existing wastewater treatment either through use of advanced technology or expansion (managing wastewater treatment efficiently).

6.1 Overview

Thames Water are considering over thirty detailed interventions as part of the DWMP process. In order to ensure there was a manageable number of potential solutions for participants to consider, the initial "long-list" was summarised into sixteen high level options that was agreed with Thames Water technical (including how each option was summarised for participants).

Participants were presented with a summary of each option in turn with showcards (Figure 6.1) providing;

- A brief description and information regarding whether the option is currently in use;
- Graphic illustrating the option;
- Two key pros and cons for the option; and
- A high level indication of the relative costs and benefits

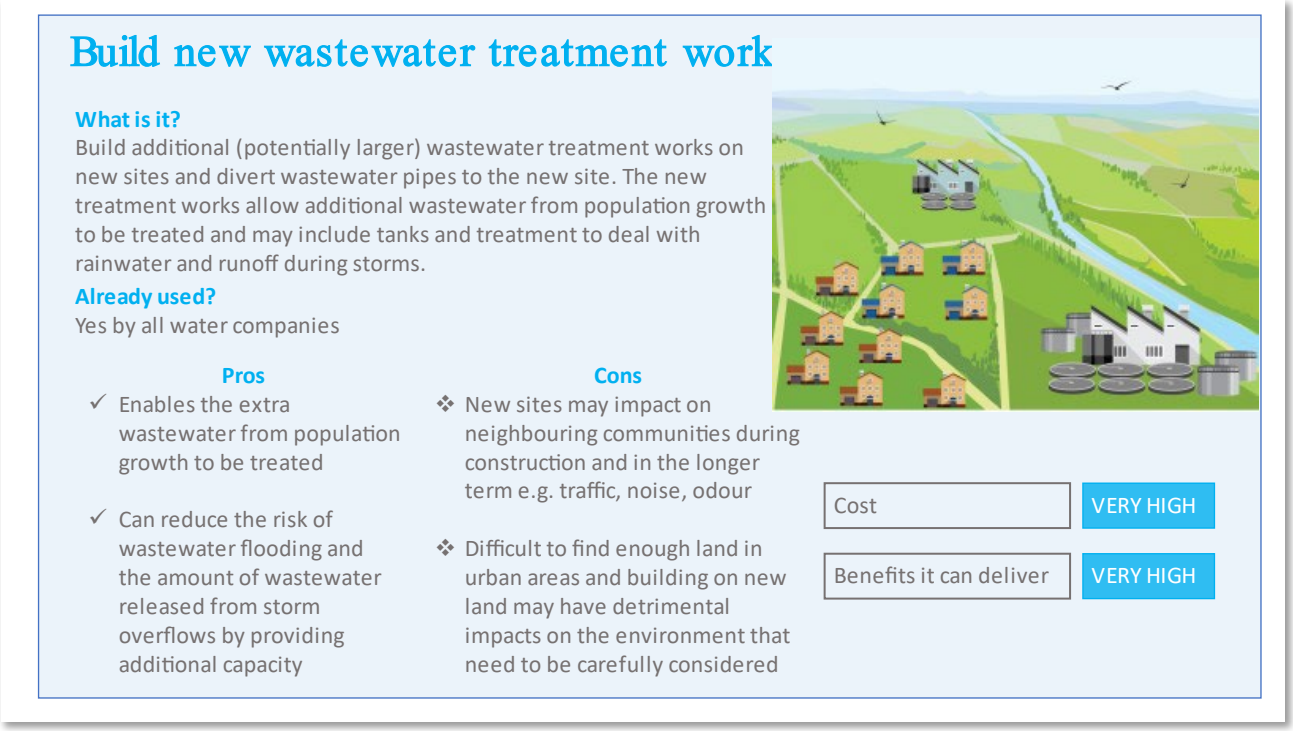
All option showcards are included for reference in Appendix C. Participants individually red-amber-green (RAG) rated each option on the following basis:

Option is acceptable

Option is only acceptable in some cases/situations

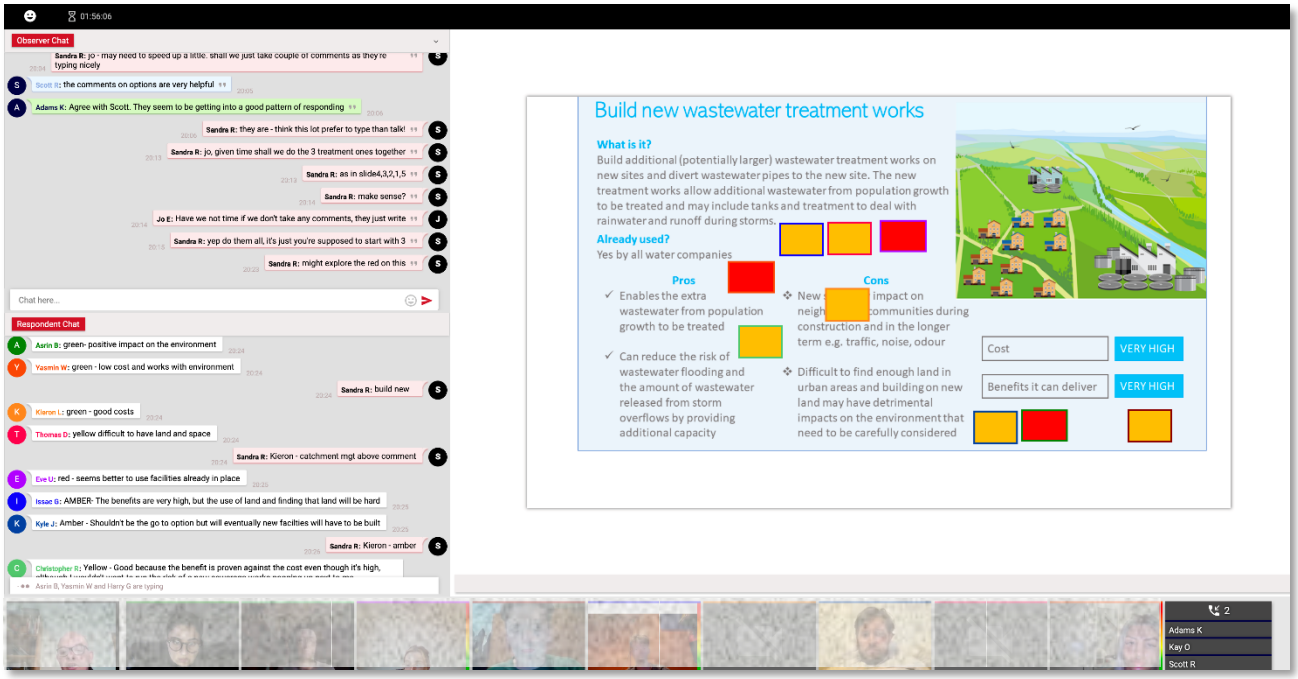
Option is not acceptable

Figure 6.1: Option showcard example



The results were then shared with the whole group (Figure 6.2) and discussed to understand how different options were perceived and reasons behind participants' preferences. Customers were encouraged to share their views in the participant chat as time was limited for each option.

Figure 6.2: Option RAG voting example



To ensure focussed feedback in the groups, the sixteen options were also grouped into the three categories that were discussed in sequence (with the sequence rotated across groups):

- Reducing the amount of wastewater in the wastewater sewer system (6 options)
- Managing the wastewater system efficiently (5 options)
- Managing wastewater treatment efficiently (5 options)

Once all the options had been RAG rated within a category, participants were then asked to select the options that they most and least preferred within that set.

All groups considered all 16 options, with the exception of the vulnerable customers group. This group covered a subset of options due to the additional time required to cover materials within the session. For several groups, time pressures did mean that discussions were typically more limited for the third set of options – but as noted above the options were considered in different order for every group, ensuring that this did not bias the feedback on any of the options under consideration.

6.2 Customers' views on the acceptability of the options

Figure 6.3 summarises participants' preferences for each option across all groups. In making their decisions participants considered all aspects and no single factor such as cost, dominated their choices. For example, when considering the merits of treatment and recycling of household wastewater (excluding toilets), participants considered flow volumes, environmental impacts, and the practicalities of installation.

No options were either universally supported or rejected by participants. The strongest support was shown for options that they considered to be realistic to implement and/or already proven to work. Customers preferred options they considered were sensible and the right thing to do such as managing rainwater (green infrastructure). Customers tended to be more comfortable with proven technology that is used within the UK.

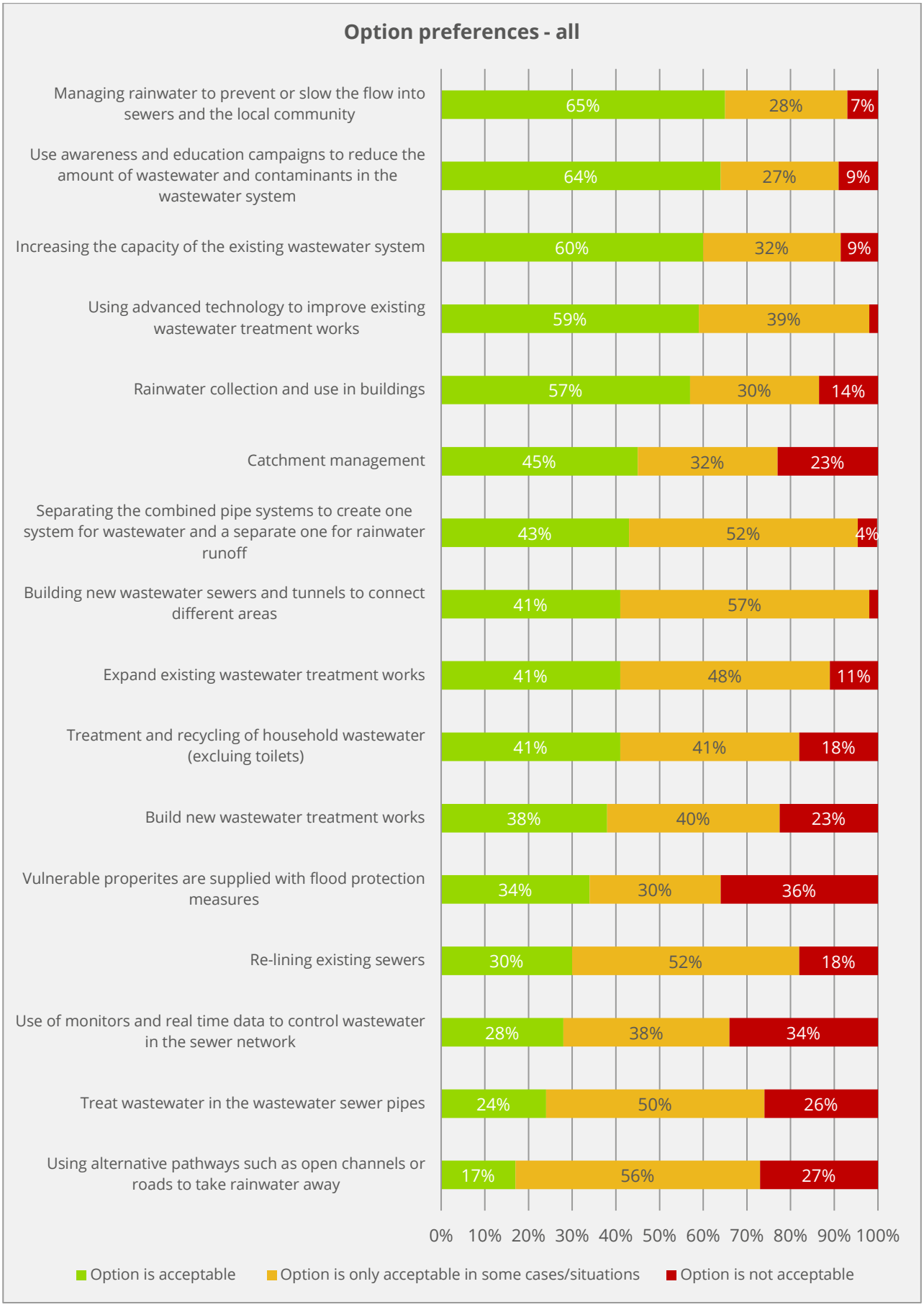
"[Increasing sewer capacity] seems like a solution that as it says is a known solution which is well understood."

Female, Aged 31-45, SEG C1C2

"Sounds like the way to improve efficiency in the system. We should be using all the technology we have available to become efficient in how the water is managed. May need some short-term investment but may reduce future costs through automation."

Male, Aged 31-45, SEG AB

Figure 6.3: DWMP option preferences (n = 45)



Green solutions in terms of managing rainwater, either through green infrastructure, or collection and reuse systems garnered strong support. Some concerns were flagged about the practicalities of implementing rainwater collection and reuse schemes.

"Near where I live you see garden roofs, and living walls, stuff like that, so it's a familiar concept to me."

Male, Aged 18-30, SEG AB

"[Managing rainwater] that's a natural solution, not invasive at all by the looks of it, I think that's really good, I like that?"

Female, Aged 65+, SEG C1C2

"[Rainwater collection] Again for the future, if it's difficult to put in existing houses, if they maybe going to start putting it on these new houses. I feel like a lot of these low-impact and low-cost ones, collectively if you keep doing these it could make a bigger impact."

Female, Aged 18-30, SEG C1C2

"[Rainwater collection] I think it's quite a good option because it's low cost, but as I said it doesn't seem like it's practical, probably why it's mainly used for commercial and industry at the moment mainly, limited use."

Male, Aged 18-30, SEG C1C2

"What exactly would need to be done, which types of building would be suitable, and how it would actually then be put into place. It's a lovely idea."

Female, Aged 65+, SEG AB

Attitudes towards treatment and recycling of household wastewater excluding toilets were more mixed. There were customers who liked the idea overall but there were also concerns about the implementation. This particularly the case for retrofit, rather than for rainwater collection and reuse.

"I think the slight difficulty that it mentions where it's quite difficult to fit into existing buildings, sort of rings true, but I think otherwise I like the idea of it quite a lot."

Male, Aged 18-30, SEG AB

"Just a question about the ongoing maintenance, is that something that the consumer would have to pay for, or would it be part of a package kind of thing?"

Female, Aged 18-30, SEG AB

"It actually recycles water as grey water…So anything that reduces capacity in the system and then actually prevents it being retreated is a good thing."

Male, Aged 46-64, SEG AB

"I do think it's a brilliant idea and it should really be brought into new housing stock, the problem that I have is the conversion of existing housing stock, I don't think it would be low to the consumer, I think it would be high. And I think it would also be something you couldn't, in terms of planning, it would be very difficult to, it would have to be a choice for each individual property, rather than something you could impose."

Male, Aged 46-64, SEG C1C2

Customer education also scored highly, in keeping with the previous discussions on the challenges and issues facing the drainage and wastewater network. Participants recognised the benefits of tackling issues at source, though some noted it may be of limited success so it would need to run in parallel with other options.

"I thought this was a good idea because it's going to massively help with all the blockages and the pollution, and I think everyone's kind of trying to educate themselves on being more sustainable, I think it's the way forward and to educate from school level right the way up, so you know it's instilled to a child this is how we should be using our systems to help the future. So, I think it's very positive."

Female, Aged 31-45, SEG C1C2

"I think essentially it's a good idea...we all are now aware of things like microplastics...I just I'm not sure how much real difference it will make."

Male, Aged 46-64, SEG C1C2

Views on catchment management were mixed, with some participants supporting a natural solution approach whilst others were concerned about the effectiveness of relying on other parties. Whilst in line with participants' strong support for green solutions, views on catchment management were mixed and tempered by a hesitancy that relying on others to deliver solutions may be of limited success. Some worried about a lack of accountability and relying on the behaviour of other parties to tackle problems, whereas others liked the idea of investing in natural solutions, feeling intuitively it should be more efficient than hard engineered solutions.

"The principle for me is less about Thames Water having to take responsibility for this, because I feel like when it's organisations and bigger companies and farms and stuff, it's their responsibility."

Female, Aged 31-45, SEG C1C2

"I don't think there's any harm in trying really. Just having the dialogue with local stakeholders, maybe there's potentially agreement there. Potentially other stakeholders more than happy to front up the bill. I just don't feel there's any harm in trying this."

Male, Aged 31-45, SEG AB

"I mean in an ideal world, if everybody cooperated, it would work, but I just put dealing with what we've got, basically, as more realistic."

Female, Aged 65+, SEG C1C2

"I think it's the most cost effective, I also like the idea that you're using natural resources rather than having to build new facilities. I think it's something that we should spend more time and energy looking into."

Male, Aged 65+, SEG AB

Participants supported larger 'new infrastructure' options, though their support tended to be more conditional as they recognised the practicalities of such options. Customers supported the bigger 'new infrastructure' options such as separating systems, constructing connecting tunnels and sewers and expanding or building new wastewater treatment works. They felt that these types of options solved the problems of flooding and environmental impact, in keeping with their long-term priority for a "drainage system that works for future generations". However, they also applied reality checks such as "is there really land available for new treatment works" and "is building separate systems in London feasible"?

"It wouldn't make sense to spend millions or billions of pounds on something that's not lasting."

Female, Aged 31-45, SEG DE

"[New sewers/tunnels to connect areas] The initiative is great, but how much are people willing to pay for this?"

Male, Aged 18-30, SEG AB

"[New sewers/tunnels to connect areas] I think the idea of moving water around is a good one, but I think it'd be hellishly expensive, and as it says it involves major widespread construction, which may cause disruption and noise, and I don't know whether the benefits would actually outweigh the disruption it would cause, and the cost."

Male, Aged 64+, SEG AB

"So, if they could divert some of the water to an area where they could manage it better, I think that would be a good solution."

Male, Aged 31-45, SEG DE, Vulnerable

"[Separating systems] I'm amber because this is a massively costly exercise. We'd be digging up roads for the next 20 years"

Male, Aged 65+, SEG C1C2

"[New wastewater treatment] is a good idea, because if you afford larger waterworks, put in the latest technology, better piping and everything else like that, it should have high advantages. But the problem is, where is the land that you're going to get it from, where you're going to build?"

Female, Aged 65+, SEG AB

"[Expanding existing wastewater treatment] is the right solution in some areas where land is available without too much negative impact. Where possible improve efficiency of existing plants first?"

Male, Aged 31-45, SEG AB

"[New wastewater treatment] sounds good but I am concerned about cost to customer and impact on the environment?"

Male, Aged 31-45, SEG AB

Participant support was more limited for options that they considered did not solve the underlying problem. Participants felt that flood protection measures or re-lining sewers did not solve the underlying problem of lack of capacity. Consequently, whilst they recognised the benefits in terms of shorter-term or as mitigation, their overall support for these options was lower. Participants also raised concerns regarding the effectiveness of relying on manual interventions alongside other practicalities such as storage of equipment such as flood gates.

Flood protection measures:

"I feel like this should be being done anyway to reassure people we are trying to look out for them, but this is only a sticking plaster."

Female, Aged 31-45, SEG C1C2

"I agree with everybody else that it's papering over the cracks, but if it's a low-cost measure, it could make a big difference to the actual individual who suffers these problems"

Female, Aged 18-30, SEG C1C2

"Manual intervention can be room for error."

Female, Aged 46-64, SEG C1C2

"The benefits are very low, and it is solely relying on occupants basically putting these measures in place themselves when they are at risk of flooding and then storing - I guess they would then have to store whatever provisions are provided until the next time. I just don't think that is very economical either. It's just not worth it. I mean, it will be a good addition to all of the other things, but this is not going to solve the problem."

Female, Aged 31-45, SEG DE

Relining sewers:

"[Relining] kind of seems like a no-brainer, but we know that there are cracks in the sewer pipes, because they've been there forever, in a lot of cases, therefore lining them, which they're already doing, it seems like a good idea"

Female, Aged 65+, SEG AB

"I was thinking, it would be a better option perhaps to replace the pipes rather than just line them, which seems more of a stop gap solution"

Female, Aged 65+, SEG AB

"I'd rather have something that actually works, than this one where they said that it's a lot of effort to reline the pipes, and that the benefits are limited because the rainfall and runoff is higher than the amount of groundwater getting into the pipes."

Female, Aged 18-30, SEG C1C2

"...it's literally papering over the cracks, so not really, I don't think it's that worthwhile. It's ok, but flooding is going to become more and more of an issue, and I don't think this is going to solve those."

Male, Aged 18-30, SEG DE

Participants were also less accepting of options that they considered to be unproven and higher risk, or unrealistic to implement. These options were considered by customers to have an unproven track record and higher perceived risk attached, for instance treat in pipe, use of real time control in sewer, or appeared unrealistic to implement, particularly in the urban environment e.g., using alternative surface pathways.

Some participants were also wary of new technologies like treating wastewater in wastewater pipes. That said, there was a small number of participants willing to embrace innovation in this area.

"Apprehensive about wastewater being treated in the wastewater pipes. makes me feel very uneasy."

Male, Aged 31-45, SEG DE

"I thought anything that can be done in the sewer pipe is a great idea, right? In my head, it's a bit more efficient than taking it to the plant and going through the process there."

Male, Aged 31-45, SEG C1C2

Views around using monitors and real time data to control the wastewater network were also mixed. These differences of opinion were often driven by attitudes to investment risk. Some felt embracing new technologies within a long term would lead to progress, others were concerned about the untested nature of solutions.

"I 4 it would be good to talk with other systems in different nationalities."

Male, Aged 46-64, SEG DE

"Well it seems a good idea, but it says it needs to be built through to open spaces, so would that mean you're damaging open green areas to create this sort of drainage, to take away the water, does that mean you're going to have to make roads smaller, cause it said something about, the way to release this flooding of water, for it to go through, so it's just the space you're using to create these"

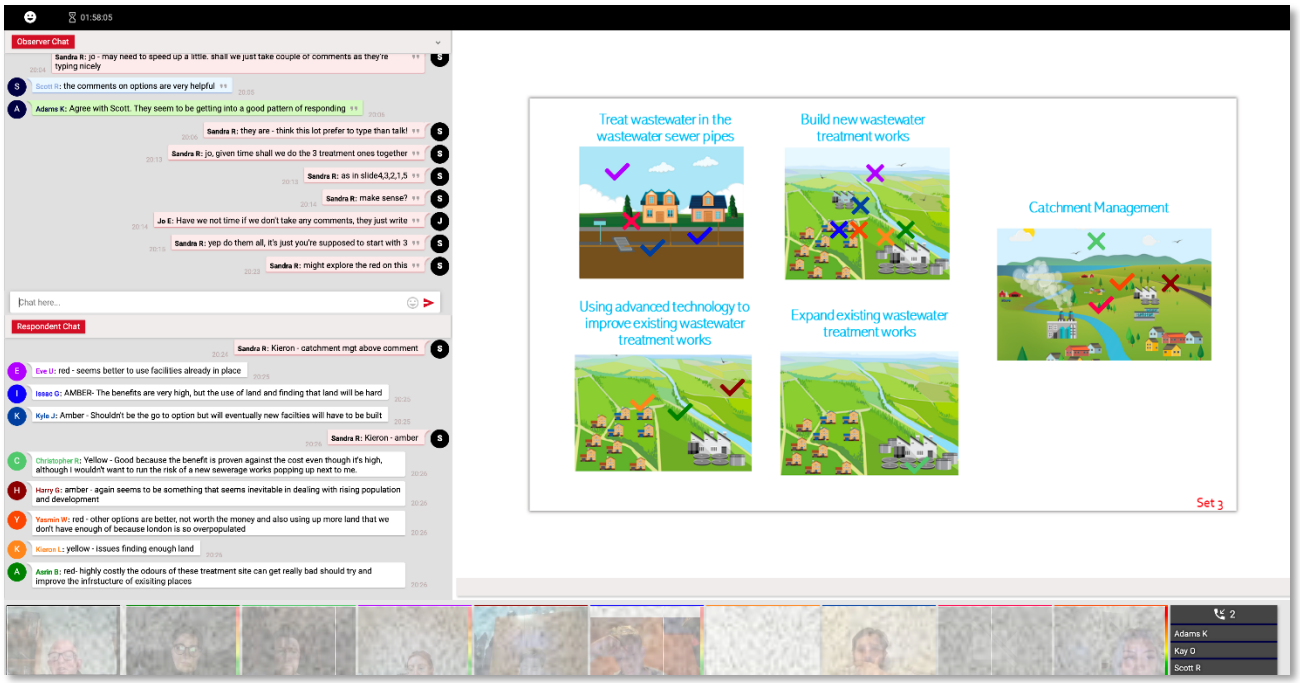
Male, Aged 46-64, SEG C1C2

6.3 Most and least preferred options

In addition to the RAG assessment for each individual option, participants were asked to choose their most and least preferred options within the three sets of options (Figure 6.4):

- Reducing the amount of wastewater in the wastewater sewer system
- Managing the wastewater system efficiently
- Managing wastewater treatment efficiently

Figure 6.4: Example of the voting exercise for 'managing wastewater treatment efficiently' options



This summary exercise was carried out after the participants had seen the rest of the group's RAG assessment and they had discussed each option. Therefore, it is to be expected that their overall most and least preferred options may not fully align with the order of option acceptability, given their greater awareness. The exercise does give further indications of the most prominent views of customers.

Reducing the amount of water in the wastewater system

In general customers were supportive of options that reduced the amount of wastewater going into sewers, recognising this could reduce the impacts in terms of flooding and discharges to the environment.

"Reduce the amount of wastewater going into rivers from sewers, to start with."

Female, Aged 65+, SEG C1C2

Separating the combined sewer system was the most popular option, followed by rainwater collection and reuse. Consistent with the RAG scoring, using alternative pathways for rainwater was least preferred.

Within this set of options, separating the combined sewer system was the most preferred followed by rainwater collection and reuse (Figure 6.5).

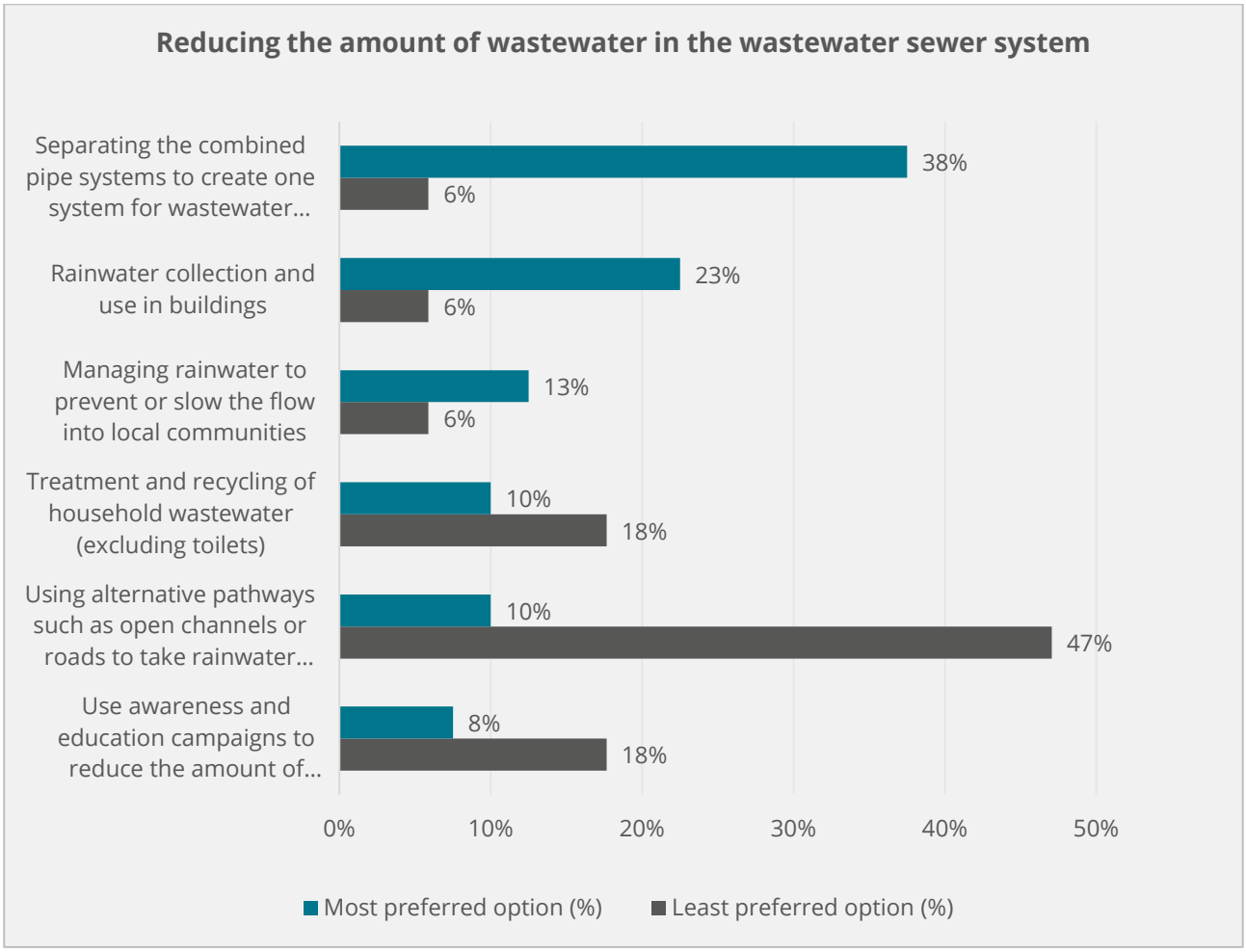
"I think the idea of actually separating them out, spending some money to separate them out, is ideal. I think, anything that, the initial cost is gonna be high because you'll have to dig up roads, new pipework etc, but diverting the two, keeping them separate, I think is the best resolution."

Male, Aged 65+, SEG AB

"This to me is the one that would last generations."

Male, Aged 46-64, SEG C1C2

Figure 6.5: Most and least preferred options for 'Reducing the amount of wastewater



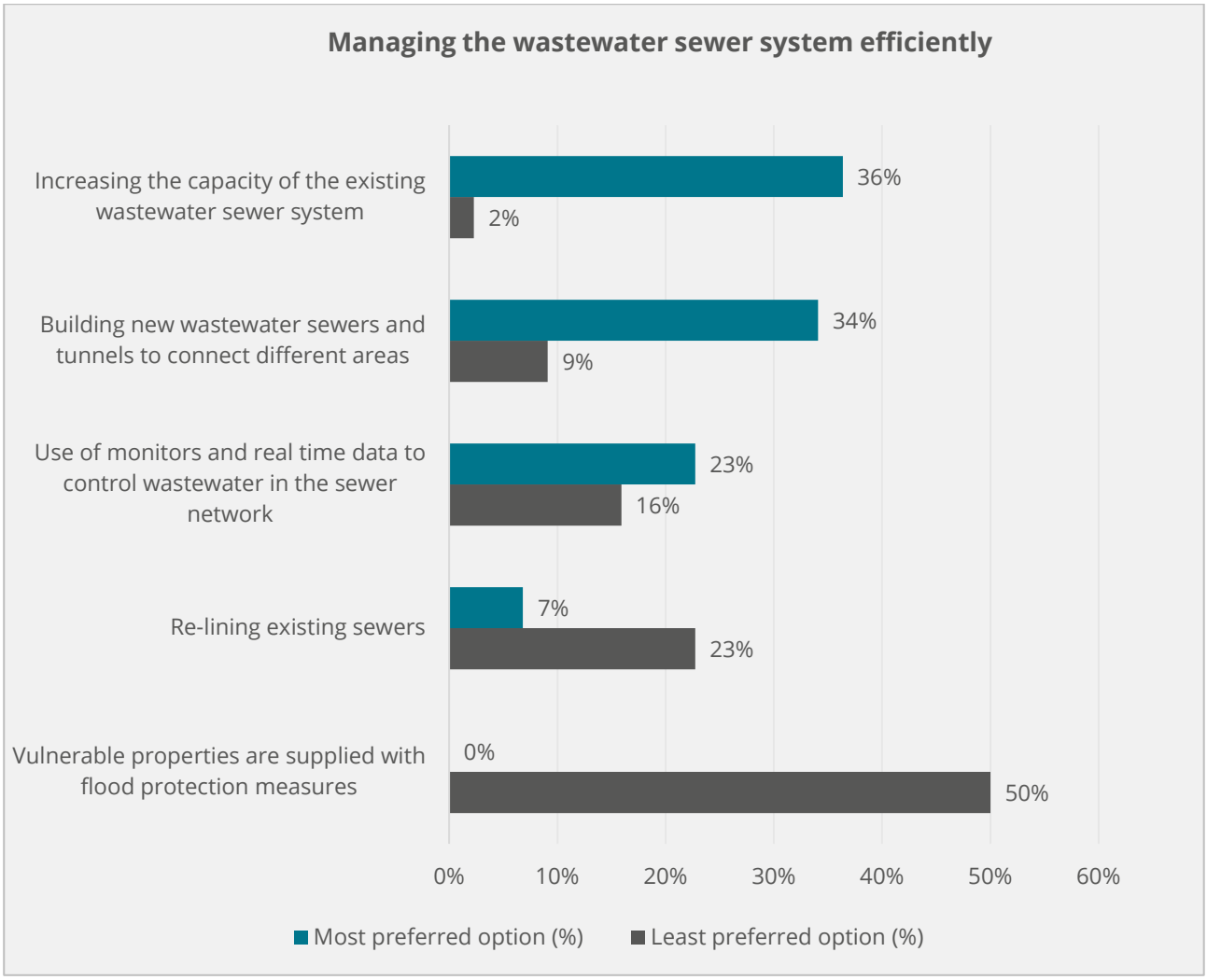
In contrast to the RAG scoring, rainwater collection and reuse was the preferred option for more participants than managing rainwater to slow the flow. This likely reflects participants' individual preferences, rather than any changes in opinion following the discussions of these options. Although education and awareness did not feature prominently in the most and least preferred options, it did score well in the RAG assessment. This reflects attitudes already referenced whereby education feels like the right thing to do, without being certain of the outcomes it delivers. Consistent with the RAG scoring, using alternative pathways for rainwater was participants least preferred option of the set.

Managing the sewer system efficiently

The two options that increase the capacity of the network are participants' preferred options.

Consistent with their RAG scoring and feedback, participants' preferred options for this set were the two options that increase the capacity of the network (Figure 6.6).

Figure 6.6: Most and least preferred options for 'Managing the wastewater sewer system efficiently'



"Feels like an obvious thing to do for areas with the greatest impact."

Female, Aged 31-45, SEG C1C2

"Increasing capacity - it makes sense to use the infrastructure you already have and make it better / great."

Female, Aged 31-45, SEG C1C2

"I just thought by building these tanks, it could reduce sewage build up. It could be a good way to have little mini flow systems everywhere rather than just having bigger ones, if that makes sense."

Female, Aged 18-29, SEG C1C2

"...it seems like quite a smart solution that can be used sort of in conjunction with some of the future technologies that were mentioned previously, about sort of redirecting water."

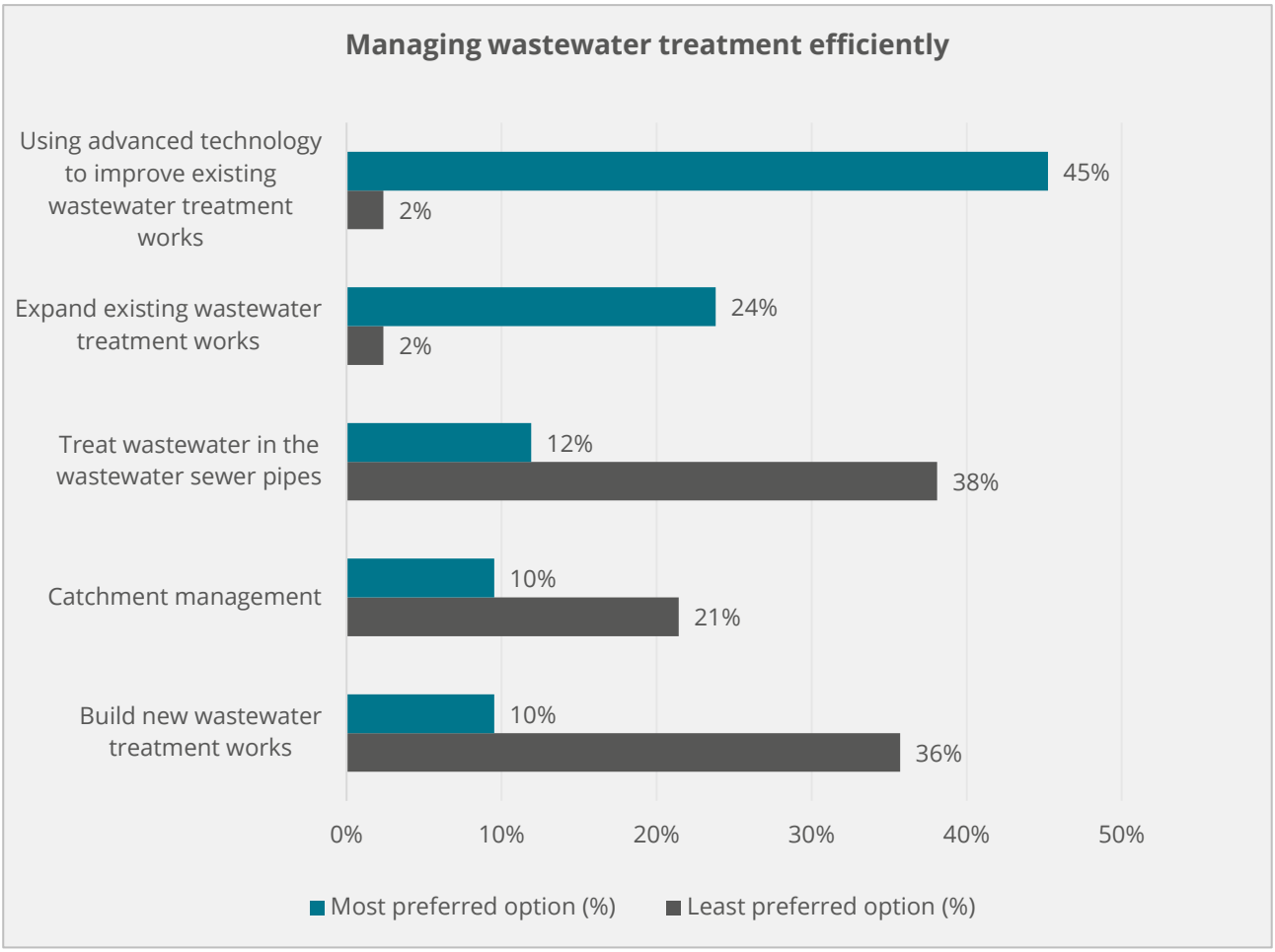
Male, Aged 18-29, SEG AB

Participants' least preferred options were in line with the RAG scoring.

Managing wastewater treatment efficiently

Participants preferred options optimise the existing wastewater treatment either through use of advanced technology or expansion. Consistent with their RAG scoring and feedback, participants' preferred options for this set were the two options that optimise existing treatment capacity (Figure 6.7).

Figure 6.7: Most and least preferred options for 'managing wastewater treatment efficiently'



"Well, I think it's a great idea to build on existing infrastructure...if you're building [new sites] ...on the green belt or rural countryside, I think there'd be a lot of objections to that."

Male, Aged 46-64, SEG C1C2

As with the other sets of options, the least preferred options were in line with the RAG scoring.

7. Conclusions

7.1 Summary

Drainage and wastewater services in the Thames Water region face many different challenges from changing climate, changing weather patterns, population growth, and growing demand for environmental protection. To meet these challenges, Thames Water, is working in partnership with stakeholders to develop a long-term plan - the Drainage and Wastewater Management Plan (DWMP) - to ensure a resilient and sustainable wastewater service for the next 25 years for London and the Thames Valley region.

This qualitative customer research supports development of the DWMP by identifying customers' expectations for drainage and wastewater services in future and understanding customers' preferences for the different options and solutions to inform the next stages of the planning process. The research was carried out online using a specialist engagement platform over six sessions, collecting the views of a total of 48 customers.

Initially participants had varying levels of awareness of drainage and wastewater. They could identify potential issues with the drainage and wastewater system, mostly focussed on blockages and the ageing Victorian infrastructure. Following some basic information and education, customers were able to give considered views on drainage and wastewater services and their expectations for the future. Customers typically preferred separate sewer systems but there was some recognition of the scale of challenge that would be required to change from combined to separate systems. The general feeling amongst participants was that Thames Water should work to reduce overflows from combined sewers and that Thames Water should address both flooding, particularly internal, and preventing spills from combined sewer overflows.

7.2 Key findings

Participants identified a broad range of challenges for the drainage and wastewater system, focussed more on the sewer and drainage system rather than wastewater treatment. The key findings for customer priorities are:

- Plans must be affordable for all customers.
- Planning for the future is a key priority for customers and there is strong support for protecting the environment.
- Preventing wastewater flooding was a lower priority for participants relative to other challenges.
- Limiting traffic disruption is the only clear low priority for participants, with many struggling to select their lower priority factors as they considered all are important.

Participants indicated that they supported Thames Water focussing the DWMP on the three challenges identified and agreed with stakeholders, namely population growth, weather pattern changes due to climate change and the impact of urban creep and misconnections. They typically understood urban creep, though struggled to believe that misconnections were such a problem to be a priority.

Participants considered sixteen high-level options and scored their acceptability as a RAG rating. The key findings are:

- No options were either universally supported or rejected.
- Participants showed strong support for options that they considered to be realistic to implement and/or already proven to work such as increasing the capacity of the existing sewer network or using advanced technology to improve existing wastewater treatment works.
- Participants preferred options they considered were sensible and the right thing to do such as managing rainwater either via green infrastructure or through rainwater collection and reuse. Some concerns were raised regarding the practicalities of implementing such systems, which also influenced lower levels of support for treatment and recycling of household water.
- Support for customer education was highlighted throughout the sessions. Participants recognised the benefits of tackling issues at source, though some noted it may be of limited success so would need to run in parallel with other options.
- Views on catchment management were mixed. Some participants supported a natural solution approach whilst others were concerned about the effectiveness of relying on other parties.
- Participants supported larger 'new infrastructure' options, such as separating systems, constructing connecting tunnels and sewers, and expanding or building new wastewater treatment works, as they considered the options in keeping with their long-term priority for a "drainage system that works for future generations". Their support tended to be more conditional as they recognised the practicalities of such options
- Although recognising the potential in terms of shorter-term benefits or as mitigation, support was more limited for options that they considered did not solve the underlying lack of capacity problem - flood mitigation for vulnerable properties and re-lining sewers.
- Participant support was lowest for options that they considered to be unproven and higher risk (real-time control in sewers, in-pipe treatment), or unrealistic to implement (alternative pathways for rainwater). Some customers indicated a willingness to embrace for innovation, reflected in support for these options typically being more conditional.

Appendix A: Qualitative research materials

The customer session topic guide, example showcards and customer pre-reading are provided.

Topic Guide

Thames Water

Drainage and Wastewater Management Plan

Topic Guide

Introduction	5 mins

- In line with MRS code, facilitator to introduce himself/herself, explain the format of the discussions, and set out objectives of the discussion.
- Explain that we are independent of Thames Water
- Explain session etiquette, that there are no right or wrong answers.
- Explain observers may review the sessions, and sessions are recorded for internal use
- Respondents to briefly introduce themselves
- Check for any questions before starting the session

Introduction and initial views on drainage and wastewater	5-10 mins (10-15)

- We shared some pre-reading for the sessions to give an overview of how the water industry works in England and Wales, and an introduction to drainage and wastewater systems. Are there any questions about it? Did anyone watch the videos? – any thoughts on that?
- Have you thought about what happens to your household wastewater before we asked you to do this reading?
    - Probe to see whether they think about what happens to their wastewater, what their level of knowledge is before we start the session e.g., do they understand how surface water runoff/rainfall is dealt with
    - Briefly assess understanding of the responsibilities of Thames Water for drainage/wastewater and if they recognise other parties are involved
- In these sessions we want to explore your views on how Thames Water manages drainage and wastewater services in the future.
- What is your experience of the drainage and wastewater system in the Thames region? What's good/bad about it? Why? Probe their understanding and level of interest and whether they have any direct experience of issues, or have heard/read anything e.g., media reports. Do they have any views of the service, any idea of the issues/problems that may occur and why (do not provide information at this stage)?
- What challenges or issues do you think that Thames Water may face now and in the future for drainage and wastewater Probe to see if they pick up on any future challenges like growth/development, climate change, environmental improvements or existing such as pollution incidents (do not provide information). Of these challenges which do you think are the most important? Why?
- Do you have any ideas on how Thames Water should deal with these challenges? Probe to see if there are any initial ideas, if not move on

Overview of drainage and wastewater	15 mins (25-30)

- We are now going to talk a little more about how the drainage and wastewater systems work
- There are two types of system - Showcard 1 – schematic of combined and separate systems
    - In a separate system wastewater is collected and transported in wastewater sewers to a wastewater treatment works. Rainfall and runoff from roofs, hard surfaces and roads are collected and transported in a separate network of pipes – the surface water system – and the water is returned directly into the rivers without any treatment.
    - In a combined system rainwater and runoff is collected and transported together in the same pipes with the wastewater. At times of high rainfall, the flows in this combined sewer system can increase so much that it becomes full. To prevent the wastewater from backing up and flooding properties or streets, there are overflows on the sewer system which act as relief valves allowing the weak wastewater to be released to the river. These are called combined sewer overflows. Showcard 2 – dynamic illustration of CSO operating at times of high rainfall with higher river levels.
    - In some places there are underground tanks built into the sewer system which store this wastewater and rainfall to help prevent flooding and reduce the amount of weak wastewater released into the river. The overflows may also have fine mesh screens to stop larger items like wipes, cotton buds and sanitary products going into the environment
- What do you think about how the drainage and wastewater system is designed to work? Probe briefly if they understand the difference between combined and separate and whether they pick up on the impact of any sewer overflows into the environment.
    - How do you feel about combined storm overflows? Probe whether they think overflows are acceptable or not and why, whether they understand that any spills from combined storm overflows include wastewater and the potential impacts.
    - Have you heard or seen reports in the media recently about these storm overflows? Probe to see if they have picked up on any recent media coverage and if this has influenced their views.
    - What do you think would happen if we didn't have combined sewer storm overflows? Probe if they realise that there would be wastewater flooding and environmental pollution if not.
- What do you think can go wrong with drainage and wastewater system?
    - What are the impacts? Probe whether they identify flooding, pollution, environmental impacts from treatment process.
    - What do you think may cause these impacts? Probe whether they can identify both operational issues – blockages, pump failures etc – and longer-term issues such as population growth, changing weather patterns, and people putting the wrong things into sewers
    - Probe if they think about their immediate environment only, or consider the whole system from drain to the wastewater treatment works discharge.
- Showcard 3 –causes of sewer problems. Problems with the drainage system can be caused in three different ways – blockages caused by fat and items like wipes, condoms, cotton buds that have been flushed down the drain – problems with the pipes such as sewers collapsing because they are old or damaged, or pumps failing to work or becoming blocked – or when there is a period of heavy rain and there is more runoff than the pipes can take away. Check understanding.

- I'm now going to show you the potential impacts when the drainage and wastewater systems don't work correctly.
- These problems can cause wastewater flooding – if necessary, make it clear that we are only considering flooding from sewers and drains, not river flooding. Wastewater flooding may be inside or outside Showcard 4
    - After long periods of rainfall, rainwater and runoff can completely fill up the sewers and the water does not drain away quickly enough.
    - Wastewater from sewers may flood out of manholes, and run down the street or enter gardens – this is outside flooding
    - This flooding from overflowing manholes may also enter properties through doors or cellars or customers may be unable to flush the toilet, have a bath or shower, or allow any water to go down drains or sinks. If they do so, they risk having wastewater from sewers enter their homes.
    - This can last for hours, days or even weeks – depending on the level of rainfall.
    - What do you think about this? Were you aware that wastewater flooding can occur? Probe their understanding of what sewer flooding is and the differences with flooding from rivers (contaminants), and views on how significant an issue it is.
- Instead of wastewater flooding, blockages, problems with pipes or heavy rain may cause wastewater to be released into rivers from storm or emergency overflows. The impact on the river depends on how much wastewater is discharged and how weak it is, what other contaminants are in it such as litter, trace chemicals, and how much flow there is in the river or stream to dilute the wastewater.
    - What do you think about this? Were you aware that this can occur? Probe their understanding and previous knowledge. Is this a concern for them, why?
    - Are there any places where you think this is worse? Probe to see if they think it's worse in amenity areas, close to where people visit etc What about at different times of year? Probe to see if they flag anything like amenity use/access increases in summer
- Wastewater flows are transported through the wastewater system to a treatment works which treats the wastewater to the standards set by the Environment Agency that make sure that the treated wastewater can be returned safely to the environment. Do you have any thoughts or concerns about this? Check their understanding and any concerns e.g., impact on the rivers, odour, whether they think treatment levels are high enough quality etc?

What do you want from your drainage and wastewater service in future	15-20 mins (45)

- In these sessions we want to explore your views on how Thames Water manages drainage and wastewater services in the future. Previously each water company has planned how they will manage their wastewater service in five-year blocks when customer prices are set. But water companies are now working with other stakeholders to form more joined-up drainage and wastewater long term plans. Given it can take a long time to plan new infrastructure, these plans are looking at how Thames Water should manage and invest in drainage and wastewater services over the next 25 years.
- At the start of the session, we asked you about your views on what is good and bad about the drainage and wastewater systems in the Thames region, what you thought were the challenges and issues, and ideas for how to deal with them. Now that we've shared a bit more detailed information about how the system works and what could happen, we'd like to explore your views a bit further.

  - What do you think Thames Water should focus on when developing their 25-year plan for drainage and wastewater? What challenges do you think they will have to deal with/plan for? Probe for issues/problems that they think should be addressed/prevented, what the challenges are e.g., climate change, and any priorities
  - What factors do you think Thames Water should take into account when deciding how to address them? Probe if there are certain factors that are the most important.
  - Any views on how you think the plans for drainage and wastewater should be carried out? Probe if they think it's just Thames Water's responsibility or other stakeholders should be involved and how.

- These challenges mean that, unless Thames Water plans ahead and invests in the wastewater system, sewer flooding may increase, discharges from combined storm overflows may happen more often putting more wastewater into the rivers, and the treatment works may not be able to treat all the wastewater. We want to explore what you think should be Thames Water's priorities when developing their future investment plans
- Showcard 5 - We have identified several different themes that Thames Water could consider when planning for drainage and wastewater for the 25 year plan.
  - Voting Exercise: Assume you are Thames Water, which 5 factors do you think are the most important for you to focus on when developing the plan – 5 ticks each
  - Although everything is important, which 3 factors do you think you would focus on/spend the least time thinking about? – 3 crosses each
  - Probe reasons for priorities, any surprises, different views, if anything has changed recently
- Thames Water have worked with stakeholders to identify the three most pressing challenges – these have been agreed as population growth, changes in weather patterns due to climate change, and the impact of urban creep and misconnections.
  - We explained urban creep and misconnections in the pre-reading. Does everyone understand the issue or are there any questions? If required - 'Urban creep' is the term used to describe where green areas have been paved over with materials that don't naturally drain, leading to more rainwater entering the drainage and wastewater sewer system and filling it up. Often linked to urban creep is the problem of properties with rainwater and runoff misconnections, where rainwater pipes such as downpipes from roofs go into the wastewater sewer rather than the separate surface water pipes. This takes up capacity within the wastewater sewer network and can cause spillages of untreated sewage into the rivers.
  - How do you think these issues can impact on the drainage and wastewater system? Probe whether they understand that the main impact is that flows into the sewers will increase causing more sewer flooding and increasing the frequency and amount discharged from storm overflows

How do we solve the challenges	70 mins (115)

- In developing the Drainage and Wastewater Management Plan, Thames Water have identified different options that could be used. We would like to get your views on these options.
- We have grouped the options into three categories and will consider each group of options in turn. For each option we will show you a brief summary of the option, some pros and cons, and whether it is currently used. The summary also shows the relative cost and how much the option could contribute towards solving problems such as wastewater flooding, wastewater releases to the rivers in storm and wastewater treatment in future – categorised from very low to very high

- Options showcards – work through one set of options at a time. Sets are:
    - Reducing the amount of wastewater in the wastewater sewer system (6 options)
    - Managing the wastewater sewer system efficiently (5 options)
    - Managing wastewater treatment efficiently (5 options)

  Sets will be rotated between groups, and the order of options within each set changed in case "option fatigue" sets in. Set titles are for internal use only

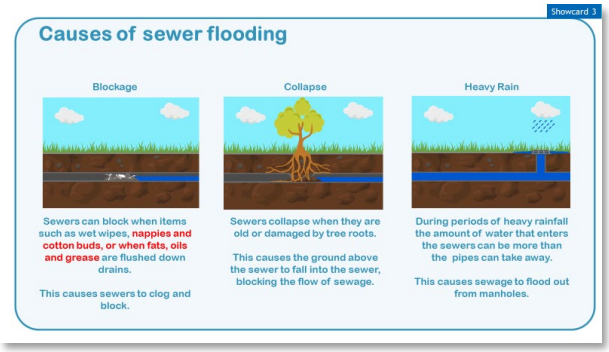
- For each option: Please read the showcard and then vote:
    - Voting Exercise
        - Green – option is acceptable
        - Amber – option is only acceptable in some cases/situations
        - Red – option is not acceptable
    - Probe reasons for votes, what they like/dislike and why. If any voted red or amber, what would need to change to make them vote green?
    - Any there any specific risks/issues that concern you about this option? Note: c. 4mins per option
- Once the set of options have been reviewed individually:
    - Voting Exercise - Now that you have considered all of the options in this set of options, we'd like you to vote:
        - Please use the cross to select the <u>one</u> option of the set that you would least like to see Thames Water using
        - Then select the option that you think is the best option – use the tick
    - Probe reasons for votes, differences
- Once all three sets of options have been completed – Now that you have reviewed all the different types of options, we'd like you to consider your overall preferences. Are there any types of solutions that you prefer and think that Thames Water should prioritise for the plan? Probe if there is a strong preference for any types of solution, or any consistent factors that put them off an option etc.

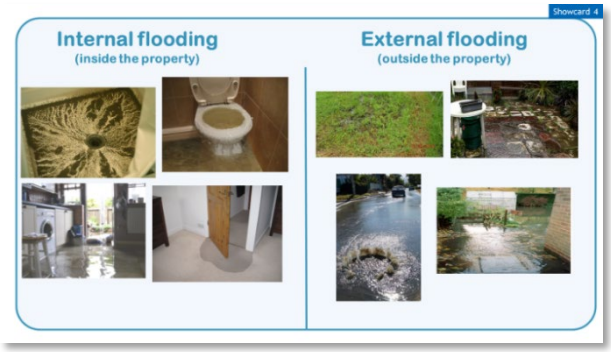
End of session	**<5 mins (120)**

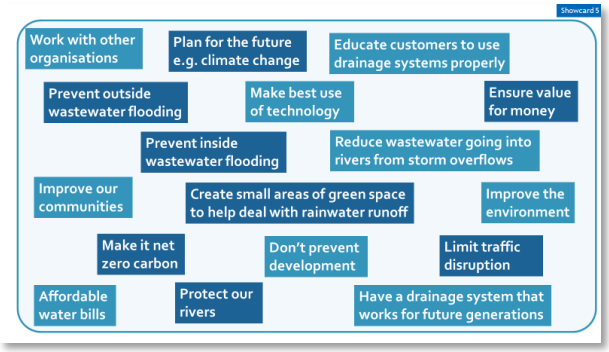
- We've covered a lot today, are there any final comments?
- We are nearly done for today.
    - Polls on how the sessions went
    - As polls completed, explain how the results will be used
- Finally, are there any final comments?
- Thank and close.

Example Showcards

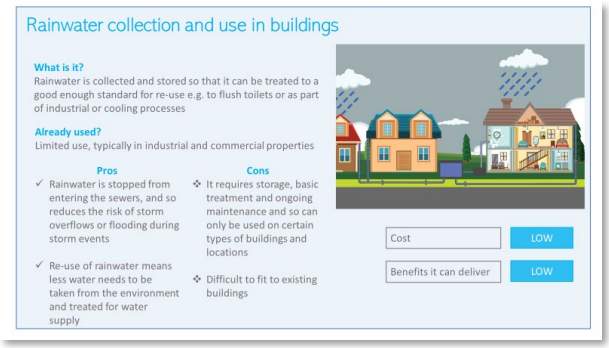
General showcards

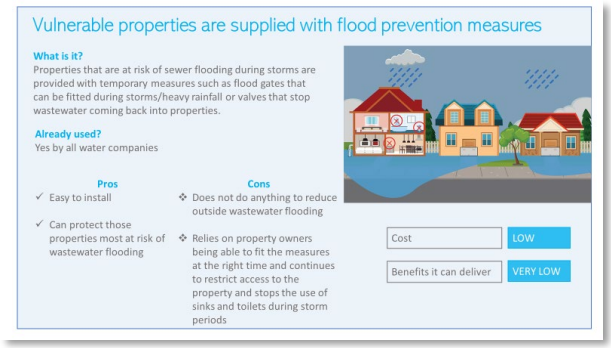


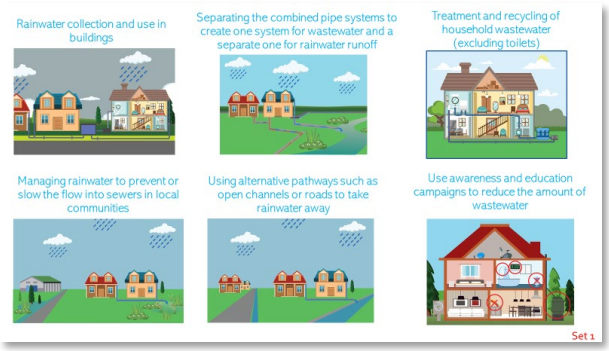


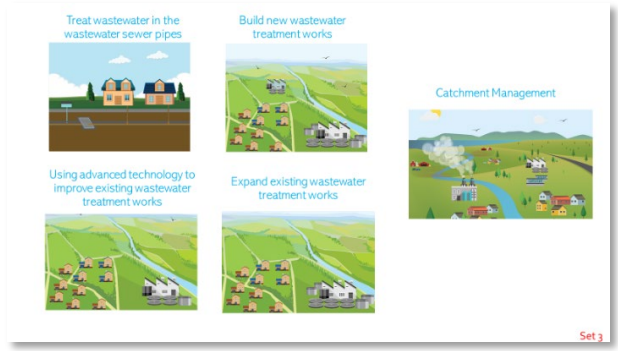


Option showcards









Customer Pre-reading

Thames Water _
Pre-reading pack_fina

Appendix B: Participant profile

Approach

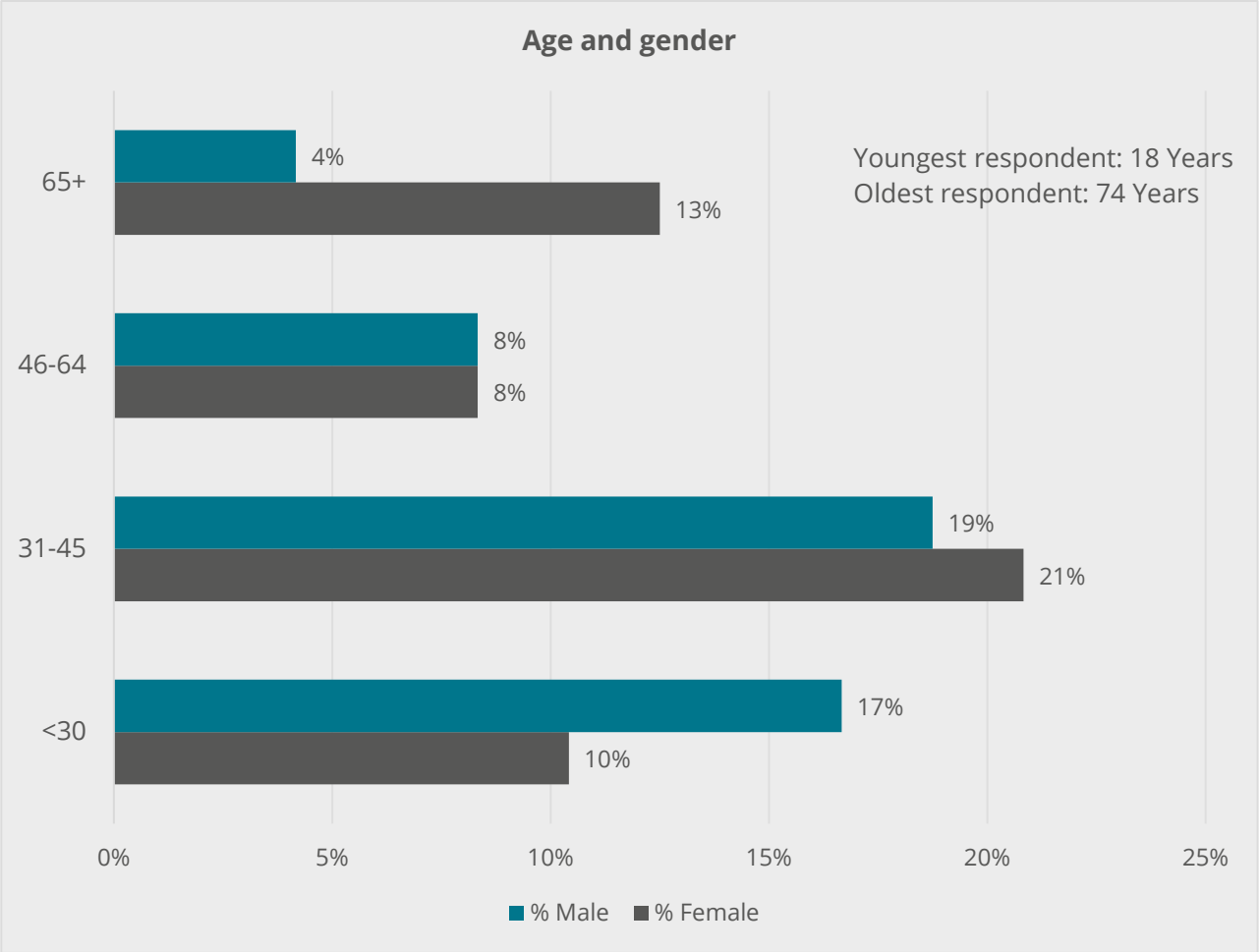
The qualitative research was implemented with six separate customer groups, with participants from across the Thames Water region taking part in the research. Customers participated in a single session. Prior to sessions participants were encouraged to reflect on the issues by completing a pre-reading task at home, which was then discussed at the start of the session.

There was good attendance for the sessions with a total of 48 customers participating. Customers in vulnerable circumstances customers were represented with 10% of participants identifying health related issues for themselves or a member of their household, and 6% reported being on the Priorities Service Register. Participants' household sizes from 1 to 6 people, providing a good coverage of home circumstances. 17 households reporting having children at home.

Participant profile

There was a slight predominance of female customers within the overall number of participants (Figure A1). In terms of age the joint lowest representation was for 65+ and 46-64 age groups, but this still made up 17% of the participants in each group.

Figure A1: Qualitative group participants by age and gender (n = 48)



The breakdown of participants by ethnic group (Figure A2) and socio-economic group (SEG) (Figure A.3) is shown below. Broadly the representation is in line with the Thames Water region.

Figure A2: Qualitative group participants by ethnicity (n = 48)

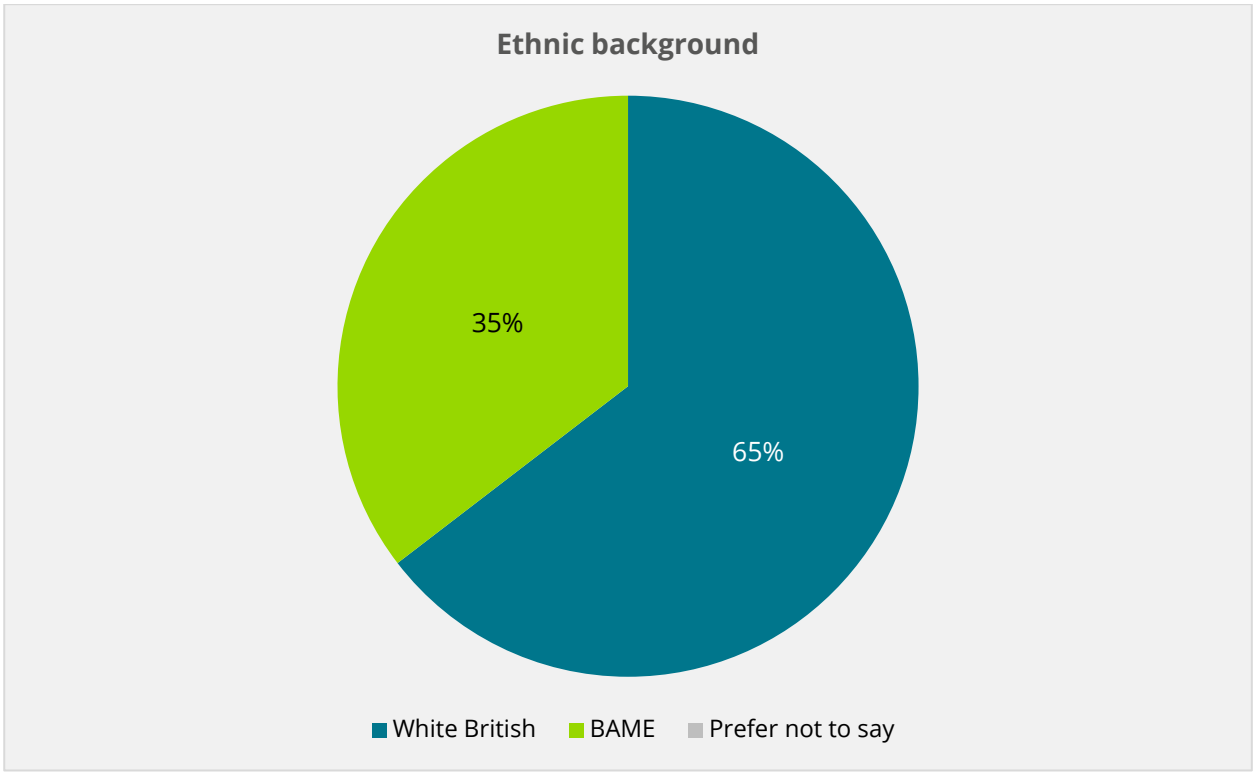
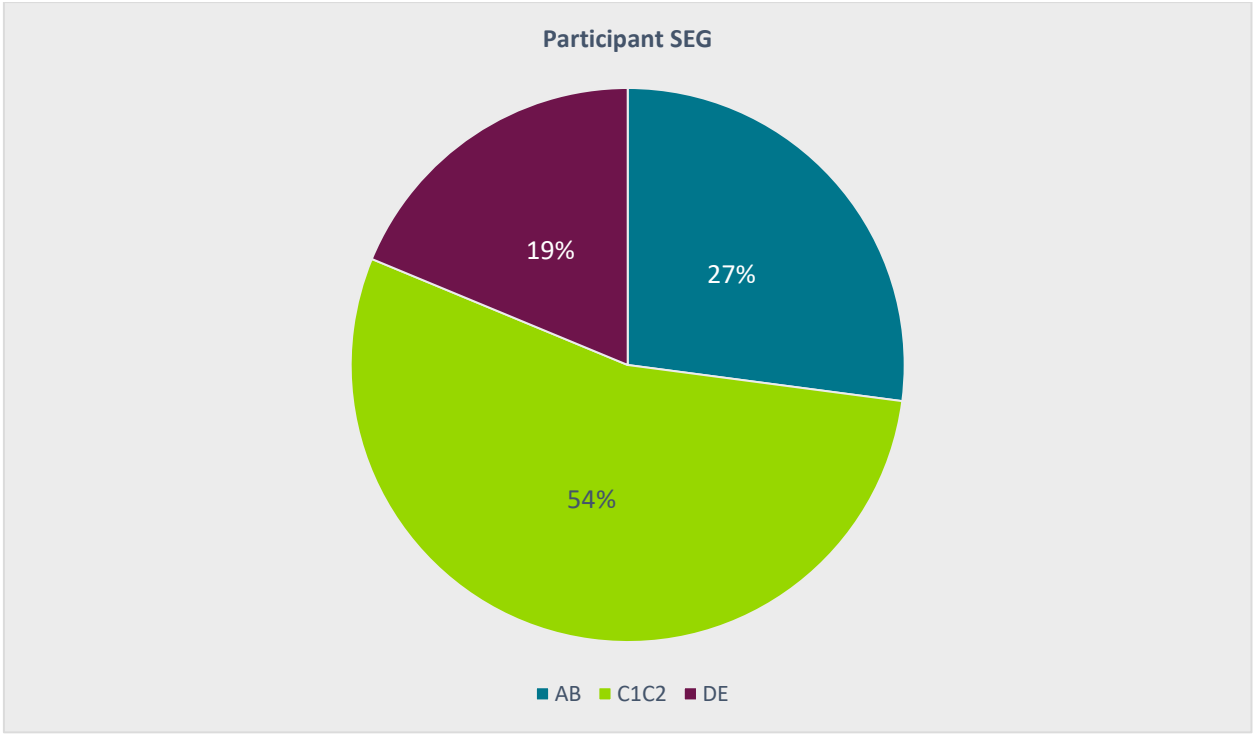


Figure A3: Qualitative group participants by socio-economic group (n=48)



Given the nature of the research, it was important that the participants experienced the range of surrounding environments experienced by Thames Water customers and represented a range of attitudes towards the environment. Figure A.4 shows that participants covered the range of geographical locations served by Thames Water, and housing circumstances.

Figure A4: Qualitative group participants – percentage by location (n = 48)

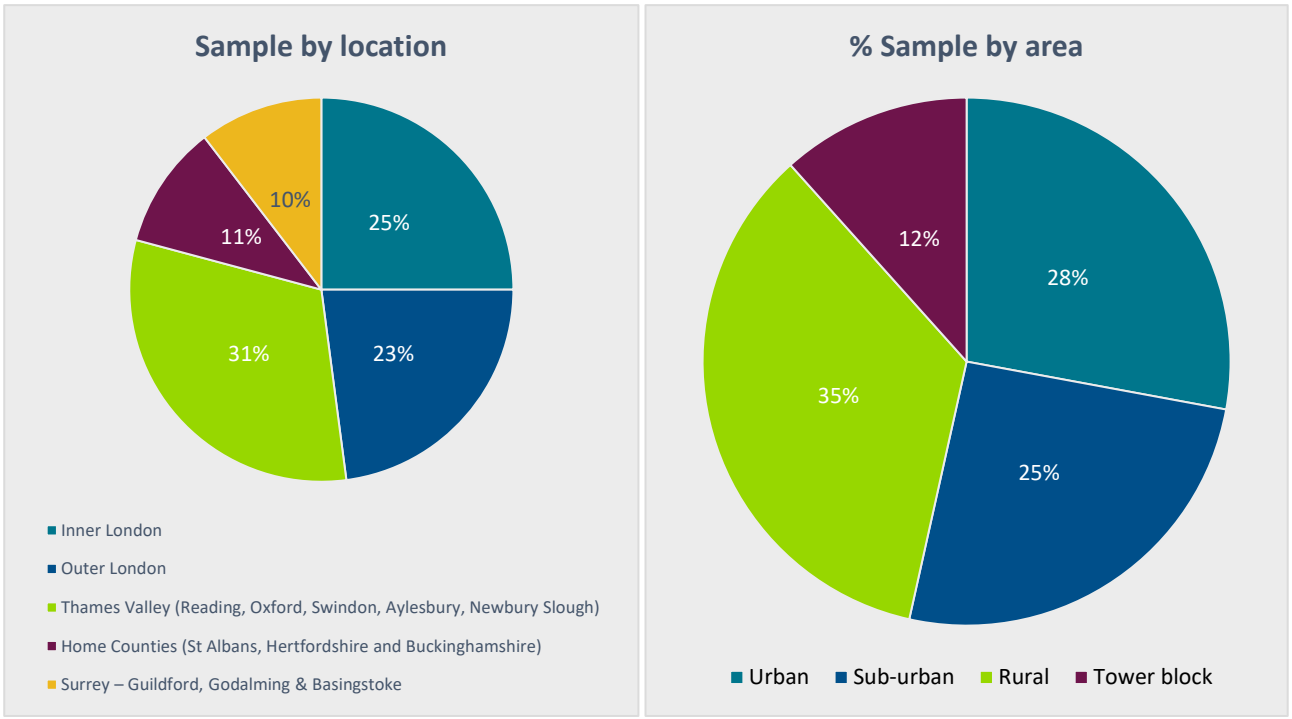
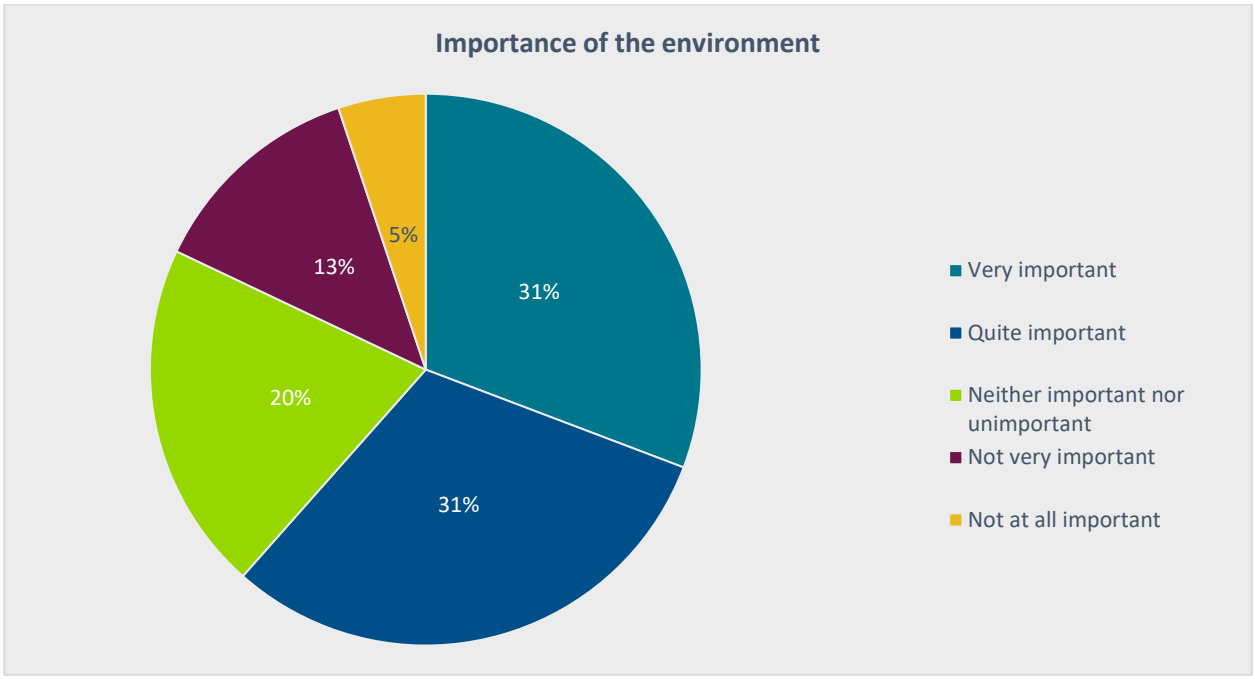


Figure A.5 indicates the participants held a range of attitudes towards the importance of the environment.

Figure A5: Qualitative group participants – importance of environment by SEG (n=39)



Appendix C: Option summary showcards

Reducing the amount of wastewater in the wastewater sewer system

Rainwater collection and use in buildings

What is it?
Rainwater is collected and stored so that it can be treated to a good enough standard for re-use e.g. to flush toilets or as part of industrial or cooling processes

Already used?
Limited use, typically in industrial and commercial properties

Pros

- ✓ Rainwater is stopped from entering the sewers, and so reduces the risk of storm overflows or flooding during storm events
- ✓ Re-use of rainwater means less water needs to be taken from the environment and treated for water supply

Cons

- ❖ It requires storage, basic treatment and ongoing maintenance and so can only be used on certain types of buildings and locations
- ❖ Difficult to fit to existing buildings

Cost	LOW
Benefits it can deliver	LOW

Treatment and recycling of household wastewater (excluding toilets)

What is it?
Recycling systems are installed in houses, industrial and commercial properties so that 'grey water' from baths/showers/sinks/washing machines is collected and treated to a good enough standard for re-use e.g. to flush toilets

Already used?
Limited use, typically in commercial properties e.g. hotels

Pros

- ✓ Reduces the amount of wastewater put into the sewer network that needs treatment and can reduce the risk of sewer flooding or storm overflows during storms
- ✓ Re-use of greywater means less water needs to be taken from the environment and treated for water supply

Cons

- ❖ Requires storage, treatment and ongoing maintenance to ensure it is recycled correctly and treatment can use quite a lot of energy
- ❖ Space required can limit use and it is difficult to fit to existing buildings

Cost	LOW
Benefits it can deliver	LOW

Managing rainwater to prevent or slow the flow into sewers in local communities

What is it?

Uses 'green infrastructure' to divert rainwater and surface water away from wastewater drains, such as:

- Green roofs that absorb and store rainfall
- Channels that send rainfall run-off to gravel/grass areas along roads or by properties
- Surfaces that let rainwater drain into the underground water table

Already used?

Yes by all water companies

Pros

- ✓ Rainwater is stopped from entering the sewers, or the flow is slowed down, reducing the risk of wastewater flooding or overflows during storms
- ✓ Helps to filter and clean surface water run-off and can create some habitat areas for wildlife

Cons

- ❖ Requires enough space for areas that rainfall and run off can drain in to and absorb it
- ❖ Requires ongoing maintenance e.g. by the local authority

Cost	MEDIUM
Benefits it can deliver	MEDIUM

Separating the combined pipe systems to create one system for wastewater and a separate one for rainwater runoff

What is it?

New pipes are built underground and the existing combined sewer system is separated. This means that sewers would take only wastewater to the treatment works, and rainwater/run-off would go into separate pipes. The rainwater does not need treatment and so can go straight into the river. Drains from properties have to be re-laid and reconnected

Already used?

Yes by all water companies

Pros

- ✓ Prevents wastewater flooding and the release of wastewater from storm overflows during storms
- ✓ Significantly reduces the amount of wastewater requiring treatment

Cons

- ❖ Involves major widespread construction which may cause disruption and noise
- ❖ If rainwater and surface water drains are connected incorrectly to the wastewater system in future, may cause pollution or wastewater flooding

Cost	VERY HIGH
Benefits it can deliver	VERY HIGH

Using alternative pathways such as open channels or roads to take rainwater away

What is it?

Rainwater and runoff is moved away from wastewater drains to where it can drain to the environment or into a dedicated surface water pipe system using 'surface water corridors' such as

- Roads/highways would be allowed to "flood" to a depth of a few centimetres;
- Open surface water channels would be built through open spaces

Already used?

Not typically used in the UK

Pros

- ✓ Prevents wastewater flooding and the release of wastewater from storm overflows during storms
- ✓ Significantly reduces the amount of wastewater requiring treatment

Cons

- ❖ Allowing surface water to flow overland at very low depths may have an impact on how we use urban spaces or roads during storms e.g. impact on pedestrians or cyclists
- ❖ Difficult to implement and needs multiple organisations to be involved

Cost	HIGH
Benefits it can deliver	VERY HIGH

Use awareness and education campaigns to reduce the amount o wastewater and contaminants in the wastewater system

What is it?

Initiatives to encourage customers and businesses to use the wastewater system correctly. For example, encouraging people to use less water and not put the wrong things down the drain (Thames Water's 'Bin It - Don't Block It campaign'), and to make sure their wastewater and surface water pipes are connected to the correct drainage system

Already used?

Yes by all water companies

Pros

- ✓ Using less water reduces the amount of wastewater in the wastewater network and needing treatment
- ✓ Prevents blockages caused by fat and sewage litter (e.g. cotton buds, wet wipes) and prevents sewage litter being released into rivers during storms

Cons

- ❖ Requires customers to change behaviours and maintain these changes over time
- ❖ Requires a large number of customers to reduce their water use to make a significant difference

Cost	LOW
Benefits it can deliver	LOW

Managing the wastewater sewer system efficiently

Vulnerable properties are supplied with flood prevention measures

What is it?
Properties that are at risk of sewer flooding during storms are provided with temporary measures such as flood gates that can be fitted during storms/heavy rainfall or valves that stop wastewater coming back into properties.

Already used?
Yes by all water companies

Pros
- ✓ Easy to install
- ✓ Can protect those properties most at risk of wastewater flooding

Cons
- ❖ Does not do anything to reduce outside wastewater flooding
- ❖ Relies on property owners being able to fit the measures at the right time and continues to restrict access to the property and stops the use of sinks and toilets during storm periods

Cost	LOW
Benefits it can deliver	VERY LOW

Use of monitors and real time data to control wastewater in the sewer network

What is it?
Use technology more to increase automation of the current system and actively control the wastewater flowing through the network e.g. temporarily hold back wastewater in one area if another part of the system is full

Already used?
Not typically used in the UK currently

Pros
- ✓ Offers the opportunity to maximise the use of the existing wastewater sewer network
- ✓ If flows of wastewater are managed, it can be better dealt with at the wastewater treatment works

Cons
- ❖ Holding back flows may increase the risk of flooding or storm overflows in a different area e.g. if technology fails
- ❖ Has not yet been proven on the larger scale required

Cost	LOW
Benefits it can deliver	LOW

Increasing the capacity of the existing wastewater sewer system

What is it?
The capacity of the existing sewer systems is increased by building storm water tanks/tunnels or replacing the existing sewers with larger pipes. This would allow the current system to hold and transport more wastewater and rainfall/runoff.

Already used?
Yes by all water companies

Pros

- ✓ Increased capacity reduces the risk of wastewater flooding and the amount of wastewater released from storm overflows
- ✓ Known solution which is well understood and benefits can be reliably predicted

Cons

- ❖ Involves major construction which may cause disruption and noise
- ❖ Limit on how much the capacity of the system can be increased by, e.g. due to limits on the space available underground

Cost	HIGH
Benefits it can deliver	HIGH

Re-lining existing sewers

What is it?
In some places where the underground water levels are high, the underground water can seep through any pipe joints or cracks in the pipes. The pipes are re-lined to stop this underground water getting into the wastewater pipe system.

Already used?
Yes by all water companies

Pros

- ✓ Reducing the amount of underground water getting into the pipes frees up capacity and reduces the risk of wastewater flooding and the amount of wastewater released from storm overflows
- ✓ Reduces the amount of wastewater requiring treatment

Cons

- ❖ Have to re-line long lengths of the pipe which may cause disruption and noise
- ❖ Benefits are limited as the amount of rainfall and runoff during storms is higher than the amount of groundwater getting into pipes

Cost	MEDIUM
Benefits it can deliver	MEDIUM

Building new wastewater sewers and tunnels to connect different areas

What is it?

Building large new sewers and tunnels that connect different wastewater pipe systems in to a closed system. These will allow wastewater to be moved between different areas during storms to balance the amount of wastewater and stop an area being overwhelmed.

Already used?

Not typically used in the UK currently

Pros

- ✓ Moving wastewater between different areas can reduce the risk of wastewater flooding and the the amount of wastewater released from storm overflows
- ✓ Known solution which is well understood and benefits can be reliably predicted

Cons

- ❖ Involves major widespread construction which may cause disruption and noise
- ❖ Limit on how much the different wastewater pipe systems can be connected, e.g. due to limits on the space available underground, or distance between different pipe systems

Cost	VERY HIGH
Benefits it can deliver	HIGH

Managing wastewater treatment efficiently

Treat wastewater in the wastewater sewer pipes

What is it?

Treating the wastewater within the sewer network to reduce the amount of pollutants so that it only needs a small amount of treatment at a wastewater treatment works, or may go from the wastewater pipe system straight to the river.

Already used?

- Screening, which removes large objects such as wet wipes and cotton buds, is currently the only in-sewer treatment in widespread use.
- Other technologies are under development

Pros

- ✓ Reduces the impact of the wastewater released from storm overflows on the rivers
- ✓ May free up capacity in the wastewater treatment works

Cons

- ❖ Does not reduce the risk of wastewater flooding
- ❖ Apart from screening not typically used in the UK and the technology needs further investigations and trials

Cost	TBC after trials
Benefits it can deliver	TBC after trials

Using advanced technology to improve existing wastewater treatment works

What is it?
Using advanced technology at wastewater treatment works to increase automation and improve the treatment processes so that more wastewater can be treated

Already used?
Yes by all water companies

Pros	Cons
✓ Enables existing wastewater treatment works to treat the extra wastewater from population growth	❖ May impact on neighbouring communities due to increase in noise or bigger buildings/plant etc
✓ Opportunity to maximise the use of existing wastewater treatment works	❖ Limit on how much extra wastewater can be treated by using advanced technology

Cost	MEDIUM
Benefits it can deliver	MEDIUM

Expand existing wastewater treatment works

What is it?
Build additional or larger treatment processes on an existing wastewater treatment works to increase capacity so that additional wastewater from population growth can be treated.
This may require additional land to be purchased.

Already used?
Yes by all water companies

Pros	Cons
✓ Enables existing wastewater treatment works to treat the extra wastewater from population growth	❖ May impact on neighbouring communities as treatment processes move closer to them
✓ Opportunity to maximise the use of existing wastewater treatment works	❖ Building on new land may have detrimental impacts on the environment that need to be carefully considered during construction

Cost	HIGH
Benefits it can deliver	HIGH

Build new wastewater treatment work

What is it?

Build additional (potentially larger) wastewater treatment works on new sites and divert wastewater pipes to the new site. The new treatment works allow additional wastewater from population growth to be treated and may include tanks and treatment to deal with rainwater and runoff during storms.

Already used?

Yes by all water companies

Pros

- ✓ Enables the extra wastewater from population growth to be treated
- ✓ Can reduce the risk of wastewater flooding and the amount of wastewater released from storm overflows by providing additional capacity

Cons

- ❖ New sites may impact on neighbouring communities during construction and in the longer term e.g. traffic, noise, odour
- ❖ Difficult to find enough land in urban areas and building on new land may have detrimental impacts on the environment that need to be carefully considered

Cost	VERY HIGH
Benefits it can deliver	VERY HIGH

Catchment Management

What is it?

Thames Water work with other organisations and stakeholders to prevent and/or treat sources of pollution entering either rivers or the wastewater sewer network so that the overall impact on the environment is reduced. Sources of pollution may be from many different places e.g. run-off from agricultural land or contaminated surfaces, or individual sources e.g. waste from a factory that goes into the wastewater sewer system

Already used?

Not widely used by UK Water Companies for wastewater and drainage issues

Pros

- ✓ Reduces the impact on the rivers and environment from other sources of pollution
- ✓ May reduce the amount of wastewater in sewers during storms by slowing surface run-off e.g. by planting vegetation

Cons

- ❖ Difficult to implement and multiple organisations and individuals have to work together
- ❖ Sorting out how to pay for improvements could be complex eg. if Thames Water makes improvements to land/property it doesn't own, or the organisations have to pay for it themselves

Cost	LOW
Benefits it can deliver	LOW

Part 2 Quantitative Research

Summary

Introduction

Drainage and wastewater services in the Thames Water region face many different challenges now and continuing into the future from changing climate, changing weather patterns, population growth, and growing demand for environmental protection. To meet these challenges, Thames Water, is working in partnership with stakeholders to develop a long-term plan - the Drainage and Wastewater Management Plan (DWMP) - to ensure a resilient and sustainable wastewater service for the next 25 years for London and the Thames Valley region.

The overall purpose of the customer research for Thames Water's Drainage and Wastewater Management Plan (DWMP) is to develop the evidence base on customer preferences and priorities to support long-term drainage and wastewater management planning. This report summarises the findings from quantitative research conducted with household and non-household customers to understand their priorities for the DWMP planning objectives and outcomes, as represented by the programme appraisal "value criteria".

The research was implemented through a representative online survey of the Thames Water wastewater customer base, with 400 household respondents and 150 non-household respondents completing the survey. A choice modelling approach was used to estimate preference weights for 14 value criteria "attributes" that presented non-technical descriptions of the DWMP planning objectives and outcomes (Box S.1).

Box S.1: Value criteria attributes

Label	Value criteria attribute*
GREEN	Amenity / wellbeing (create more green space)
1IN50	Reduce risk of wastewater flooding due to extreme wet weather
INT	Reduce the number of properties affected by internal flooding from sewers
EXT	Reduce the number of properties affected by external flooding from sewers
SURFW	Reduce the amount of rainfall entering the wastewater system
RIVER	Continue to meet environmental standards for rivers
STORM	Reduce number of storm overflows from the wastewater system
CARBON	Net zero carbon impact
ENV	Maximise positive environmental impact
PI	Reduce number of pollution incidents
MISC	Fix wastewater misconnections
ASSET	Inspect and maintain pipes to reduce number of sewer collapses
COLLAB	Work with other organisations that are responsible for drainage
COST	Deliver the plan at an affordable cost

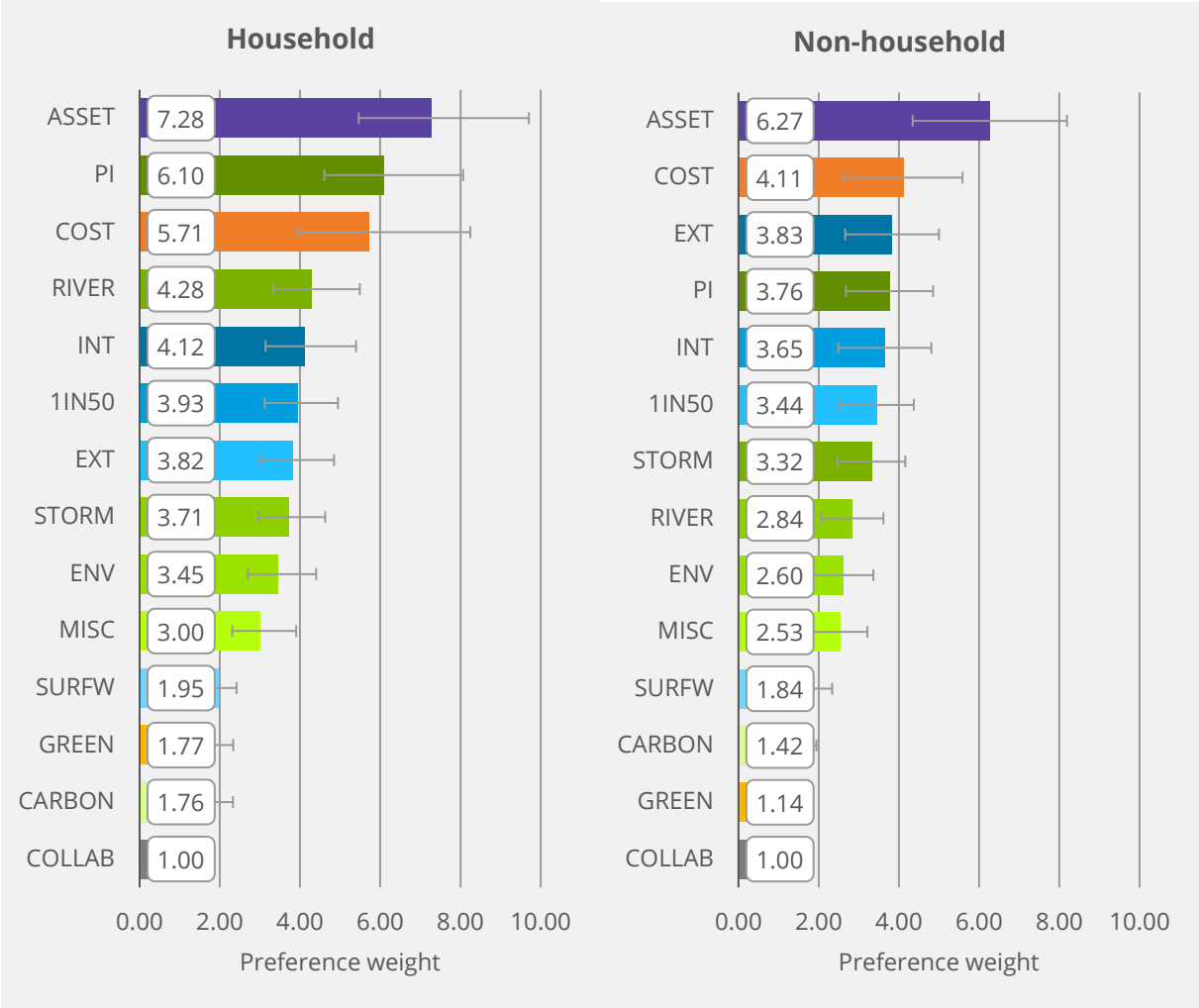
*See Main Report for DWMP value criteria (Section 1.3) and full description of value criteria attributes provided to respondents (Section 2.2).

The survey structure and content was developed through an iterative test-re-test process, via a series of one-to-one cognitive interviews carried out with respondents in three waves. The survey content was also reviewed by Thames Water technical experts and the Atkins DWMP investment modelling team along with representatives from the Customer Challenge Group (CCG) and CCWater. This included feedback on the background explanation about the DWMP process, terminology and language used, the descriptions of value criteria, and providing wider context for the value criteria to help respondents better consider relative priorities.

Main findings

Figure S.1 reports the customer preference weights for the household and non-household samples. These can be interpreted a measure of the level of importance placed on different outcomes and objectives for the wastewater system and drainage.

Figure S.1: Customer preference weights for DWMP value criteria attributes



Whilst each value criterion was found to be a material consideration for customers for the long-term plan for the wastewater system and drainage, there was a clear priority ordering as indicated by the preference weights reported in Figure S.1:

- **Top priorities**: to ensure that the current system is properly maintained and effective ahead of further investment to increase capacity (i.e. asset health). This is closely followed by avoiding pollution incidents (consistent with the potential severity of impact on rivers and wildlife) and cost (impact on customer bills).

- **Mid-tier priorities**: to reduce flooding risks and address wider environmental quality issues, including storm overflows.

- **Lower priorities**: activities that customers see as "business as usual" across all of Thames Water's service areas – rather than exclusive to the DWMP - including net zero carbon and collaborative working.

Overall, there was a good level of consistency in the results for household and non-household respondents, with the main observed difference being the slightly higher level of importance placed on reducing flooding outcomes by non-household respondents. More broadly, though, the composition of the top ranked, mid-ranked, and lowest set of priorities is aligned across both sets of customers. Supplemental analysis was carried out for the household sample to examine customer priorities by region, socio-economic group and vulnerability indicators. Findings for these segments were in line with the main results.

Conclusions

Results from this study are primarily an input to the programme appraisal phase of the DWMP, where the purpose is to compare performance of alternative candidate plans as part of the process of developing a preferred plan. The customer preference weights are judged to be "fit for purpose" for this use and they provide a concise-customer metric that can applied alongside the technical assessments underpinning the programme appraisal. As stated above, the main findings from the quantitative research can be summarised into three levels of priority. The top priority being to ensure that the current system is maintained and effective. This is followed by the avoidance of pollution incidents and their impacts on rivers and wildlife along with the bill impact to customers. The mid-tier priorities are to reduce flooding risks and address wider environmental quality issues. The lowest priorities are activities that customers see as "business as usual" across all service areas; these include net zero carbon and collaborative working.

1.Introduction

1.1 Background

Thames Water is leading the development of the Drainage and Wastewater Management Plan (DWMP) for London and the Thames Valley region. The DWMP is a long-term costed plan, focused on partnership working, with the aim to identify the future risks and pressures for drainage and wastewater treatment systems and develop integrated solutions to address them. Thames Water are currently developing their first DWMP, based on the nationally agreed framework[4].

Thames Water have completed the strategic context stage of the planning process and identified nine future pressures that will impact on the first DWMP. Three have been prioritised for the first plan based on stakeholder feedback: climate change; population growth; urban creep and misconnections.

There is limited industry guidance on how customer research should inform the development of the DWMP. Overall, a combination of qualitative and quantitative customer evidence is required by Thames Water to support the development of the DWMP, with the purpose of: (a) testing the planning objectives that have been proposed in the initial stages of the planning process; and (b) incorporating customer preferences into the programme appraisal stage of the plan development process.

1.2 Research aims

The main customer research questions and evidence needs for this stage of development of the DWMP are:

Research question	***Requirement***
A. What do customers want from their drainage and wastewater service over next 25 years?	Qualitative insight on customer needs and behaviour in context of long-term plan – to support the overall strategic context for the DWMP.
B. What are customers' preferences for the types of solutions that can be used to address long term challenges - are any solutions unacceptable to them and why?	Qualitative insight to understand level of customer support for the main types of solutions (e.g., "preferred"; "acceptable"; "unacceptable") – to support the options development stage of the plan.
C. What are customers' priorities (weight/ranking) for the "value criteria" that will be used to balance the plan?	Quantitative evidence (preference weights) - to input to the programme appraisal to help compare performance of alternative candidate plans.
D. What is the "preferred" plan for customers in terms of the trade-off between planning objectives (value criteria) and affordability?	Quantitative evidence (level of customer support) for a candidate plan / set of candidate plans – input to programme appraisal to help identify the "preferred" plan from a customer perspective.

A three-part approach for customer research has been set out to address these research questions and support the development of the DWMP:

[4] See: https://www.water.org.uk/policy-topics/managing-sewage-and-drainage/drainage-and-wastewater-management-plans/

- **Evidence review**: an initial desk-based exercise to provide a rapid review of the PR19 customer evidence base. This focused the planning objectives (value criteria) and the extent to which customer weights can be specified from existing results.

- **Qualitative research**: conducted with household customers of Thames Water to serve as a scene-setting and "priming" exercise with customers to explore their needs and views on solutions (Research Questions A and B).

- **Quantitative research**: a representative survey of customers in the Thames Water region to quantitively provide customer preference weights for the planning objectives (value criteria) (Research Question C) to inform the investment modelling underpinning the development of the DWMP.

Research Question D will be addressed by Thames Water in latter stages of the DWMP development process, once a candidate plan or set of candidate plans have been determined from the programme appraisal stage.

This Part of the report summarises the **quantitative research** results. Part 1 documents the findings from the qualitative research. Findings from the evidence review are summarised in Appendix 1..

1.3 Scope of quantitative research

The purpose of the quantitative research was to quantify customers' priorities for the DWMP planning objectives and outcomes, as represented by the programme appraisal "value criteria". The value criteria – as specified by Thames Water for the DWMP investment model – are listed in Table 1.1.

Table 1.1: DWMP investment model value criteria (planning objectives)

Planning theme	Value criteria	Measure (investment model)
Communities	Wellbeing	Amenity opportunities
Flooding	Properties at risk in extreme storms (1 in 50)	Percentage properties at risk of flooding in 1 in 50 storm
	Reduce internal property flooding	No. of properties at risk of internal flooding due to hydraulic incapacity in 1 in 30 storms
	Reduce external property flooding	No. of properties at risk of external flooding due to hydraulic incapacity in 1 in 30 storms
	Reduce surface water runoff into a combined water system	*Not specified*
Environment	Dry weather flow (DWF) compliance	No. of days of failure predicted due to growth
	STW quality compliance	No. of days of failure predicted due to growth
	Storm overflow performance	Annual average number of spills in a catchment
	Carbon neutrality	Carbon impact
	Strategic Environmental Assessment (SEA)	SEA combination score
	Natural capital value	Natural capital score

Planning theme	Value criteria	Measure (investment model)
	Risk of pollution incidents	Average of 3-year annual performance for Cat 1 to 3 pollution incidents
	Reducing misconnections	Foul to storm: quality benefit
Asset health	Sewer collapses	*Not specified*
Stakeholders	Collaboration	*Not specified*
Affordability	Cost	*Not specified*

Source: Thames Water / Atkins DWMP investment modelling team (May 2021)

A choice modelling approach was used to understand the relative importance (weight and priority) customers place on the value criteria. The main results from the research are customer preference weights that will be applied to the value criteria in the DWMP investment model. The overall survey and choice task was subject to a pre-testing phase and "soft-launch" pilot. The approach and survey materials were also shared with Thames Water technical specialists and representatives from the Customer Challenge Group (CCG) and CCWater for review and comment during the design stage.

1.4 Report structure

The remainder of this report is structured as follows:

- **Section 2** outlines the research methodology, including the survey design and testing, structure and content, and sampling approach;
- **Section 3** presents the main results, covering the household and non-household sample profiles, customer priorities for the DWMP objectives and outcomes, and respondent feedback; and
- **Section 4** summarises key findings.

The main report content is supported by six appendices:

- Appendix A: Value Criteria Mapping to PR19 Risk Framework
- Appendix B: Cognitive Testing Summary
- Appendix C: Household Survey
- Appendix D: Non-Household Survey
- Appendix E: Summary Statistics
- Appendix F: Choice Model Estimations

2. Methodology

Summary

- The quantitative research was carried out online in June 2021. The survey content was developed through an iterative test and re-test approach using one-to-one cognitive interviews.
- Two variants of the survey were developed – one for household customers and a second for non-household customers.
- The sampling strategy reflected the research objective to provide results representative of wastewater service customers in the Thames Water region.

2.1 Survey design and testing

The initial content and material for the survey was developed from a range of sources, including Thames Water's PR19 customers preferences research materials – which included quantitative studies on both sewer flooding and river environment quality topics – and relevant content from the Qualitative Research topic guide and show materials.

Cognitive interviews

The content and materials for the survey were refined iteratively through 10 one-to-one cognitive interviews carried out in three waves of testing. Feedback from the testing included comments on the scene-setting for the DWMP, the presentation of the value criteria, the instructions for the choice task exercise, along with explanations and reasons for answers. Materials were updated following each wave of interviews for further testing. Table 2.1 summarises the key learnings from the cognitive interviews. Appendix B provides a more detailed summary.

Table 2.1: Summary of findings from cognitive interviews

Aspect of survey	Findings, results, outcomes for survey content and material
Understanding of research aims	• Respondents demonstrated good understanding of the purpose of the survey and what they were being asked to do (prioritising DWMP investment areas).
Explanatory material, including language and terminology	• Respondents had limited pre-survey awareness of the scope of Thames Water's responsibilities for the wastewater system and drainage. There was also a fairly high-level understanding of the pressures faced. Various feedback helped improve the survey explanatory material (showcards and graphics) so that respondents were sufficiently informed on the DWMP planning context, including providing a clear separation between "challenges" faced (pressures) and resulting "problems" (impacts). • Some respondents did find it difficult to distinguish between a number of the value criteria – leading to revisions of the attribute showcards, particularly in terms of the graphics (icons) shown to help better differentiate the different outcomes / constraints for the plan.
Ease/difficulty of survey and choice task	• Most respondents found the survey straightforward to complete, with feedback received helping to refine the onscreen instructions for completing the choice task. Positive feedback was received on the labels used for the value criteria (clear and precise) in the choice task and the accompanying icons.
Clarity of language	• Feedback received was used to edit and improve descriptions of the value criteria (e.g. "carbon credits").
Reasons for choice task responses	• Respondents tended to prioritise value criteria (outcomes) that they could relate to personally (i.e. the disruption and upset that would be caused by flooding) or where there was a tangible impact on the environment.

Aspect of survey	Findings, results, outcomes for survey content and material
Survey presentation	• Constructive feedback was received on the survey appearance, layout and visual material. This was used to improve the survey content.

The survey structure and material were also reviewed by Thames Water technical experts and the Atkins DWMP investment modelling team along with representatives from the Customer Challenge Group (CCG) and CCWater. This included feedback on the background explanation about the DWMP process, terminology and language used, the descriptions of value criteria, and providing wider context for the value criteria to help respondents better consider relative priorities. The survey content and materials were updated in response to the comments received.

Pilot survey

The survey was pilot tested with a "soft launch" with 47 respondents to check length and time to complete and ensure that the routing of the survey and data collection were functioning correctly. No amendments to the survey were made following the soft launch but a further 94 responses were collected in a second wave to further check the choice task data and run preliminary analysis. Findings were in line with expectations and the full survey sampling was implemented.

2.2 Survey structure and content

Survey outline

The structure of the customer survey is set out in Table 2.2. The questionnaire material was developed as a single survey with household and non-household customer variants. Appendices C and D present the household and non-household customer versions, respectively.

Choice task

Customer preferences for the DWMP planning objectives (value criteria) were elicited via a best-worst scaling (BWS) choice task[5]. This is a stated preference method that is a suitable format for producing customer preference weights that can be used in investment modelling – such as the process underpinning the development of the DWMP by Thames Water.

In the choice task, respondents were asked to consider different combinations of the "factors" (the value criteria) that Thames Water are balancing in producing the DWMP. In each case respondents were presented with three of the value criteria and asked to select which factor was most important – i.e. the priority for the DWMP – and then of the remaining two, which factor was most important (Figure 2.1). Respondents answered 14 choice questions in total. A statistical experimental design was used to determine the combinations of the factors respondents saw in each choice, with the design ensuring that across the sequence of repeated choices each respondent saw each value criteria at least once.

[5] See Louviere, J.J., Flynn, T.N. and Marley, A.A.J (2015) *Best-Worst Scaling: Theory, Methods and Applications*, Cambridge University Press.

Table 2.2: Survey structure

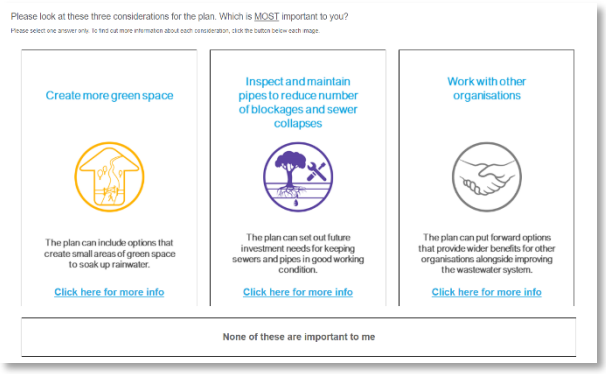
Section	Household customers	Non-household customers
Introduction	• Introduction to Thames Water, the DWMP and purpose of survey	
Section A: Respondent screening and quotas	• Respondent screening – Thames Water customer and bill payer	
	• Respondent quotas: age, gender, socio-economic group	• Respondent quotas: business activity/sector, water company
Section B: Value criteria	• Explanatory information about the wastewater system and drainage and warm-up questions on the outcomes from the plan • Value criteria • Choice task exercise (best-worst scaling with progressive choice format), including instructions • Initial follow-up questions on ease/difficulty of choices and most/least important factors (value criteria)	
Section C: Follow-ups	• Attitudes to long-term planning issues • Experience of problems with wastewater services and drainage	
Section D: Respondent profile	• Socio-economic and demographic profile (household size, employment, education etc.) • Disability, Priority Services Register (PSR)	Business profile - number of sites, turnover
Survey close	• Survey feedback • Link to additional information on PSR	• Survey feedback
	• Thank and close	

Figure 2.1 shows the onscreen appearance of the choice task exercise. The layout and appearance were developed and refined through the cognitive interviews, with respondents presented with the "label" for the factor, an accompanying icon, and short description of the plan objective – appearing onscreen as a card. Additional information on the factor was provided via the "click here for more information" link, which flipped the card over. Prior to starting the choice task, respondents were provided with a set of instructions (animated gif) that explained the: (i) the key information shown on screen for each choice; (ii) how to display the additional information for each factor); and (iii) how to select the most important factor, and then the most important factor from the remaining two.

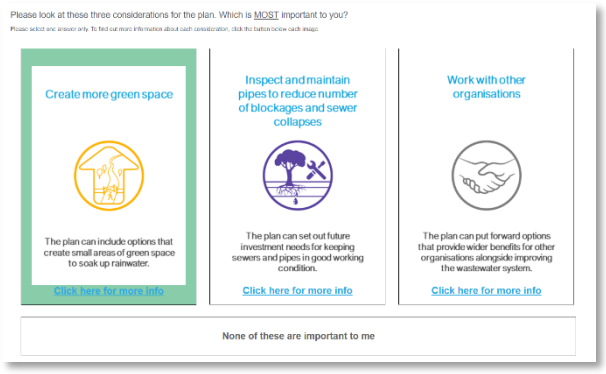
The choice task used a progressive format, asking for: (a) most important from the three factors; and then (b) most important from the two remaining factors[6]. This provides a full preference ranking for each combination of factors and across the full sample a rich dataset on the relative importance of the value criteria to support the estimation of customer preference weights (see Section 3.2).

[6] An alternative approach would be to use the conventional best-worst response format, asking respondents of the three factors shown, which was most important, and which was least important – this is also the basis of a max-diff type exercise which can also be used in quantitative research with customers. The progressive choice format was used, however, as this was judged to be easier for respondents complete, requiring them to pick the most important factor only in a given choice, rather than also requiring them to explicitly think about what was least important.

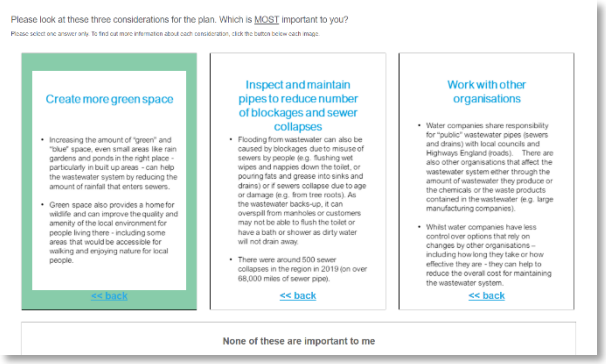
Figure 2.1: Choice task layout



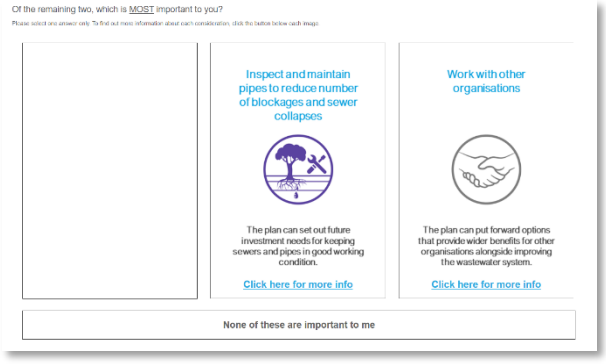
(a) Choice task onscreen appearance



(b) Selection of "most important factor"



(c) Additional information



(d) Progressive choice – most important factor from remaining two

Attributes (value criteria)

The DWMP value criteria (Table 1.1) were formulated into 14 value criteria "attributes" for the choice task (the factors for balancing the plan as described above). The main focus was to prepare non-technical descriptions of the criteria that were clear and understandable for respondents, in terms of the objective for the DWMP – whether this was an outcome (e.g. reduce number of properties impacted by sewer flooding) or a constraint (e.g. affordability). As a result, some value criteria were merged where there was considerable overlap from a customer understanding perspective – namely:

- Dry weather flow compliance and sewage treatment quality compliance – combined into "Continue to meet environmental standards for rivers"; and
- Strategic environmental assessment and natural capital value – combined into "Maximise positive environmental impact".

Table 2.3 presents the non-technical descriptions of the value criteria in terms of the: (i) attribute labels; (ii) short description of the plan objective; and (iii) additional information shown on the flip side of the attribute card in the choice task.

Table 2.3: Attribute descriptions

Value criteria	Attribute label and short description	Attribute description – additional information
Wellbeing	**Create more green space** *The plan can include options that create small areas of green space to soak up rainwater.*	Increasing the amount of "green" and "blue" space, even small areas like rain gardens and ponds in the right place - particularly in built up areas - can help the wastewater system by reducing the amount of rainfall that enters sewers. Green space also provides a home for wildlife and can improve the quality and amenity of the local environment for people living there - including some areas that would be accessible for walking and enjoying nature for local people.
Properties at risk in extreme storms (1 in 50)	**Reduce risk of wastewater flooding due to extreme wet weather** *The plan can include options that will prevent properties from being flooded by wastewater in extreme wet weather.*	Extreme wet weather (a storm with prolonged heavy rainfall) can overwhelm the wastewater system in an area, causing wastewater to overflow and flood streets, gardens, or even the inside of customers' homes. Around 10% of properties in the region are at risk from wastewater flooding due to extreme wet weather. For these properties there is about a 2% chance (1 in 50) each year that they could be flooded.
Reduce internal property flooding	**Reduce the number of properties affected by internal flooding from sewers** *The plan can include options that will fix local problems with sewers that can cause properties to be flooded with wastewater.*	Heavy rainfall can cause localised problems in the wastewater system. Due to increased population and more wastewater being collected, some sewers are no longer large enough to cope with a lot of rainwater draining into them in a short space of time. Where this is a problem wastewater can overflow and cause flooding in cellars and ground-level rooms. Around 200 properties in the region were flooded in 2019 due to overloaded sewers.
Reduce external property flooding	**Reduce the number of properties affected by external flooding from sewers** *The plan can include options that will fix local problems with sewers that can cause roads and gardens to be flooded with wastewater.*	Heavy rainfall can cause localised problems in the wastewater system. Due to increased population and more wastewater being collected, some sewers are no longer large enough to cope with a lot of rainwater draining into them in a short space of time. Where this is a problem wastewater can overflow and cause flooding in streets and gardens. Around 500 properties in the region were affected by external flooding in 2019 due to overloaded sewers.
Reduce surface water runoff into a combined wastewater system	**Reduce the amount of rainfall entering the wastewater system** *The plan can include options that reduce the amount of wastewater that is collected in sewers and needs to be treated at wastewater treatment works.*	Combined sewers make up much of the wastewater system in the region. These collect sewage from homes and businesses in the same pipes as rainwater and runoff from roofs, roads and other hard surfaces. If the amount of rainwater that enters sewers is reduced – either by slowing the flow in or directing it elsewhere - there is more capacity available in pipes. This means that it is less likely there will be problems with the wastewater system, such as flooding of roads or customers' properties, or storm overflows, or pollution incidents affecting rivers.

Value criteria	Attribute label and short description	Attribute description – additional information
Dry weather flow (DWF) Compliance STW quality Compliance	**Continue to meet environmental standards for rivers** *The plan will include the investments that will be needed – due to growing population – to maintain compliance with legal standards that protect the environment.*	The Environment Agency sets legal environmental standards to protect the health of rivers and the plants, fish and wildlife they support. This includes the levels of treatment that are needed before wastewater can be safely returned to rivers. Population growth means that over time more sewage will need to be collected, removed and treated by the wastewater system in the region before being safely returned to rivers. The capacity of sewage treatment works in the region will need to increase in order to ensure that the legal standards to treat wastewater and protect rivers and wildlife continue to be met as the population in the region increases.
Storm overflow performance	**Reduce the number of storm overflows from the wastewater system** *The plan can include options that prevent overflows into rivers when there is heavy rainfall.*	To help avoid wastewater flooding roads and people's homes and gardens, the wastewater system was designed in the past to allow storm overflows. These overflows are permitted by the Environment Agency and release wastewater into rivers when sewers are full due to heavy rain. Overflows, however, can cause harm to rivers and the plants, fish and other wildlife they support. The impact depends on how much wastewater is released, for how long, and how much it is diluted with rainwater. In 2019, there were around 9,500 overflows from 370 locations, on average lasting about 12 hours. This is about 25 overflows per location per year.
Carbon neutrality	**Net zero carbon impact** *The plan will ensure that the carbon impact is neutral by balancing the unavoidable emissions with carbon savings elsewhere.*	The water industry has committed to achieving "net-zero" carbon by 2030. This will make sure that the amount of carbon added to the atmosphere by water companies is balanced out removing the same amount. Low carbon approaches can be used to minimise the amount of carbon emitted by the plan – for example by using renewable energy as much as possible, avoiding construction or construction materials that require a lot of energy (e.g. cement). Where emissions are avoidable, they can be "offset" (balanced out) by generating renewable energy from sewage waste or by buying carbon credits created by carbon saving projects outside the water sector.
Strategic Environmental Assessment (SEA) Natural capital value	**Maximise positive environmental impact** *The plan will use options that protect and improve the local environment as much as possible.*	The options for improving the drainage and wastewater system can have a range of positive and negative environmental impacts. Positive impacts can include helping to protect plants and wildlife and creating new habitats, improving river quality, reducing risk of flooding and air pollution, and providing wider benefits for local communities (e.g. recreation sites). Negative impacts can include loss of habitats, landscape and visual impacts from construction, new buildings and infrastructure, and emissions from the operation of sites.
Risk of pollution incidents	**Reduce pollution incidents** *The plan can include options that will reduce the risk of problems in the wastewater system that can cause pollution of rivers.*	Failures in the wastewater system can result in raw sewage polluting rivers and harming the plants and wildlife they support. This could be due to sewer collapses, pumps failing, or problems at wastewater treatment works. The impact depends on how much sewage is released and how long for. In 2019, there were 325 pollution incidents in the region. Although most of these – 310 (95% of all incidents) were minor incidents that did not cause harm to the environment, there were 15 serious pollution incidents

Value criteria	Attribute label and short description	Attribute description – additional information
		(5% of all incidents) that resulted in significant harm to the environment, including death of fish and other wildlife in rivers.
Reducing misconnections	**Fix wastewater misconnections** *The plan can include options that prevent sewage entering pipes meant for surface water only.*	In some places in the wastewater system there are separate pipes for sewage (wastewater sewers) and rainfall and runoff (surface water sewers). Usually, surface water sewers release water directly to rivers without any treatment. Misconnections can mean that sewage and wastewater (e.g. from household appliances) is incorrectly sent into surface water sewers. Although the wastewater is diluted with rainwater it can still result in damage to rivers and harm to wildlife.
Asset health (sewer collapses)	**Inspect and maintain pipes to reduce number of blockages and sewer collapses** *The plan can set out future investment needs for keeping sewers and pipes in good working condition.*	Flooding from wastewater can also be caused by blockages due to misuse of sewers by people (e.g. flushing wet wipes and nappies down the toilet, or pouring fats and grease into sinks and drains) or if sewers collapse due to age or damage (e.g. from tree roots). As the wastewater backs-up, it can overspill from manholes or customers may not be able to flush the toilet or have a bath or shower as dirty water will not drain away. There were around 500 sewer collapses in the region in 2019 (on over 68,000 miles of sewer pipe).
Collaboration	**Work with other organisations** *The plan can put forward options that provide wider benefits for other organisations alongside improving the wastewater system*	Water companies share responsibility for "public" wastewater pipes (sewers and drains) with local councils and Highways England (roads). There are also other organisations that affect the wastewater system either through the amount of wastewater they produce or the chemicals or the waste products contained in the wastewater (e.g. large manufacturing companies). Whilst water companies have less control over options that rely on changes by other organisations – including how long they take or how effective they are - they can help to reduce the overall cost for maintaining the wastewater system.
Cost	**Deliver the plan at an affordable cost** *The plan will look at different combinations of investment options to see what can be delivered for different levels of change in customer bills.*	For the most part, the plan will be paid for by customers through the wastewater part of their water bills. The investment is needed for measures and investments that will increase the capacity of sewers, protection against flooding, increase capacity at wastewater treatment works, and protect the environment.

Notes: [1]Thames Water / Atkins DWMP investment modelling team (May 2021).

2.3 Sampling approach

Sampling quotas were specified in accordance with Thames Water's overall customer sampling strategy[7]. This provides guidelines for all customer research and requires quota-based samples of respondents to ensure adequate representation of the overall customer base.

Household customers

The quota criteria for household customer samples were: gender; age; and socio-economic group (SEG). The quota targets (Table 2.4) were primarily specified according to Thames Water's customer research sampling approach[8] which is based on Census data for the Thames Water region (overall population/consumers of water and wastewater services). The age profile was adjusted using more recent population estimates (ONS mid-2019 population estimates for South East and London). Note that the sampling quotas reflect the overall population profile rather than the actual bill-payer profile for the Thames Water customer base. It is recognised that the bill payer profile differs from the overall population profile and is important to note that the customer preference research surveys screen respondents for bill payers (household decision-makers). This implies that it may not be feasible to satisfy all target quotas for household customer within the main survey sampling as they do match the recruitment objectives of the research. As a result, sample weights may be applied in the analysis to account for this misalignment.

Table 2.4: Sampling quotas – household customers

Quota*		Percentage respondents (%)
Gender*	Female	51%
	Male	49%
	Total	**100%**
Age**	18-24	12%
	25-30	13%
	31-44	28%
	45-54	17%
	55-64	13%
	65+	17%
	Total	**100%**
Socio-economic group (SEG)*	SEG AB	29%
	SEG C1	33%
	SEG C2	17%
	SEG DE	21%
	Total	**100%**

Source: *Thames Water (2018) Customer research and sampling approach, September 2018; ONS population estimates for South East and London (mid-2019).

A soft quota for the household sample was specified for region to achieve an approximate representation of the London (62%) versus non-London (38%) customer base.

[8] See: Thames Water (2018) Customer research and sampling approach, September 2018

Non-household customers

For non-household respondents the specified quota criteria was for sector (primary, secondary, tertiary). The quota targets were specified according to ONS Business Activity (2019) data for the South East of England – rounded to the nearest percentage point (Table 2.7). Respondents were recruited from an online panel provider. The survey was completed by the respondent immediately following recruitment.

Table 2.5: Sampling quota - non-household customers

Sector	Online
Primary industry, such as agriculture and mining	1%
Secondary industry, such as manufacturing and construction	15%
Tertiary industry, such as retail and services	84%
Total	**100%**

Target sample sizes

The target sample sizes were 400 respondents for household customers and 150 respondents for the non-household customers. These are sufficient to ensure robust results – in terms of the precision of customer preference weight estimates (e.g. 95% confidence intervals) – for household customers, and testing for differences in the priority ranking of value criteria between household and non-household customers.

Recruitment

Both household and non-household respondents were recruited from online panel providers. The survey was completed online by the respondent immediately following recruitment.

3. Results

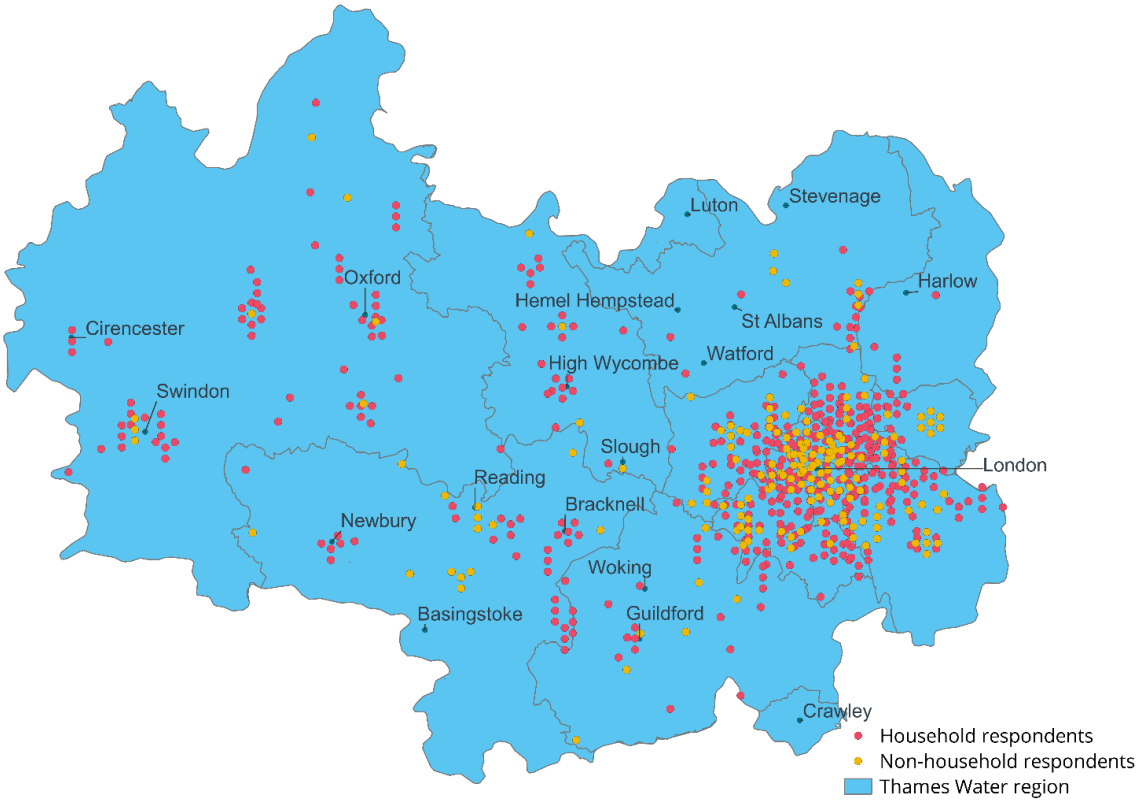
Summary of findings

- The sample profile was representative household and non-household customers in the Thames Water wastewater region.
- Relatively few household and non-household respondents had experienced issues with wastewater services. The most common problems encountered were blocked drains, inconvenience from street works, unpleasant smells, and sewage flooding in public places.
- Overall, there was a good level of consistency in the prioritisation of the DWMP value criteria by household and non-household respondents. The highest priority was placed on maintaining the current system in good working condition and avoiding pollution incidents.
- Respondent feedback on the survey was positive, indicating a high degree of engagement and understanding of the purpose.

3.1 Sample profile

Overall, 550 customers participated in the research. The sample size targets were met with 400 household respondents and 150 non-household respondents completing the survey. The average survey completion times were 15.8 minutes for the household survey and 14.2 minutes for the non-household survey. Figure 3.1 shows the geographic distribution of respondents by survey version.

Figure 3.1: Distribution of survey respondents - household and non-household



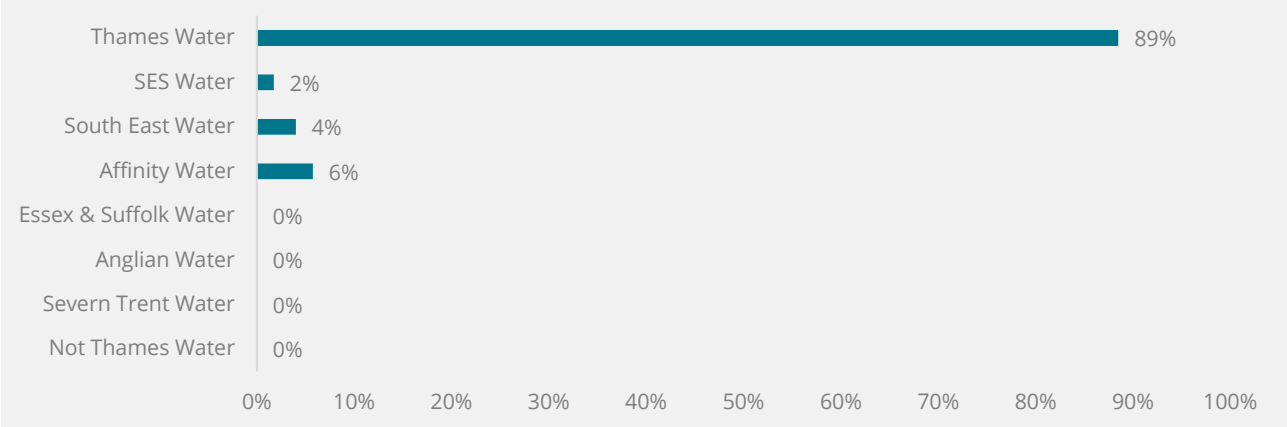
Household sample profile

The household customer version of the survey collected respondent information on socio-economic and demographic characteristics and on the experience of wastewater service issues. As detailed above, some characteristics were defined by quotas specified in accordance with Thames Water's overall customer sampling strategy to ensure a representative sample (Section 2.3). The following summary of the household sample is structured as follows: geographic profile; demographic profile; socio-economic profile; experience of wastewater service issues; and broad views on wastewater services.

Geographic profile

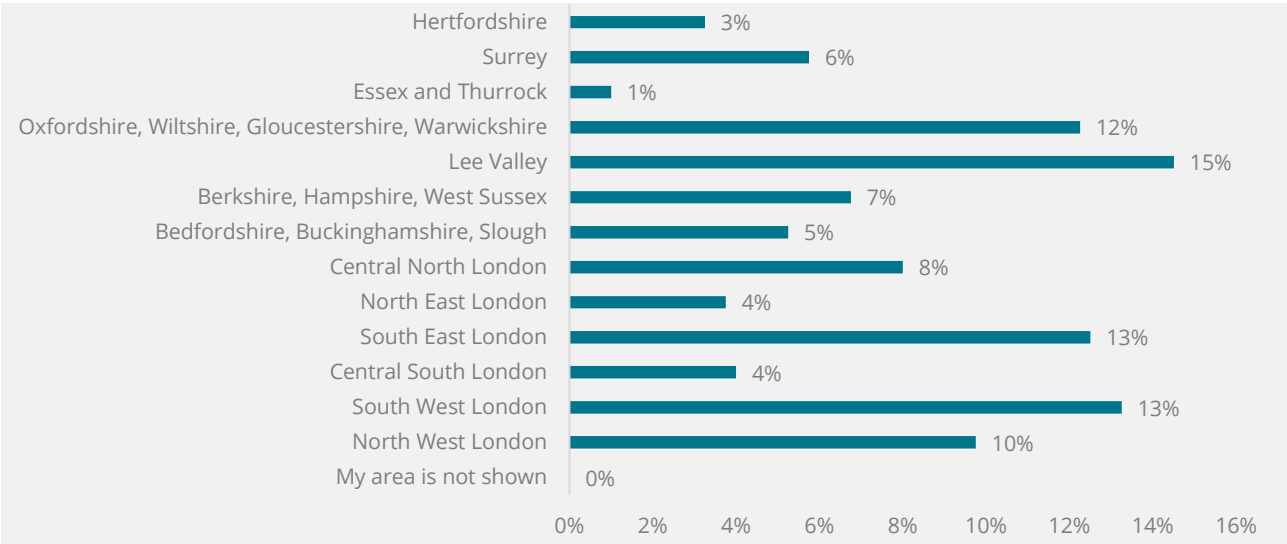
Figure 3.2 shows that the majority of the household sample were Thames Water combined water and wastewater service customers (89%), with relatively small representation of wastewater only customers.

Figure 3.2: Water services supplier (n=400)



As shown in Figure 3.3, the geographic distribution of the sample covered all the Thames Regional Flood and Coastal Committee (TRFCC) areas, with most residing in the Lee Valley (15%), followed by South West London (13%) and South East London (13%).

Figure 3.3: TRFCC area (n=400)



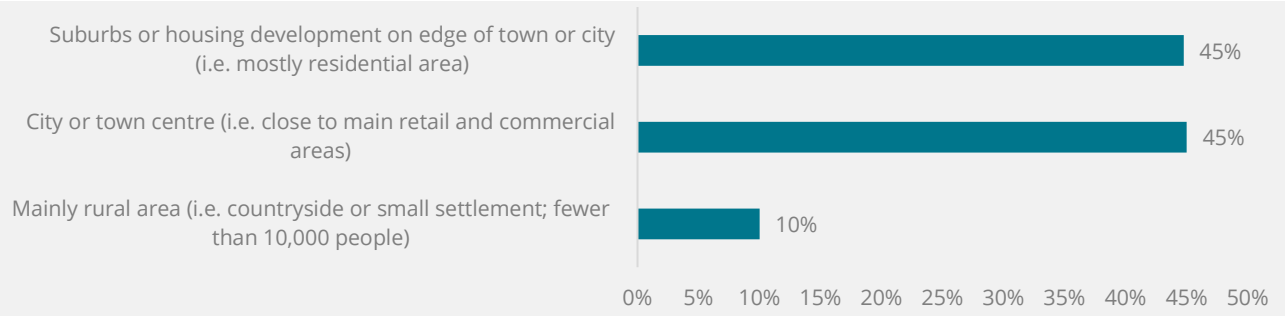
Compared to the target distribution of household customers, the sample slightly over-represented the Inner London customer base (+4 percentage points) and under-represented the Outside London customer base (-4 percentage points) (Table 3.1).

Table 3.1: London vs. non-London (n=400)

		n	%
Within London		263	66%
	Quota		62%
Outside London		137	34%
	Quota		38%
Total		**400**	

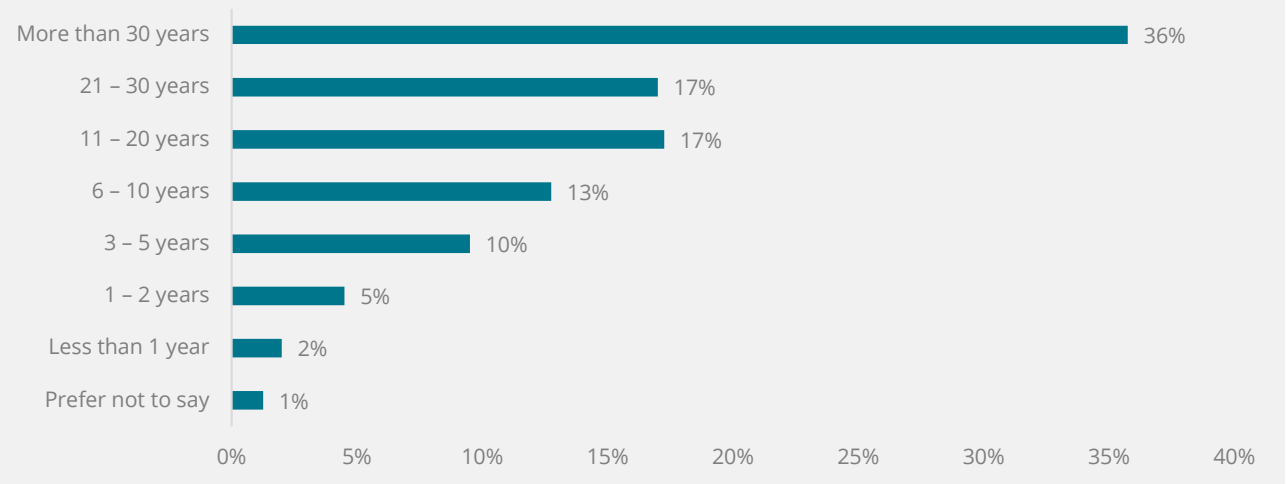
Most respondents indicated that they lived either in the suburbs or edge of town/city (45%), or in the city or town centre (45%), while a smaller share indicated living in a rural area (10%) (Figure 3.4).

Figure 3.4: Urban vs. rural area (n=400)



Respondents were also asked how long they had lived in the Thames Water region (Figure 3.5). The majority of respondents had lived in the region for over 10 years, and within this group most for more than 30 years (36%), followed by between 21 and 30 years (17%), between 11 and 20 years (17%) and between 6 and 10 years (13%). A smaller proportion indicated they had been in the region between 3 and 5 years (10%), and a minority for less than 3 years, whether between 1 and 2 years (5%) or less than 1 year (2%).

Figure 3.5: Time lived in Thames Water region (n=400)



Demographic profile

The proportion of male/female respondents was just off the quota target (within +/- 1 percentage point difference) (Table 3.2).

Table 3.2: Gender (n=399)

		n	%
Female		206	52%
	Quota		51%
Male		193	48%
	Quota		49%
Total		**399**	

Note: One respondent indicated "I prefer to identify another way".

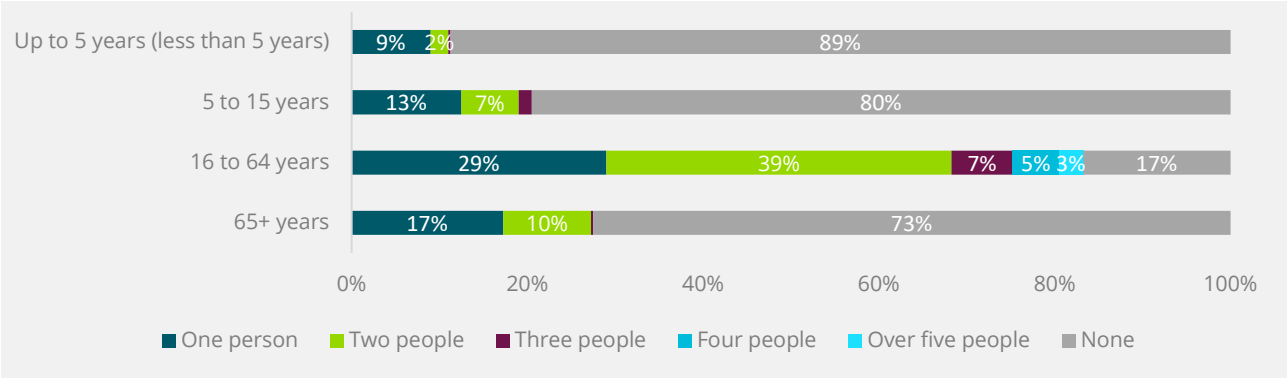
Sample by age also compared well with the quotas (Table 3.3). Most age cohorts were within +/- 2 percentage points difference of the target, with the exception of respondents aged 18-24 which was 4 percentage points below the target quota, reflecting the difference between the profile of the Thames Water bill payers and the population/consumer profile based on census data.

Table 3.3: Age (n=400)

		n	%
18-24		32	8%
	Quota		12%
25-30		45	11%
	Quota		13%
31-44		115	29%
	Quota		28%
45 - 54		75	19%
	Quota		17%
55 - 64		58	15%
	Quota		13%
65+		75	19%
	Quota		17%
Total		**400**	

The household composition provided additional insights on the distribution in the age within respondents' households (Figure 3.6). Most household respondents (including themselves) had at least one member between 16 to 64 years (83%). A smaller share of respondents indicated living with someone over 65 years old (27%). An even smaller proportion indicated that their households also included children, whether under the age of 5 (11%) or between 5 to 15 years (22%).

Figure 3.6: Household composition (n=400)



Note: categories are not mutually exclusive, as respondents' households are likely to include more than one member.

Results for additional questions on respondents' demographic profile are provided in Appendix E – summary statistics for the household survey.

Socio-economic characteristics

The sample profile was broadly aligned to the socio-economic group (SEG) quotas with each segment within +/- 4 percentage points difference of the regional profile (Table 3.4).

Table 3.4: SEG (n=400)

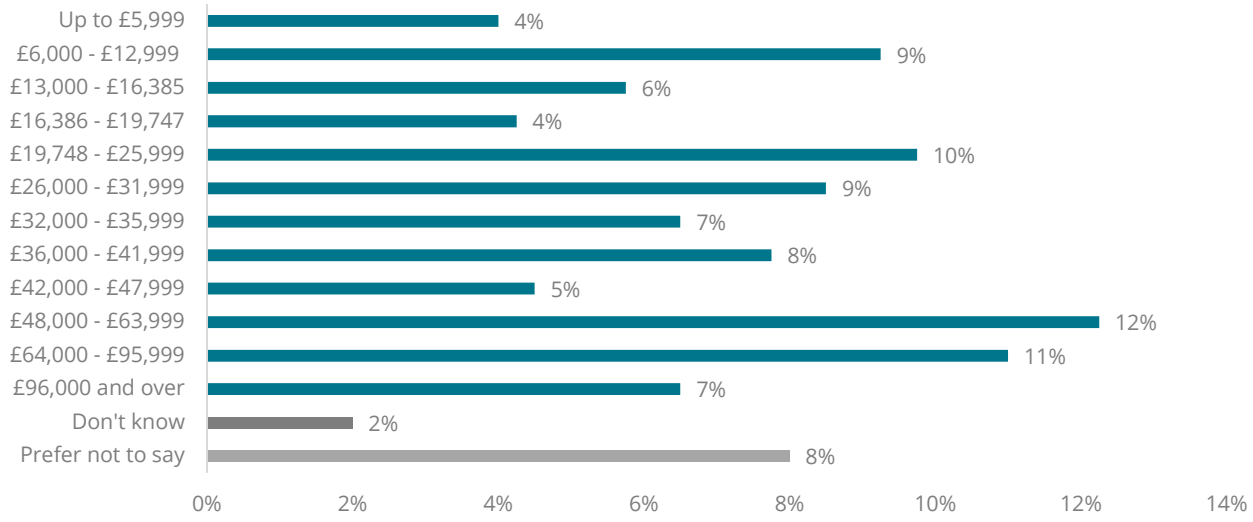
		n	%
AB		128	32%
	Quota		29%
C1		147	37%
	Quota		33%
C2		51	13%
	Quota		17%
DE		74	19%
	Quota		21%
Total		**400**	

Note: Market Research Society definitions are: A = professionals, very senior managers, etc.; B = middle management in large organisations, top management or owners of small businesses, educational and service establishments; C1 = junior management, owners of small establishments, and all others in non-manual positions; C2= skilled manual labourers; D = semi-skilled and unskilled manual workers; E = state pensioners, casual and lowest grade workers, unemployed with state benefits only (NRS, 2008 http://www.nrs.co.uk/lifestyle-data/).

Average self-reported (gross) household income was within the range £36,000 - £41,999 per year, with a median within the range £32,000 - £35,999 per year and a mode within the range £48,000 - £63,999 per year (Figure 3.7)[9]. Approximately one-fifth of respondents (19%) reported household income as £16,385 per year or less[10].

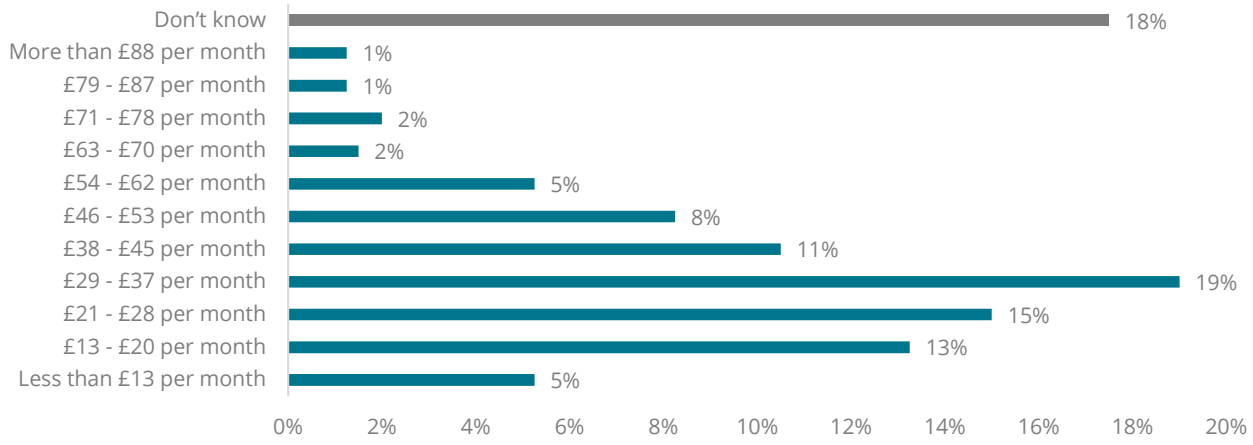
[9] Note that respondents were asked to report total household income before tax and other deductions.
[10] £16,385 is the current income threshold for child tax credit. See: https://www.gov.uk/government/publications/rates-and-allowances-tax-credits-child-benefit-and-guardians-allowance/tax-credits-child-benefit-and-guardians-allowance

Figure 3.7: Gross annual household income per year (n=400)



The median household water and sewerage services bill for the sample was £29 - £37 per month. This is in line with the average combined (water and wastewater) bill in England and Wales of £34.42 per month[11]. A sizeable proportion (18%) indicated that they did not know what they paid for water and sewerage services (Figure 3.8).

Figure 3.8: Household water and sewerage services bills (n=400)



A range of criteria were applied to identify respondents who potentially represented customers/households in vulnerable circumstances: financial vulnerability, pensionable age, physical vulnerability and dependence on water (Table 3.5). Note the criteria were not mutually exclusive – meaning a respondent could be both financially vulnerable and of pensionable age.

[11] From Discover Water data reported by water companies in July 2020.

Table 3.5: Types of vulnerability (n=400)

Type of vulnerability	Criteria	Sample (% of household respondents)
Financial vulnerability	Earn less than £16,385 per year outside of London, or £19,201 per year inside London	N = 76 respondents (19%) irrespective of postcode less than £16.4k; plus further N = 8 in London less than £19.2k (21% in total)
Pensionable age	Respondent and/or a household member is of pensionable age	N = 131 respondents (33%)
Physical vulnerability	Respondent has indicated that they and/or a household member has a disability that does not depend on water. This is measured as either, they/a household member: • Has restricted mobility or disability; • Has chronic illness and/or on dialysis; • Are blind or partially sighted; • Are deaf or hard of hearing; • Have a mental health condition; or • Have additional communication needs (language, dyslexia or learning difficulties). Or is registered on the Priority Services Register (PSR) as they are "Physical issues, such as limited mobility or have young children that make it difficult to leave the house to collect water supplies from shops or water collection points"	N = 47 respondents (38%)
Dependence on water	Respondent has indicated that their household is dependent on water. This is measured as either: • They and/or a household member "Need a constant supply of water for medical equipment and medication"; or • Their household is registered on the Priority Services Register (PSR) as they are "Medically dependent on water such as kidney dialysis, medical conditions that require showers or baths to ease conditions or need water to take medication"	N = 22 respondents (6%)

The largest proportion of respondents (and/or their households) – around two-fifths of the overall sample - were observed to meet criteria for physical vulnerability (38%). A sizeable proportion had a household member of pensionable age (33%). Fewer respondents met the criteria of financial vulnerability (16%) and only a relatively small number met the criteria for a dependence on water (6%).

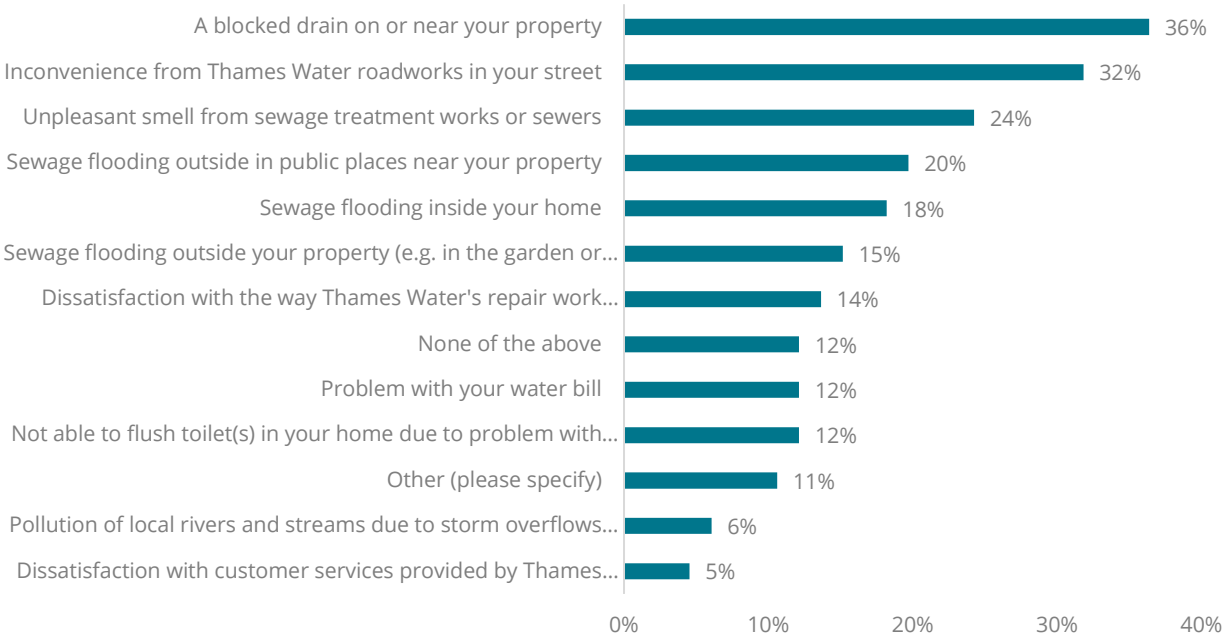
Results for additional questions on respondents' socio-economic profile are provided in Appendix E – summary statistics for the household survey.

Experience of wastewater service issues

A relatively small share of the overall sample of respondents (17%) reported experiencing problems with the wastewater services over the last 5 years. Figure 3.9 shows the frequency of experienced service issues. The most commonly stated service issues were blocked drains (36%), inconvenience from street works

(32%), followed by unpleasant smell from sewage treatment works or sewers (24%) and sewage flooding outside in public places near your property (20%).

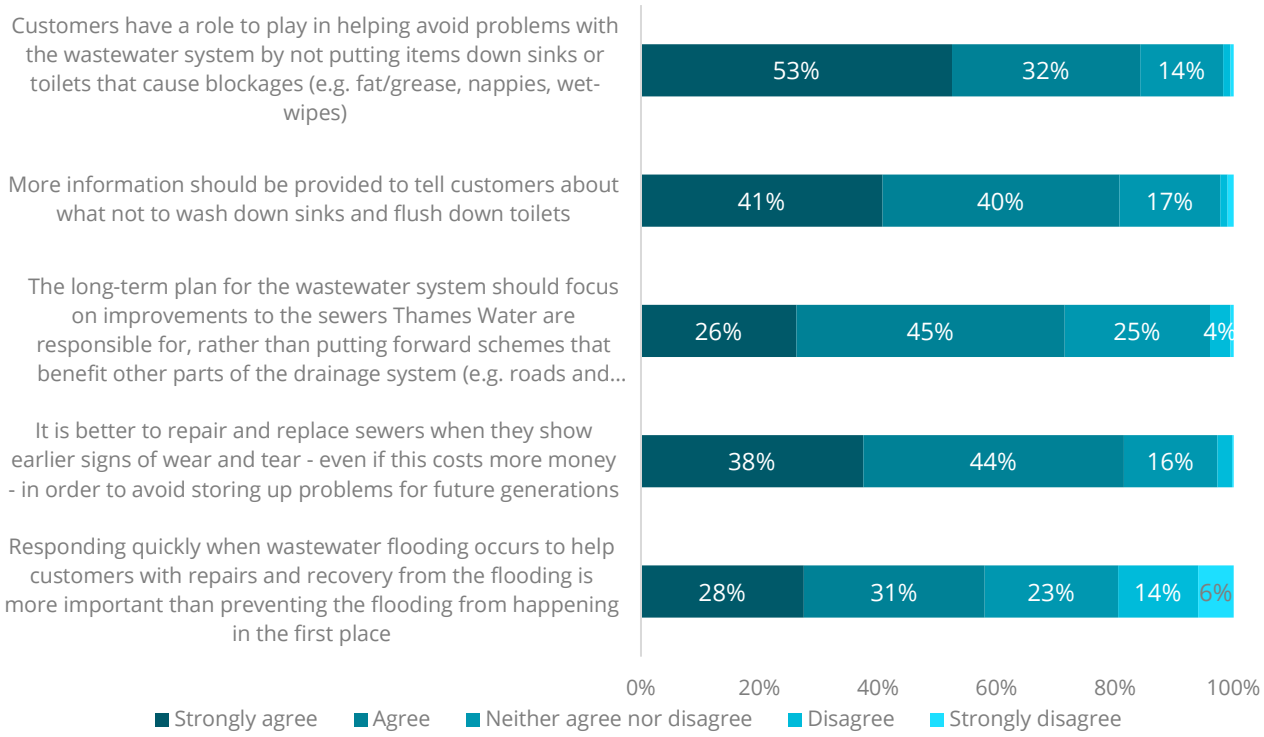
Figure 3.9: Experience of service issues (n=400)



Broad views on wastewater services

A series of follow up questions asked respondents to express their opinions around customer behaviour and the management of wastewater systems (Figure 3.10). Results showed that an overwhelming majority of respondents agreed (32%) or strongly agreed (53%) that customers have a role to play in helping avoid problems with the wastewater system, and that this should come alongside more information about what not to wash down sinks and flush down toilets (41% strongly agree and 40% agree). A majority of respondents (71%) also agreed or strongly agreed that the long-term plan for the wastewater system should focus on improvements to the sewers Thames Water are responsible for, rather than putting forward schemes that benefit other parts of the drainage system, and (82%) agreed or strongly agreed that it is better to repair and replace sewers when they show earlier signs of wear and tear even if it costs more money in order to avoid storing up problems. Although by a slimmer majority (59%), most respondents felt responding quickly when wastewater occurs to help customers with repairs and recovery from the flooding was more important than preventing the flooding from happening in the first place.

Figure 3.10: Views on wastewater services (n=400)



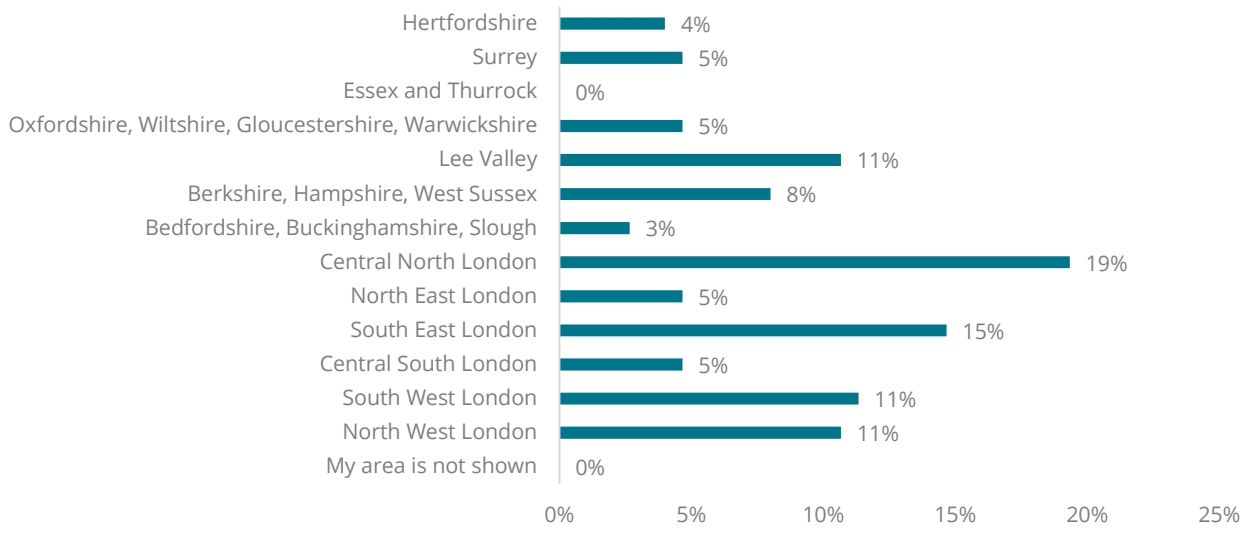
Non-household customers

The non-household customer version of the survey collected information on the nature of the respondent's organisation in terms of the following characteristics: The following summary of the non-household sample is structured as follows: geographic profile; activity and size; experience of wastewater service issues and broad views on wastewater services.

Geographic profile

Figure 3.11 shows the distribution of non-household respondents across the TRFCC areas. Most respondents in the sample were based in Central North London (19%) and in South East London (15%).

Figure 3.11: Thames Regional Flood and Coastal Committee (TRFCC) (n=150)



As shown in Table 3.6, non-household respondents within London were over-represented in the sample relative to the target distribution (+14 percentage points), while those outside London were under-represented (-14 percentage points).

Table 3.6: London vs. non-London (n=150)

		n	%
Within London		114	76%
	Quota		62%
Outside London		36	24%
	Quota		38%
Total		**150**	

Activity

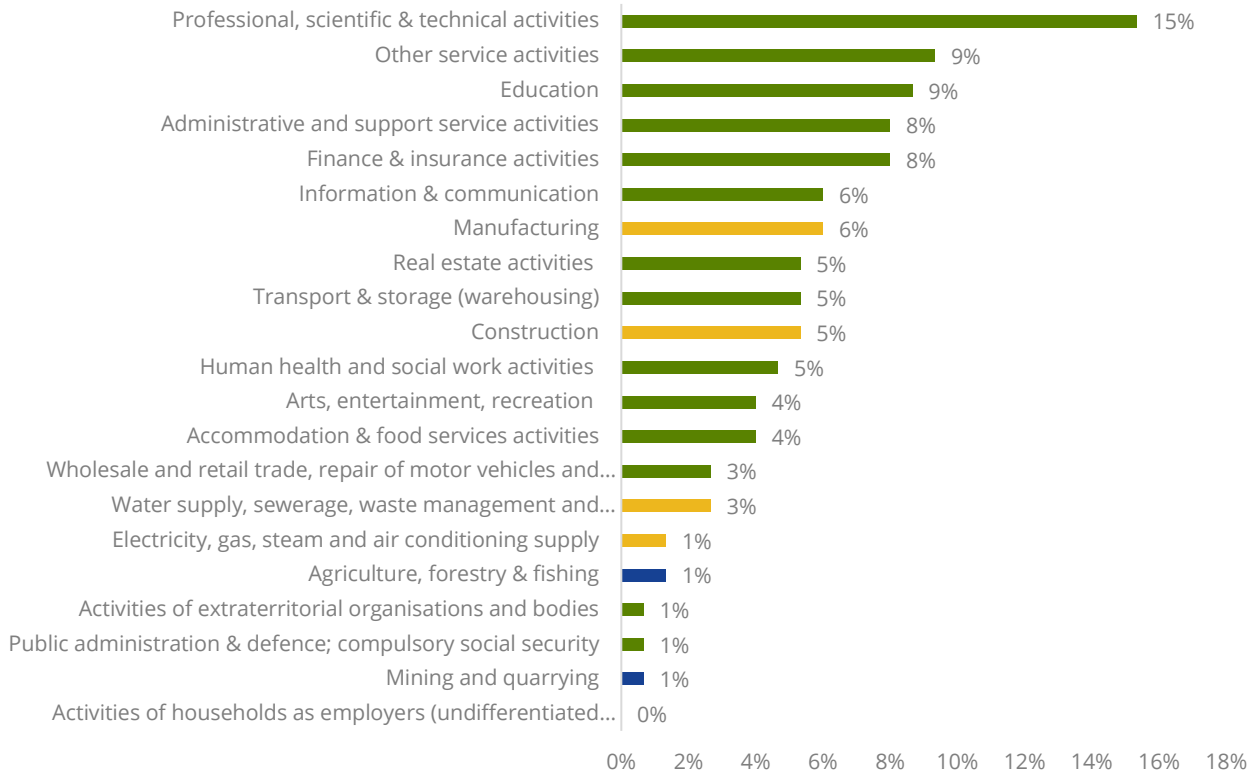
The non-household sample aligned well to the quotas specified for sector, with the majority of respondents from organisations in the tertiary industry (83%) and less than a fifth in the secondary (15%) and primary industries (2%) (Table 3.7).

Table 3.7: Sector (n=150)

		n	%
Primary		3	2%
	Quota		1%
Secondary		23	15%
	Quota		15%
Tertiary		124	83%
	Quota		84%
Total		**150**	

The breakdown of the sample by business activity is provided in Figure 3.12. The most represented sector was scientific & technical activities (15%), but overall, the sample showed a reasonable mix of respondents with no particular organisation types dominating.

Figure 3.12: Business activity (n=150)

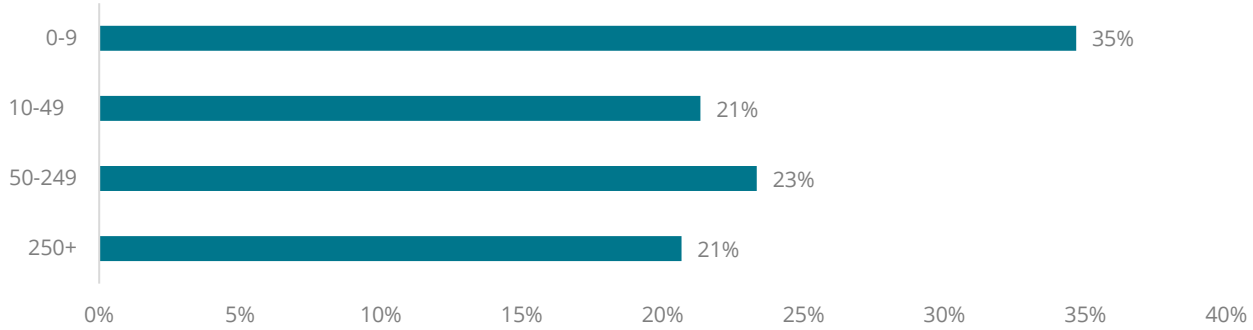


Notes: The colours correspond to the sectors presented in Table 3.7: primary industry (blue); secondary industry (yellow); and tertiary industry (green).

Size

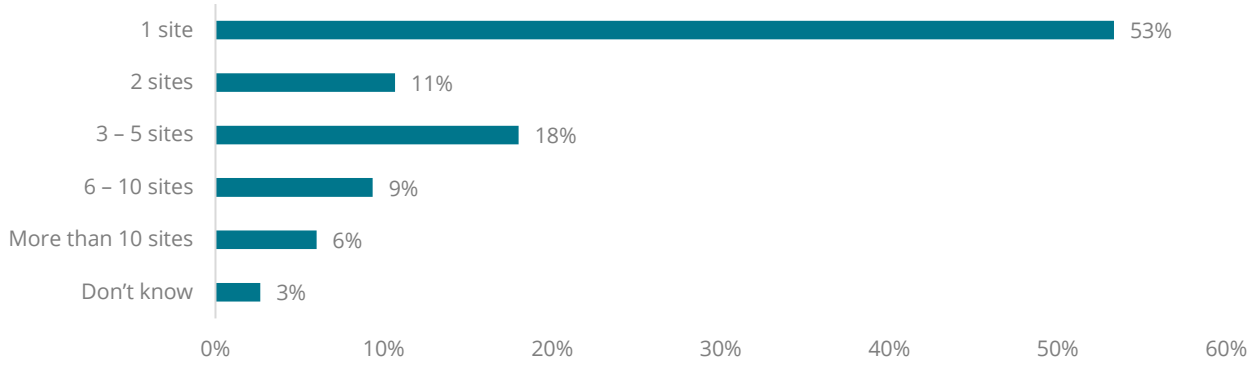
The profile of the non-household sample in terms of organisation size (no. employees) is shown in Figure 3.13. The largest proportion of respondents were from small organisations, defined as between 0 – 49 employees (56%), and mainly comprised of micro-sized businesses (up to 9 employees, 35%). Marginally fewer respondents were from medium sized organisations (between 50 and 249 workers, 23%) or large organisations (over 250 workers, 21%).

Figure 3.13: Employees per organisation (n=150)



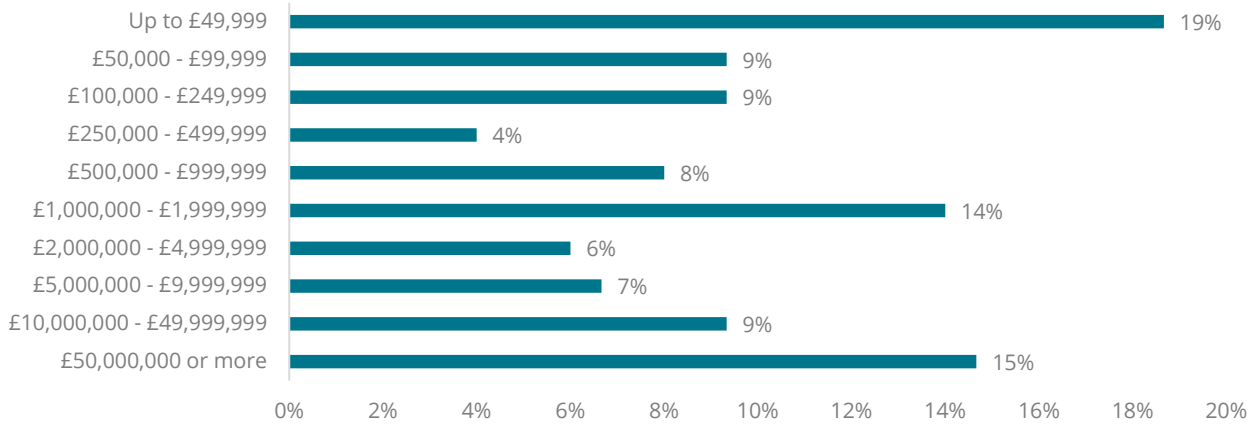
As shown in Figure 3.14, an overwhelming majority of non-household respondents operated from a single site (53%). About a third of the sample operated from organisations with 2 to 5 sites (29%), and only a small proportion (15%) operated from more than 6 sites.

Figure 3.14: Number of sites per organisation (n=150)



Organisation annual turnover is summarised in Figure 3.15. About a fifth of the sample reported turnover of up to £49,999 (19%) and about a fourth reported turnover of more than £10,000,000 (24%). The median range was turnover of £1,000,000 - £1,999,999. BEIS data on the UK private sector reports that the estimated average turnover of a small business (0-49 employees) was approximately over £266,000 in 2020[12].

Figure 3.15: Organisation turnover (n=150)

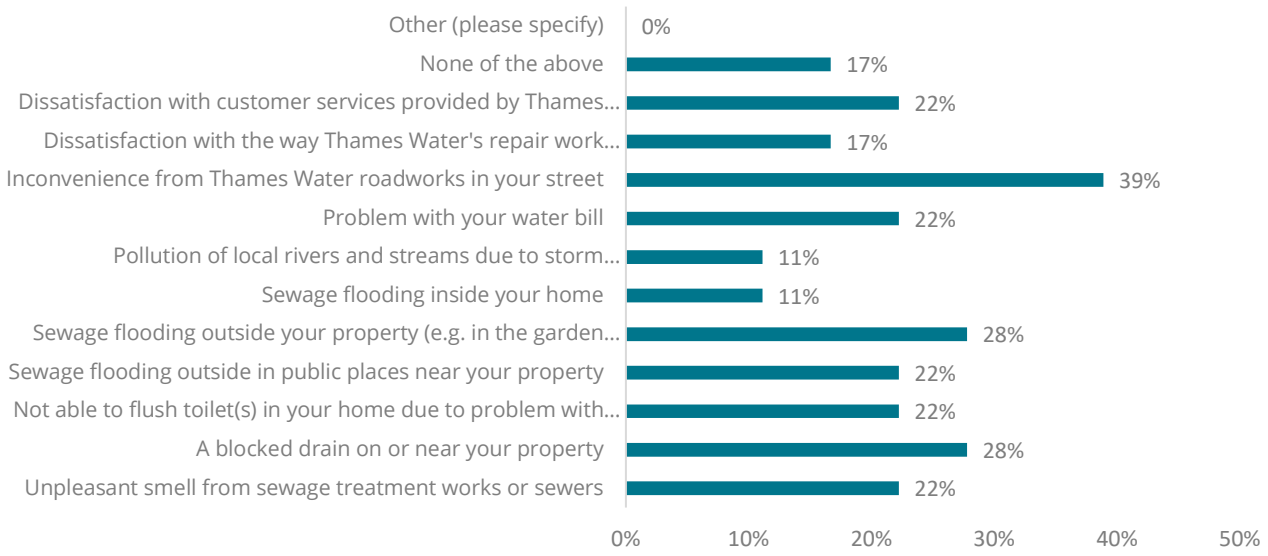


Experience of wastewater service issues

A relatively small share of the overall sample of respondents (12%) reported experiencing problems with the wastewater services over the last 5 years. Figure 3.16 shows the frequency of experienced service issues. The most commonly stated service issues were inconvenience from street works (39%), followed by sewage flooding outside in public places near property (28%) and blocked drains (28%).

[12] See: Business population estimates for the UK and regions 2020: statistical release (HTML) - GOV.UK (www.gov.uk) Data reported for start of 2020 indicates that there are 5,936,545 small businesses (0-49 employees) and earned £1.576 trillion.

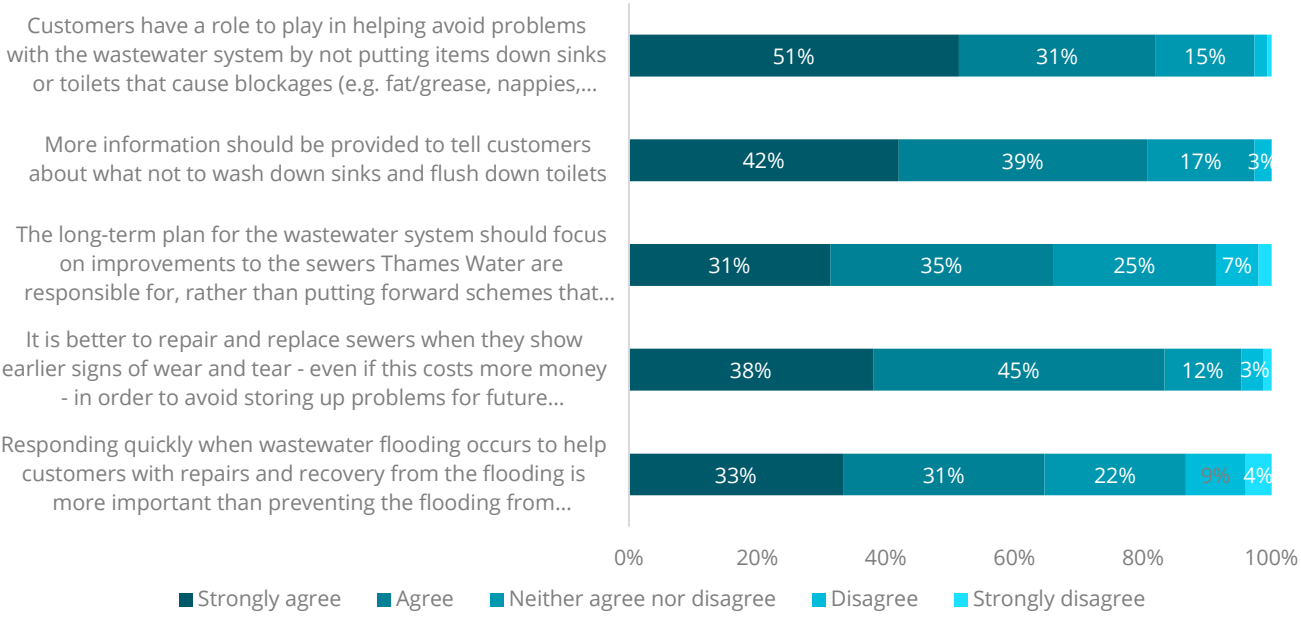
Figure 3.16: Experience of service issues (n=150)



Broad views on wastewater services

A series of follow up questions asked respondents to express their opinions around customer behaviour and the management of wastewater systems (Figure 3.16).

Figure 3.17: Broad views on wastewater services (n=150)



Results showed that an overwhelming majority of non-household respondents agreed (31%) or strongly agreed (51%) that customers have a role to play in helping avoid problems with the wastewater system, and that this should come alongside more information about what not to wash down sinks and flush down toilets (42% strongly agree and 39% agree). A majority of respondents (82%) also agreed or strongly agreed that it is better to repair and replace sewers when they show earlier signs of wear and tear even if it costs more money in order to avoid storing up problems. Respondents were more divided in establishing whether the long-term plan for the wastewater system should focus on improvements to the sewers

Thames Water are responsible for or putting forward schemes that benefit other parts of the drainage system, and whether responding quickly when wastewater occurs to help customers with repairs and recovery from the flooding was more important than preventing the flooding from happening in the first place.

3.2 Customer preferences for DWMP value criteria

Customer preferences for the DWMP planning objectives (value criteria) were elicited via the best-worst scaling (BWS) exercise described in Section 2.2. The main results are preference weights that quantify customer priorities. These can be interpreted as the level of importance placed on different outcomes and objectives for the wastewater system and drainage. As such, the weights measure the relative importance of the value criteria and are an input to the programme appraisal to help compare performance of alternative candidate plans.

Main results

The BWS response data was analysed using conventional choice models to estimate preference weights for the 14 value criteria attributes[13] (Box 3.1).

Box 3.1: Value criteria attribute labels

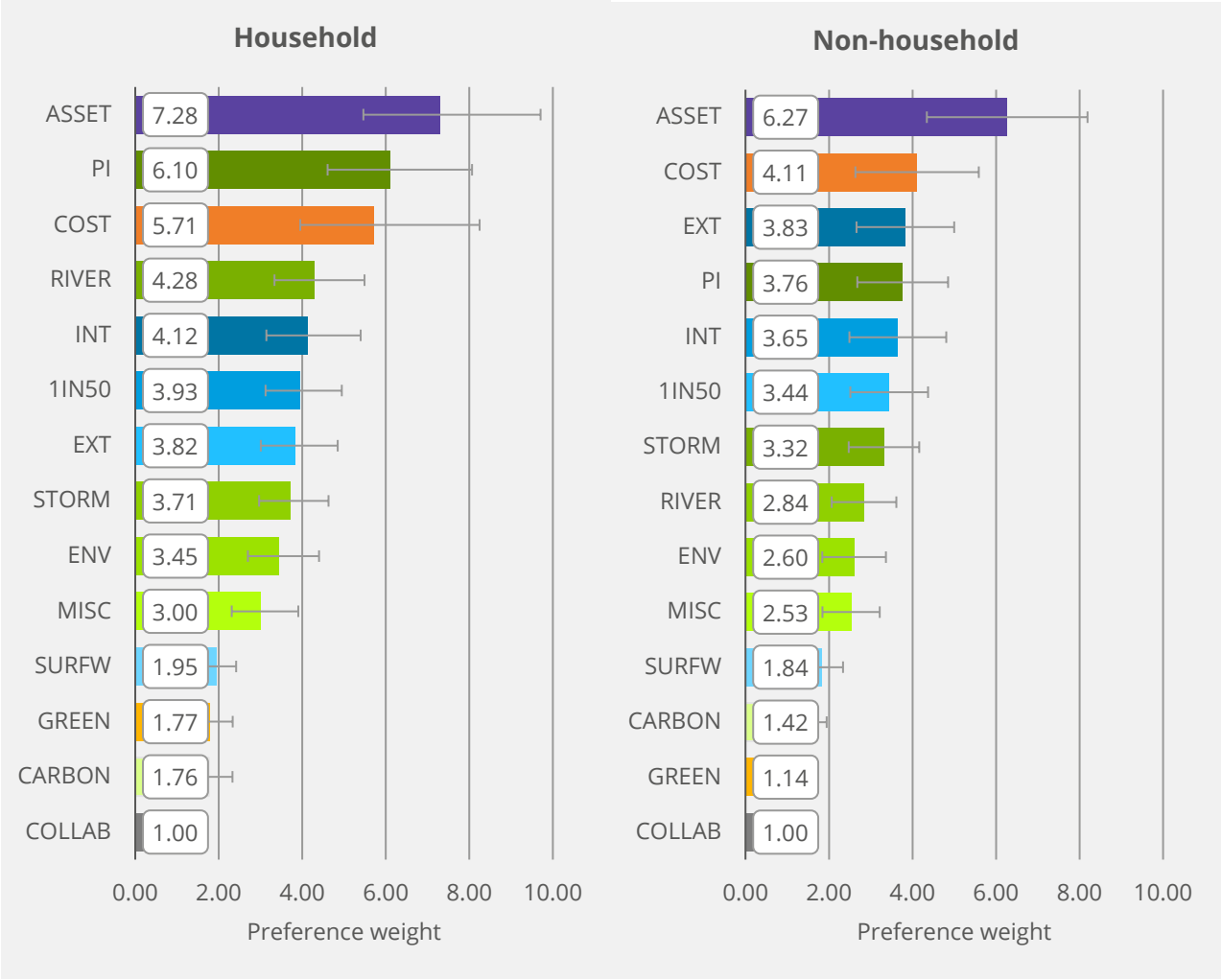
Label	Value criteria attribute*
GREEN	Amenity / wellbeing (create more green space)
1IN50	Reduce risk of wastewater flooding due to extreme wet weather
INT	Reduce the number of properties affected by internal flooding from sewers
EXT	Reduce the number of properties affected by external flooding from sewers
SURFW	Reduce the amount of rainfall entering the wastewater system
RIVER	Continue to meet environmental standards for rivers
STORM	Reduce number of storm overflows from the wastewater system
CARBON	Net zero carbon impact
ENV	Maximise positive environmental impact
PI	Reduce number of pollution incidents
MISC	Fix wastewater misconnections
ASSET	Inspect and maintain pipes to reduce number of sewer collapses
COLLAB	Work with other organisations that are responsible for drainage
COST	Deliver the plan at an affordable cost

*See Table 2.3 for full description provided to respondents.

Figure 3.18 reports the preference weights for the household and non-household samples. The preference weights are measured relative to the base case 'Work with other organisations that are responsible for drainage' (COLLAB) (weight = 1.0). If a value criteria attribute has a weight greater than one, it is (on average) viewed by customers to be a higher-level priority than COLLAB; a weight below one would signify a lower-level priority (on average). If a weight is not statistically different to 1.0 (e.g. at the 95% level of significance), it is not possible to conclude that the level of priority is different from the base case. Overall, the results can be interpreted as the both the priority ordering for the value criteria and the strength of preference.

[13] The full model results are provided Appendix F.

Figure 3.18: Customer preference weights for DWMP value criteria attributes



The main findings are:

- The highest priority for both household (weight = 7.28) and non-household (weight = 6.27) respondents was placed on asset health (keeping sewers and pipes in good working condition). Effectively, the view from respondents is to ensure the current system is maintained and effective ahead of further investment to increase capacity.

- Avoiding pollution incidents was the top DWMP outcome for household respondents (weight = 6.10), consistent with potential severity of impact on rivers and wildlife. The ranking is slightly lower for non-household respondents (see below).

- As expected, cost was also a top-level consideration for both household (weight = 5.71) and non-household (weight = 4.11) respondents, indicating the need to balance the pace of investment and the impact on customer bills.

- Flooding and wider environmental quality outcomes, including storm overflows were largely mid-ranked priorities for both household (weights in range 3.00 to 4.28) and non-household (weights in range 2.53 to 3.83) respondents. For non-household respondents flooding outcomes tended to be

higher weighted in this group, possibly reflecting the disruption to day-to-day activities that could be caused.

- A lower level of priority was placed on surface water management by household (weight = 1.95) and non-household (weight = 1.84) respondents. This indicates that respondents tended to weight actual outcomes (e.g. reducing negative impacts on the environment and flooding risk) over potential measures to achieve those outcomes (e.g. reducing pressure on combined sewers).

- Both household and non-household respondents placed the lowest level of priority on wider amenity outcomes, net zero carbon and collaborative working[14]. To some extent it is likely that these outcomes were seen as part of "business as usual" across all of Thames Water's activities and not exclusive to – and hence not necessarily key priorities – for the DWMP.

Overall, there is a good level of consistency between the results for household and non-household respondents, with the main observed difference being the slightly higher relative importance placed on reducing flooding outcomes by non-household respondent. More broadly, though, the composition of the top ranked, mid-ranked, and lowest priority groups is aligned across both sets of customers.

Household segments

Supplemental analysis was carried out for the household sample to examine customer priorities by region, socio-economic group and vulnerability indicators. Results are provided in Appendix F for reference. The main findings were:

- Region: overall no major difference in customer priorities within/outside London. Asset health and pollution incidents are top ranked for both, and beyond this there are only minor differences in the ranking of value criteria attributes. Cost was ranked higher for respondents within London, whereas river quality (meeting standards) was ranked lower within London compared to outside. Flooding outcomes were ranked similar to the overall sample for respondents within London, whilst respondents outside London ranked these outcomes higher. The lowest priorities were consistent across these segments and in line with the main findings (overall sample).

- Socio-economic group (SEG): there was a high degree of consistency in priorities across SEGs, with asset health and pollution incidents top ranked for all groups. The main observed difference is in line with expectations, with lower SEG group (DE) placing more weight on cost versus other SEGs.

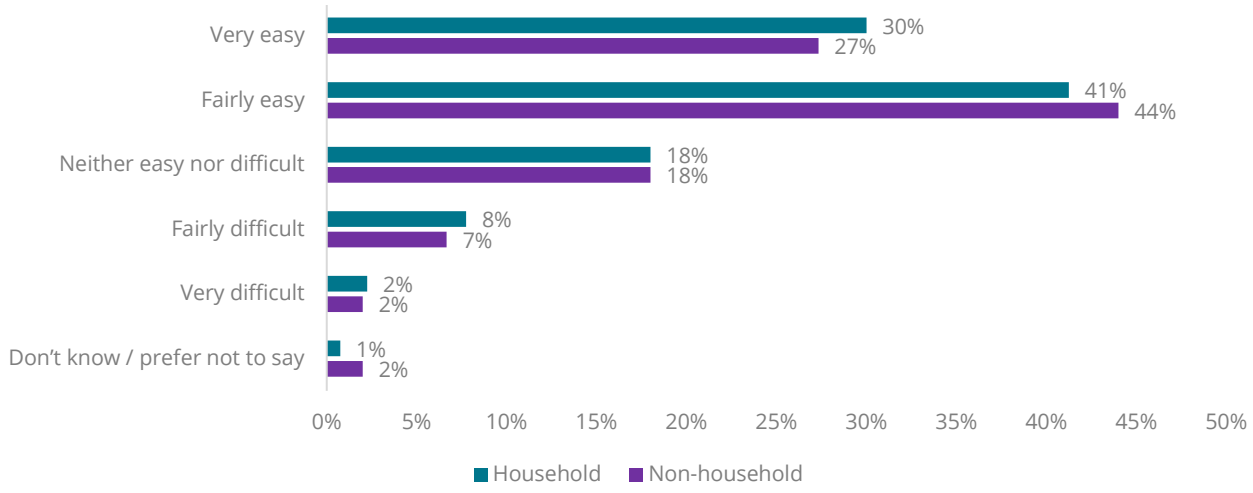
- Vulnerable circumstances: similarly, there was little difference in preferences across indicators of vulnerable circumstance (physical, financial, and both). Cost was ranked top for financially vulnerable households, consistent with expectations.

[14] The respective weights for CARBON and GREEN are not statistically different from the base case (COLLAB).

3.3 Respondent feedback

The survey design and testing stage provided the first opportunity to gauge the level of understanding and respondent engagement with the survey, which the participants found interesting and educational. Subsequent feedback in the survey from respondents was consistent with these findings. The majority of respondents (71% of both household and non-household respondents) stated that the survey was easy to complete (either "very easy" or "fairly easy") (Figure 3.17).

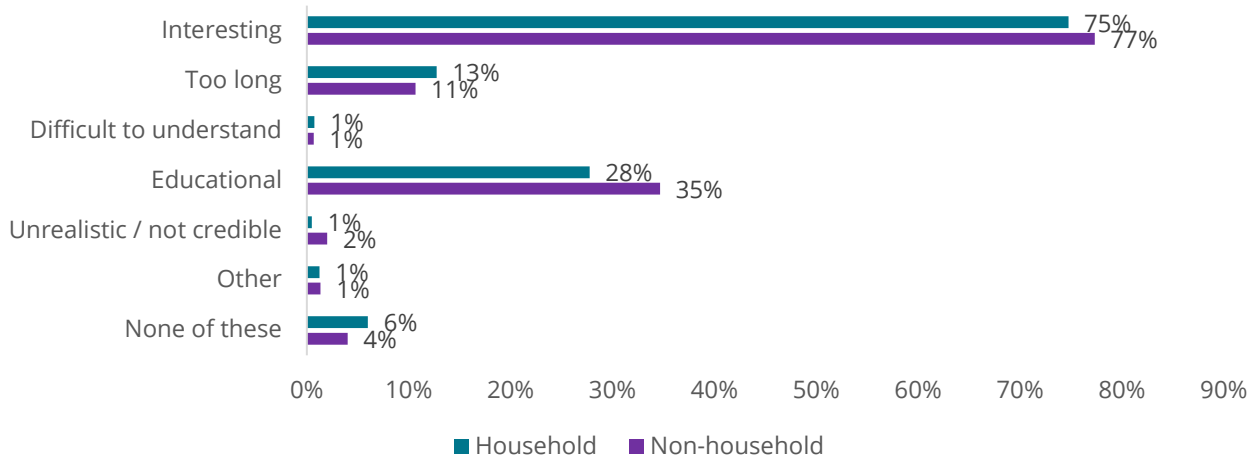
Figure 3.19: Ease of answering questions in the survey (% of respondents) (n=550)



Sample size: Household – 400 respondents; Non-household – 150 respondents.

Similarly, a large portion of respondents found the survey interesting (75% of household respondents; 77% of non-household respondents) or educational (28% of household respondents; 35% of non-household respondents) (Figure 3.18). Some respondents, however, did indicate that the survey was too long (13% of household respondents; 11% of non-household respondents). Very few respondents indicated that they found the survey difficult to understand (1% of household respondents; 1% of non-household respondents).

Figure 3.20: Feedback on the survey (% respondents)



Sample size: Household – 400 respondents; Non-household – 150 respondents.

4. Conclusions

4.1 Summary

Drainage and wastewater services in the Thames Water region face many different challenges from changing climate, changing weather patterns, population growth, and growing demand for environmental protection. To meet these challenges, Thames Water, is working in partnership with stakeholders to develop a long-term plan - the Drainage and Wastewater Management Plan (DWMP) - to ensure a resilient and sustainable wastewater service for the next 25 years for London and the Thames Valley region.

This quantitative research supports development of the DWMP by measuring customers' priorities for the DWMP planning objectives and outcomes, as represented by the programme appraisal "value criteria". A choice modelling approach was used to estimate these weights, with the research implemented through a representative online survey of the wastewater customer base.

4.2 Key findings

Overall, there is a consistent view on the priority objectives and outcomes for the DWMP, across both the household and non-household customers that were sampled, and within different segments of the household respondents. Whilst each of the value criteria are found to be material considerations for customers, there is a clear prioritisation:

- **Top priorities**: to ensure that the current system is properly maintained and effective ahead of further investment to increase capacity (i.e. asset health). This is closely followed by avoiding pollution incidents (consistent with the potential severity of impact on rivers and wildlife) and costs (impact on customer bills).

- **Mid-tier priorities**: to reduce flooding and address wider environmental quality issues, including storm overflows.

- **Lower priorities**: activities that customers see as "business as usual" across all service areas – rather than exclusive to the DWMP - including net zero carbon and collaborative working.

Results from this study are primarily an input to the programme appraisal phase of the DWMP, where the purpose is to compare performance of alternative candidate plans as part of the process of developing a preferred plan. Table 4.1 presents the combined household and non-household customer preference weights, providing relative importance (weight and priority) for the programme appraisal value criteria.

Table 4.1: Customer preference weights for DWMP value criteria

Value criteria	Preference weight*
Asset health (sewer collapses)	12.3%
Risk of pollution incidents	10.1%
Cost	9.5%
Dry weather flow (DWF) Compliance	7.1%
STW quality Compliance	7.1%
Reduce internal property flooding	6.9%
Properties at risk in extreme storms (1 in 50)	6.6%
Reduce external property flooding	6.5%
Storm overflow performance	6.3%
Strategic Environmental Assessment (SEA)	5.8%
Natural capital value	5.8%
Reducing misconnections	5.1%
Reduce surface water runoff into a combined water system	3.3%
Carbon neutrality	3.0%
Wellbeing	3.0%
Collaboration	1.7%
	100%

Notes: *Preference weights from Figure 3.18 expressed in percentage terms (%). Combined weight is based on proportional share of household (95%) and non-households (5%) in overall wastewater services customer base.

Appendix A: Value Criteria Mapping

Appendix A - Value Criteria Mapping.pdf

Appendix B: Cognitive Testing Summary

Objectives

The purpose of the survey testing phase was to:

- Test whether customers understood what the survey was about and what its purpose was;
- Understand what and how much contextual information was required by customers;
- Test the layout and appearance of the survey;
- Test how much effort was required to complete the survey;
- Assess how easy or difficult it was to complete, and to assess the clarity of instructions;
- Evaluate how well people understood the plan preferences and paired choices
- Understand the thinking behind how customers made their choices

Research process

The survey testing phase consisted of 10 cognitive interviews undertaken in June 2021. These were carried out across three waves to allow for refinement and iteration of the survey content and material. The first and third waves comprised three interviews each, while the second wave featured four interviews. Given the continued Government advice on Covid-19, an online approach was utilised to conduct the interviews.

The testing assessed all the materials (questionnaire wording and showcards) to check they were clearly understood by respondents. Debrief questions and probes sought to clarify any ambiguities and ensured that information could be presented in the most meaningful way to customers. It therefore played a crucial part in making sure the survey was fit for purpose before moving on to the pilot stage and eventually, the main stage of the survey.

All participants in the interviews had to be solely, or jointly, responsible for paying their household bills. In addition, a broadly even split of customers in terms of age, gender and socio-economic group was achieved.

Key Findings

Understanding

Overall, respondents understood what the survey was about and what they were being asked to do in the cognitive interviews. There were three main responses, which demonstrated that customers had a good understanding of what was being asked of them:

Purpose of Survey	No. mentions
Prioritising the most important DWMP investment areas	7
To understand what people think TW should do	5
Planning for future environmental improvements	3

Some verbatim comments illustrating the above categories are shown below.

Prioritising the most important Drainage and Wastewater Management Plan (DWMP) investment areas

"To rank in priority order what Thames Water should tackle first" – Wave 1

"To decide what's important to customers around planning for the environment and flooding" – Wave 1

"Deciding what's important and to streamline developments and investments to keep people happy" - Wave 2

"…how difficult it is to decide what the most important factors are for Thames Water going forward to handle the growing population and its impact on wastewater" – Wave 2

To understand what people think Thames Water should do

"To understand what people think Thames Water should do in terms of preventing a range of factors" – Wave 2

"To find out what people care about and what their different priorities are" – Wave 3

"To get an idea of what Thames Water customers want and where to focus priorities" – Wave 3

Planning for future environmental improvements

"…looking at how to plan for the future, to present what they're planning and what projects to focus on… " – Wave 3

""…looking at future improvements in the environment" – Wave 3

Views on Thames Water consulting customers

Overall, respondents thought it was a good thing that Thames Water was consulting households about potential future plans for improving the drainage and wastewater infrastructure in the South East.

"…really glad they are doing this; it's brilliant that they are raising awareness about some of the problems; they have to use it for future proofing" – Wave 1

"…very positive to get end users priorities and thoughts" – Wave 1

"It is good to participate, especially as I've had experience of wastewater issues" – Wave 2

"It's a positive thing because they care about what customers want" – Wave 3

"…consulting customers is a good thing…affecting what they've decided to do rather than informing what they're going to do" – Wave 3

Credibility and influence of survey

Most people thought the survey was credible, albeit with some caveats; and people were hopeful that their opinions would mean something and would help to influence decision making.

"…very credible in terms of addressing the different issues and priorities, apart from the CO (all businesses have to achieve this)" – Wave 1

"I think they will use the information, but maybe not all of it…" – Wave 1

"…makes me think it's noy just talk, but not sure as Thames Water has a monopoly; they don't care as they have the business, but they want to be seen as being ethical" – Wave 2

"Canvassing opinion is important, but it will come down to cost in the end" – Wave 2

"It is credible and realistic in terms of the choices and specificity which are grounded in real world plans" – Wave 3

"Being listened to is always great, but do they really care…is it just a tick box exercise; maybe they will use it for business planning" – Wave 3

Ease of survey completion

Overall, most respondents found the survey quite easy to understand and straightforward to complete.

"Very easy and straightforward; also being quite formulaic eg step 1, step 2 made it easy to process" – Wave 1

"Quite easy – all the all the content was very clear and concise, no waffling, the pictures helped me memorise things" – Wave 2

"Easy, just needed a lot of concentration…" – Wave 3

While most found the content and process undemanding, others were more challenged. This was partly due to the 'clunky' completion process which involved changing between three screens….

"Quite difficult because of the clunky interface and wording; after choosing the two most preferred options, it wasn't clear on how to continue" – Wave 3

…but also because of the number of factors in the paired choices that needed consideration, some of which were deemed quite similar (see more below).

"It was easier once I got into it; the aims were clear, but just had to think as there were quite a few options" – Wave 1

"So many factors to consider meant they were difficult choices to make" – Wave 2

Respondents were reassured that the whole process would be online and that there would be no need to flick between screens, and they were comfortable with this.

Understanding of the long-term drainage and wastewater plan

Contextual information was provided about the DWMP in terms of Thames Water's responsibilities, the challenges they are facing and the main problems that occur. There was limited recall of what Thames Water was and was not responsible for. Individually, a handful of respondents could remember one or two aspects. Maintaining wastewater treatment works and pumping stations were not mentioned, and the reference to sewage flooding was general; i.e. there was no distinguishing between internal and external.

Challenges

As part of setting the scene, a growing number of challenges (see below) were also explained to respondents. There were varying degrees to which people were able to recall these challenges, although no-one could remember all of them. Most people therefore needed prompting on these challenges, Often, people mixed up the 'challenges' and 'problems with the wastewater system', which while not the exact sequencing, does show that people were taking in the information. For example, people included pollution and sewer flooding as part of the challenges. There were also instances where respondents assumed that the ageing system was one of the challenges or problems. It was not itemised in any of the information, but again, it shows people were thinking about some of the wider issues.

Wastewater challenges in the South East

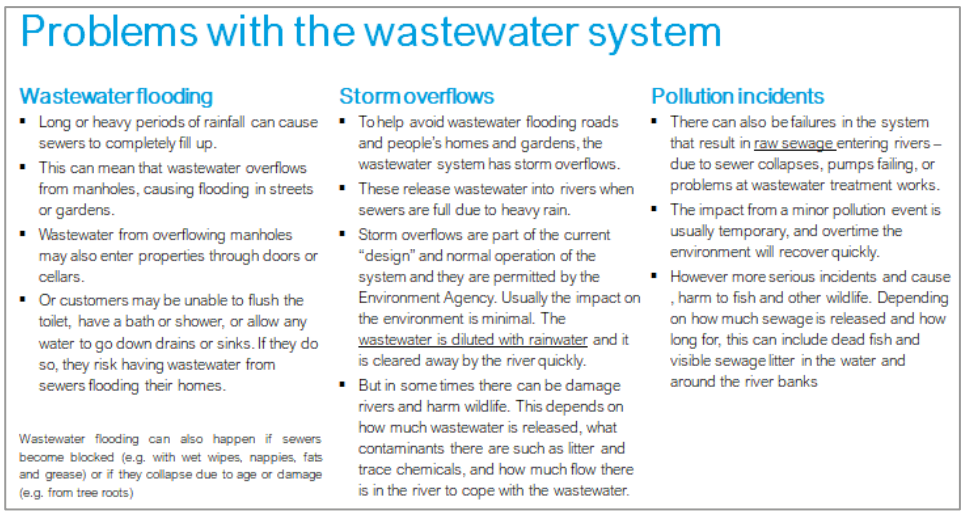
- **More wastewater is being produced by a growing population** – *more sewage needs to be collected and removed by the system*
- **More rainfall due to climate change effects, including more frequent heavy downpours** - *more water is collected by the system more quickly through surface water drains*
- **Increasing "urban creep" where greenspace that naturally soaks up water is lost and replaced by hard (impermeable) surfaces like paving and tarmac** - *more water is collected by the system more quickly through surface water drains*
- **Problems with misconnections** - *rainfall from roofs and guttering is also collected in sewers, reducing the capacity of the system to collect sewage*

Problems

The third aspect of the context provided to customers was the problems associated with the wastewater system. The flooding and pollution elements were recalled quite frequently, storm overflows less so. There was again the odd mix up where an individual mentioned misconnections here, but in general there was good recall of this information.

Problems with the wastewater system

Overall, the explanatory information was useful and helpful context at a high level:



Problems with the wastewater system

Wastewater flooding

- Long or heavy periods of rainfall can cause sewers to completely fill up.
- This can mean that wastewater overflows from manholes, causing flooding in streets or gardens.
- Wastewater from overflowing manholes may also enter properties through doors or cellars.
- Or customers may be unable to flush the toilet, have a bath or shower, or allow any water to go down drains or sinks. If they do so, they risk having wastewater from sewers flooding their homes.

Wastewater flooding can also happen if sewers become blocked (e.g. with wet wipes, nappies, fats and grease) or if they collapse due to age or damage (e.g. from tree roots)

Storm overflows

- To help avoid wastewater flooding roads and people's homes and gardens, the wastewater system has storm overflows.
- These release wastewater into rivers when sewers are full due to heavy rain.
- Storm overflows are part of the current "design" and normal operation of the system and they are permitted by the Environment Agency. Usually the impact on the environment is minimal. The wastewater is diluted with rainwater and it is cleared away by the river quickly.
- But in some times there can be damage rivers and harm wildlife. This depends on how much wastewater is released, what contaminants there are such as litter and trace chemicals, and how much flow there is in the river to cope with the wastewater.

Pollution incidents

- There can also be failures in the system that result in raw sewage entering rivers – due to sewer collapses, pumps failing, or problems at wastewater treatment works.
- The impact from a minor pollution event is usually temporary, and overtime the environment will recover quickly.
- However more serious incidents and cause , harm to fish and other wildlife. Depending on how much sewage is released and how long for, this can include dead fish and visible sewage litter in the water and around the river banks

In terms of the detail, respondents found it quite challenging to link it into their decision making on the choice card options that were presented later in the survey, but as the choice cards provided necessary explanations, this was not an issue. As such, the above information served its purpose as a 'warm up' for getting respondents to think about wastewater issues. And crucially, it provided useful context to ensure respondents gave considered responses to the survey.

High level aims of the DWMP

In addition to the various pieces of background information presented, participants were also informed of the high level aims of the plan and asked to rank them in order of importance. There was some extra information that respondents could have looked at to gain more understanding of the aims, but they felt that was not required, as each of the aims were quite intuitive, albeit less so for 'look after local communities' and 'work collaboratively with other organisations'.

While respondents had no problem with ranking each of the high level aims during the survey, many struggled to recall these when asked about them in the survey debrief, some being able to remember more, and others were unable to recollect any of them.

"They didn't really stick in my mind as much as the issues and challenges" – Wave 1

"I don't really remember them…" – Wave 3

This could be because of the amount of information presented after this initial warm up aspect of the survey. On revisiting the aims, almost all thought they were clear and made sense.

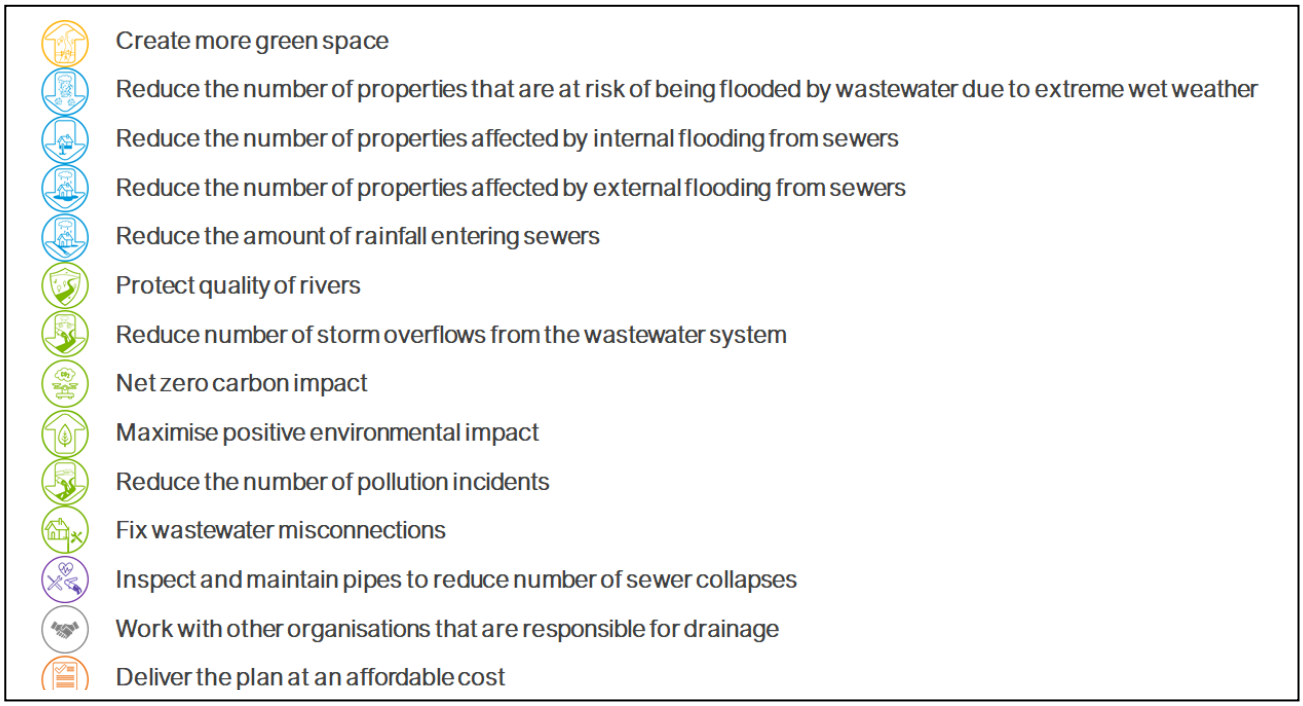
"They all made sense and I understood them completely" – Wave 2

The extra 'Tell Me More' information was especially helpful in explaining further what looking after local communities meant. And crucially, everyone thought there was sufficient detail to rank each of the high-level aims.

"I don't think the bullet points needed that much explanation, there was enough information" – Wave 2

Understanding the value criteria attributes

Participants were shown the set of value criteria attributes pertaining to the DWMP objectives and outcomes. In total there were 14 criteria as shown below.



DWMP value criteria attributes

To help respondents understand more about the criteria they were shown what could be included in the plan (Panel A), as well as further Tell Me More information (Panel B), if they required.

Example value criteria (Panel A)

Example value criteria (Panel B)

A key element of testing process was to ensure respondents understood each of the value criteria attributes and to test how clear they were in terms of the titles, icons and summary explanations. Overall, the feedback was very positive.

"Very clear, not too complicated, not too much writing, worked well on both sides (Tell Me More), and the icon worked well in terms of instant recognition alongside the text" – Wave 1

"The titles are very clear, they go hand in hand with the icons, and the colour coding is useful" – Wave 3

Some of the criteria was specifically asked about to ensure people were clear about the differences; these are set out below:

All these factors were clear and easy enough to differentiate, although there were some who thought that 'external sewer flooding' and 'reducing rainfall into sewers' showcards could be amalgamated.

"Pretty easy to understand, but you could include misconnections with outside (external)" – Wave 1

"The internal and external icons are relevant" – Wave 2

"Not sure if there's a huge difference – is it really necessary" – Wave 2

"Internal and external (sewer flooding) are self-explanatory, but not 100% sure about the other…" – Wave 3

There were others who thought misconnections was completely different though…

"The differences are all clear, they are completely separate issues" – Wave 2

Some respondents felt that some of the icons for flooding objectives and outcomes were too similar, and that they could be changed to make a clear distinction between them. As such, the title, icon and description for surface water management was revised for the third wave of interviews.

Two other factors that were tested to understand whether respondents noticed the differences between them were 'reducing the number of storm overflows' and 'reducing the number of pollution incidents'.

Wave 1: Reducing storm overflows

Reducing pollution incidents

Revised icons were shown in the second wave of interviews, along with using the term 'storm overflows' instead of 'emergency overflows'. There was a sense that these were quite similar but that were differences.

"…definitely related, but the differences are clear" – Phase 2

"I couldn't immediately tell the difference…" – Phase 2

Wave 2: Reducing storm overflows

Reducing pollution incidents

The similarity of the icons was commented on by three of the four respondents as a contributor to perceived similarity.

"There's enough difference, but the pictures are exactly the same – Wave 2

The suggestion was to make it clearer about the impacts to wildlife as a result of pollution incidents as it wasn't immediately obvious from the icon. It was also suggested the description could mention the potential impacts. As such revisions to these showcards were made for the last waves of interviews.

Wave 3: Reducing storm overflows

Reducing pollution incidents

The key differences are as follows:

- Each of the titles no longer includes 'the number of…' As the specific numbers were not shown in the summary, there was a disconnect between the title and the sub text; the actual numbers were included in the detailed description.
- Storm overflow icon – more emphasis was placed on the overflow litter emerging from the sewer
- Reduce pollution icon – a larger dead fish was included to show the impact on wildlife

These changes had the desired effect as all phase 3 participants felt the differences were clearly explained.

"…pretty self-explanatory, one of the easier ones to comprehend…" – Phase 3

Net zero carbon impact was another factor that respondents were asked to comment on in the cognitive testing. The title slide remained consistent in all three waves of testing, and while some were comfortable with the concept, they felt it was not particularly ambitious because they felt that companies would have to do this anyway.

It's topical, political; they should be doing it anyway. It's straightforward and easy to understand, but not very ambitious" – Wave 1

"It's clear, but companies have to be corporately responsible and include; it's a given" – Wave 1

"…yep, good understanding makes it clear that any carbon produced is off set" – Wave 3

However, there were several people who did not understand what 'carbon credits' were.

"I don't know about carbon credits…" – Wave 1

"It confuses me, it's all too sciency this buying carbon credits…" – Wave 2

"I'm not sure what buying carbon credits actually means" – Wave 2

There were also a couple of respondents who thought the more detailed Tell Me More explanation was 'a bit too wordy', but it was also understood that if there was less information, there would not be enough to understand it.

"There's a lot of information, but if there was any less there would not be enough understand…" – Wave 2

"There's a lot of information to absorb and digest; it's a bit too wordy" – Wave 3

Collaborating with other organisations was a factor where respondent's understanding was tested in waves two and three. Respondents felt this was very clear and easy to understand, but it was also seen as one of those issues that was just a given, that the Thames Water would be doing this as a matter of course.

The final aspect that was fully tested with respondents in all three phases of cognitive interviewing was 'cost'. The summary information shown was consistent throughout all three waves of testing. There was unanimity from all participants that this was very clear, straightforward and easy to understand.

Best-worst scaling

Ease of completion

Without exception respondents found the instructions about the best-worst scaling exercise clear and easy to follow, and therefore this made the task of choosing between the options easy from a process perspective.

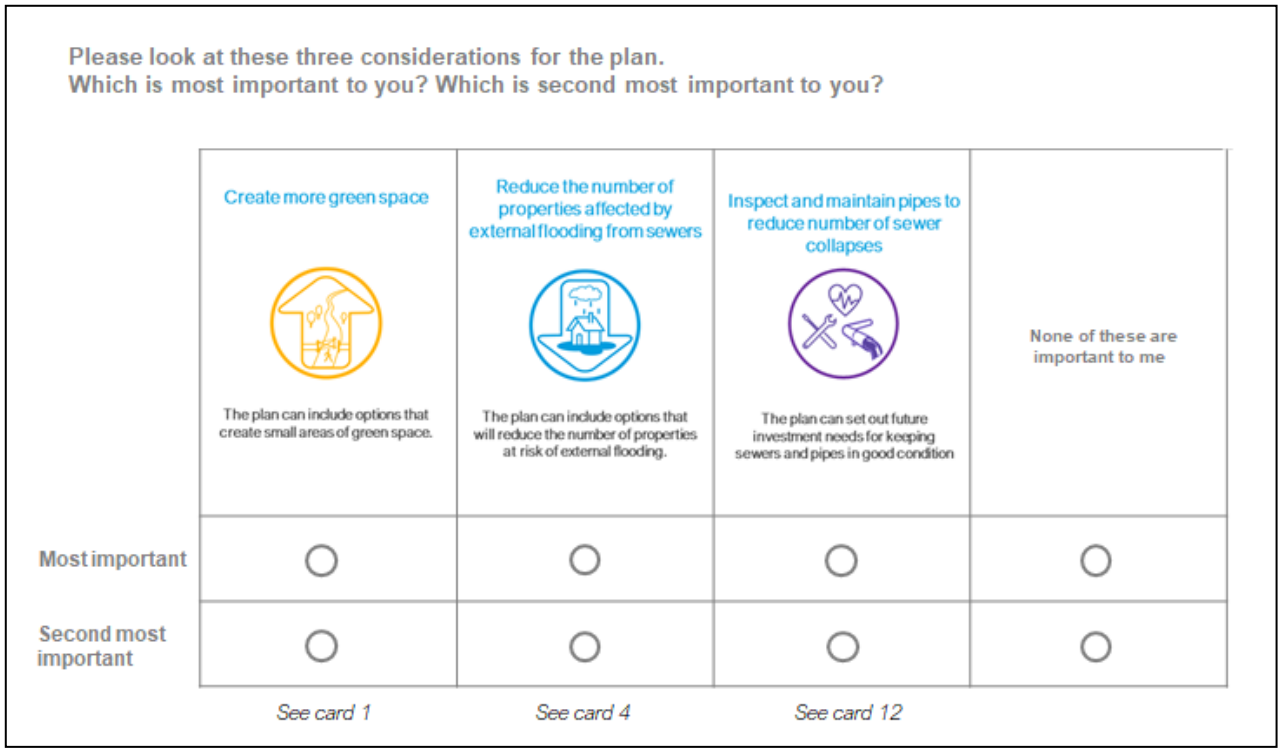
"…very clear, very straightforward process and what's expected of me and I was supposed to do" – Wave 1

"The instructions were clear, to choose what's most and second most important" – Wave 2

As stated earlier, the manual approach to completing the comparisons in the cognitive interviews was often perceived as rather clumsy, resulting in some confusion, but after a couple of efforts respondents soon got the idea of what they were supposed to do.

Participant preferences

There were choice cards where respondents had to make their choices of most, and second most important. An example is shown below.



Best-worst scaling – cognitive interviews

While respondents found the concept of choosing between what was most and second most important easy, some found the decision-making challenging as it was too difficult to prioritise one issue over another.

"It was quite hard because all three options resonated; I cared most about the green (environmental) ones" – Phase 2

"The process was quite easy, but choosing one was quite hard; the information helped me make my decisions" – Phase 2

In some cases, respondents wondered why things had to be mutually exclusive for example, managing green space and carbon net zero. Respondent's judgements were also challenged by what *'should'* be more important compared to issues that had been experienced which brought into focus the need to invest in that area.

"The process is quite difficult as I'm trying to imagine what's most important compared to ones where I've had personal experience" – Wave 1

In terms of the actual choices respondents made there was a varied mix of responses depending on their priorities. Most chose issues that could affect them personally or where there was a very tangible impact on the environment.

"The personal impact of sewage backing up into the house or garden is not very pleasant" – Wave 1

"...it's about what directly affects me and what directly affects the environment" – Wave 2

"It's a personal thing for me as I live quite near the river Thames..." – Wave 2

"Environment is most important; carbon emissions are an existential threat" – Wave 3

"Environmental impact is the most important, but house flooding is really bad; the last thing you want is getting worse on environmental standard" – Wave 3

Respondent's prioritisations were further reinforced when they were asked about the three most and three least important factors. The three most important factors included 'protecting the quality of rivers', reducing the number of pollution incidents', and 'reducing number of properties at risk from flooding'.

The three least important factors included some environmental factors which were quite general such as 'create more green space' and 'net zero carbon impact'. While the latter was deemed to have a positive impact on the environment, it was felt that Thames Water would have to do this anyway; as such, it was not down to customer preferences. Other issues of lower importance that were mentioned included 'working with other organisations' and 'affordability'.

Of note was the fact that hardly one opted for the 'none of these are important to me' response option. This was mostly because in every comparison, there was always something that was considered important; indeed, a regular refrain was that all the issues were important.

"I noticed it, but it was secondary…" – Wave 1

"I didn't choose it as all the issues are important" – Wave 1

"I did notice 'none', but all are important to me" – Wave 2

Presentation of choices

Most participants thought the presentation of the best-worst scaling exercise worked well. The criteria title was very important…

"The labels are really important…a quick bullet point of what it means" – Wave 2

"The is really important as it sets the tone, and then can read more about if you don't understand" – Wave 2

Similarly, the icons were very useful in terms of breaking up the text and providing some graphic representation.

"The icons were pretty good, some were pretty obvious, some were too similar so not as obvious" – Wave 2

"The icons add value, they helped to explain the idea" – Wave 3

There were a couple of people who thought the icons would be helpful generally, but for them specifically, they focused more on the words.

"It needs some sort of image, but I wasn't paying much attention as I was concentrating more on the words" – Phase 2

There was a slight concern was the number of repeated choices. Some felt the number of choices was 'not excessive', 'just about right' and 'manageable', while others felt there were too many choices and that the process became too repetitive.

General points

Survey length

Most respondents were comfortable with the length of the survey, although it was erring on being too long, but there was recognition that a lot of information was needed to obtain meaningful answers.

"It's fairly long, definitely needs a lot of information…needs to be that long to do what it needs to do" – Wave 1

While most said the length was 'about right', 'fine' or 'okay', there was concern that with people's busy lifestyles, the survey might be too long.

"…depends on who has to complete it; for people with busy lifestyles in London, it might be too long but I'm not sure how to shorten it" – Wave 2

Other factors

Apart from people's own experiences there was little else that influenced people's answers in the survey.

"My own experience was a big factor – I'm in a first floor flat not exposed to extreme weather, so I was more focused on climate change and reducing the impact of pollution on seas and wildlife" – Wave 1

Although Covid-19 was still an issue in early summer, restrictions had started to ease. In any case, the pandemic was considered relevant in people's responses to the survey.

Summary

Overall, the testing process helped refine and improve the survey content to help ensure it was fit for purpose. Respondents understood what was being asked of them, they comprehended the value criteria and best-worst scaling exercise to a good extent; and they were able to articulate clearly the reasons for their choices.

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Appendix C: Household Survey

Appendix C - Household Survey.pdf

Appendix D: Non-Household Survey

Appendix D - Non-Household Surv

Appendix E: Summary Statistics

Appendix E - Summary Statistics.xls

Appendix F: Choice Model Estimations

Household – Mixed Logit / Ranked Ordered Logit Estimation – Full Sample

Attribute	Coef.	Odds Ratio	95% CI
Create more green space	0.573***	1.774	1.349 - 2.333
Reduce risk of wastewater flooding due to extreme wet weather	1.368***	3.929	3.120 - 4.946
Reduce the number of properties affected by internal flooding from sewers	1.415***	4.117	3.140 - 5.398
Reduce the number of properties affected by external flooding from sewers	1.340***	3.818	3.007 - 4.848
Reduce the amount of rainfall entering the wastewater system	0.668***	1.951	1.575 - 2.416
Continue to meet environmental standards for rivers	1.454***	4.278	3.334 - 5.490
Reduce number of storm overflows from the wastewater system	1.310***	3.705	2.966 - 4.628
Net zero carbon impact	0.566***	1.761	1.331 - 2.328
Maximise positive environmental impact	1.237***	3.445	2.697 - 4.401
Reduce pollution incidents	1.807***	6.095	4.606 - 8.065
Fix wastewater misconnections	1.100***	3.003	2.310 - 3.904
Inspect and maintain pipes to reduce number of sewer collapses	1.985***	7.282	5.463 - 9.706
Work with other organisations that are responsible for drainage	(base)	1.000	-
Deliver the plan at an affordable cost	1.742***	5.708	3.951 - 8.246

Model fit	
No. respondents	400
No. of observations (ranking sets)	5357
No. of choice sets ('exploded' ranking sets)	10712
No. of estimated parameters	26
LL(0)	-9597.76
LL(β)	-8609.38
Pseudo-R2	0.116
Akaike Information Criterion (AIC)	17270.76
Bayesian Information Criterion (BIC)	17483.84

Note: (1) * p<.1; ** p<.05; *** p<.01, (2) OR's sharing a letter are not significantly different at the 5% level

Non-Household – Mixed Logit / Ranked Ordered Logit Estimation – Full Sample

Attribute	Coef.	Odds Ratio	95% CI
Create more green space	0.134	1.575***	(0.726 - 1.560)
Reduce risk of wastewater flooding due to extreme wet weather	1.236***	3.442	(2.511 - 4.372)
Reduce the number of properties affected by internal flooding from sewers	1.294***	3.649	(2.489 - 4.808)
Reduce the number of properties affected by external flooding from sewers	1.342***	3.828	(2.659 - 4.998)
Reduce the amount of rainfall entering the wastewater system	0.608***	1.837	(1.337 - 2.336)
Continue to meet environmental standards for rivers	1.043***	2.839	(2.065 - 3.613)
Reduce number of storm overflows from the wastewater system	1.199***	3.317	(2.472 - 4.161)
Net zero carbon impact	0.351*	1.421	(0.898 - 1.944)
Maximise positive environmental impact	0.956***	2.601	(1.839 - 3.363)
Reduce pollution incidents	1.326***	3.765	(2.678 - 4.852)
Fix wastewater misconnections	0.928***	2.529	(1.843 - 3.215)
Inspect and maintain pipes to reduce number of sewer collapses	1.835***	6.267	(4.343 - 8.191)
Work with other organisations that are responsible for drainage	(base)	1.000	-
Deliver the plan at an affordable cost	1.413***	4.110	(2.632 - 5.587)
Model fit			
No. respondents	149		
No. of observations (ranking sets)	1984		
No. of choice sets ('exploded' ranking sets)	3966		
No. of estimated parameters	26		
LL(0)	-3553.46		
LL(β)	-3240.31		
Pseudo-R2	0.088		
Akaike Information Criterion (AIC)	6532.62		
Bayesian Information Criterion (BIC)	6696.04		

Note: (1) * p<.1; ** p<.05; *** p<.01, (2) OR's sharing a letter are not significantly different at the 5% level

Segmentation By Region- Full Estimation - Household

Attribute	Within London		Outside London	
	Coef.	Odds Ratio	Coef.	Odds Ratio
Inspect and maintain pipes to reduce number of sewer collapses	1.320	3.742	1.688	5.407
Reduce pollution incidents	1.178	3.249	1.724	5.607
Continue to meet environmental standards for rivers	0.957	2.603	1.563	4.771
Deliver the plan at an affordable cost	1.021	2.776	1.360	3.897
Reduce risk of wastewater flooding due to extreme wet weather	0.974	2.648	1.369	3.933
Reduce the number of properties affected by internal flooding from sewers	0.894	2.444	1.426	4.164
Reduce the number of properties affected by external flooding from sewers	0.927	2.528	1.369	3.931
Reduce number of storm overflows from the wastewater system	0.879	2.408	1.339	3.814
Maximise positive environmental impact	0.867	2.379	1.205	3.337
Fix wastewater misconnections	0.796	2.217	1.182	3.260
Create more green space	0.443	1.557	0.843	2.323
Reduce the amount of rainfall entering the wastewater system	0.568	1.765	0.525	1.690
Net zero carbon impact	0.317	1.374	0.653	1.922
Work with other organisations that are responsible for drainage	(base)	1.000	(base)	1.000
Model Fit	**Within London**		**Outside London**	
Nr. respondents	263		137	
Nr. of observations (ranking sets)	3524		1833	
Nr. of estimated parameters	13		13	
LL(0)	-6642.07		-3561.44	
LL(β)	-6407.49		-3343.74	
Pseudo-R2	0.035		0.061	

Note: All coefficients and OR's are significantly different from the base level at the 1% significance level.

Segmentation By Socio Economic Group – Full Estimation - Household

Attribute	AB		C1C2		DE	
	Coef.	Odds Ratio	Coef.	Odds Ratio	Coef.	Odds Ratio
Inspect and maintain pipes to reduce number of sewer collapses	1.553	4.726	1.522	4.583	1.090	2.974
Reduce pollution incidents (	1.324	3.759	1.447	4.251	1.186	3.273
Continue to meet environmental standards for rivers	1.126	3.083	1.261	3.529	0.935	2.547
Deliver the plan at an affordable cost	0.859	2.362	1.273	3.572	1.162	3.196
Reduce risk of wastewater flooding due to extreme wet weather	1.136	3.116	1.225	3.406	0.790	2.204
Reduce the number of properties affected by internal flooding from sewers	1.179	3.251	1.089	2.970	0.889	2.433
Reduce the number of properties affected by external flooding from sewers	1.079	2.943	1.137	3.116	0.907	2.476
Reduce number of storm overflows from the wastewater system	1.036	2.818	1.096	2.993	0.858	2.359
Maximise positive environmental impact	0.944	2.571	1.086	2.963	0.768	2.154
Fix wastewater misconnections	0.963	2.619	1.018	2.767	0.633	1.884
Create more green space	0.599	1.821	0.576	1.778	0.543	1.721
Reduce the amount of rainfall entering the wastewater system	0.489	1.631	0.677	1.969	0.350	1.420
Net zero carbon impact	0.365	1.441	0.449	1.567	0.438	1.549
Work with other organisations that are responsible for drainage	(base)	1.000	(base)	1.000	(base)	1.000
Model Fit	**AB**		**C1C2**		**DE**	
Nr. respondents	128		198		74	
Nr. of observations (ranking sets)	1726		2657		974	
Nr. of estimated parameters	13		13		13	
LL(0)	-2378.54		-5094.28		-2730.70	
LL(β)	-2240.40		-4844.09		-2666.30	
Pseudo-R2	0.058		0.049		0.024	

Note: All coefficients and OR's are significantly different from the base level at the 1% significance level.

Segmentation Vulnerability – Full Estimation - Household

Attribute	No Vulnerability		Physical Vulnerability		Financial Vulnerability		Physical and Financial Vulnerability	
	Coef.	Odds Ratio	Coef.	Odds Ratio	Coef.	Odds Ratio	Coef.	Odds Ratio
Create more green space	0.584***	1.793	0.826***	2.283	0.291**	1.337	0.575**	1.778
Reduce risk of wastewater flooding due to extreme wet weather	1.260***	3.526	1.118***	3.058	0.506***	1.659	0.442*	1.557
Reduce the number of properties affected by internal flooding from sewers	1.164***	3.203	1.160***	3.189	0.617***	1.854	0.669***	1.952
Reduce the number of properties affected by external flooding from sewers	1.298***	3.662	1.044***	2.841	0.555***	1.742	0.722***	2.058
Reduce the amount of rainfall entering the wastewater system	0.642***	1.900	0.644***	1.903	0.108	1.115	0.193	1.213
Continue to meet environmental standards for rivers	1.208***	3.347	1.332***	3.790	0.677***	1.967	0.769***	2.157
Reduce number of storm overflows from the wastewater system	1.175***	3.239	1.236***	3.440	0.454***	1.575	0.935***	2.547
Net zero carbon impact	0.488***	1.629	0.582***	1.790	0.093	1.097	0.356	1.427
Maximise positive environmental impact	1.035***	2.816	1.053***	2.866	0.747***	2.111	0.869***	2.386
Reduce pollution incidents	1.444***	4.240	1.503***	4.497	0.897***	2.452	1.076***	2.934
Fix wastewater misconnections	1.100***	3.003	0.944***	2.569	0.363**	1.438	0.498**	1.645
Inspect and maintain pipes to reduce number of sewer collapses	1.629***	5.099	1.458***	4.296	0.884***	2.420	1.078***	2.938
Work with other organisations that are responsible for drainage	(base)	1.000	(base)	1.000	(base)	1.000	(base)	1.000
Deliver the plan at an affordable cost	1.173***	3.231	1.234***	3.434	0.921***	2.511	1.062***	2.891

Model Fit	No Vulnerability	Physical Vulnerability	Financial Vulnerability	Physical and Financial Vulnerability
Nr. respondents	224	129	85	38
Nr. of observations (ranking sets)	3018	1698	1134	493
Nr. of estimated parameters	13	13	13	13
LL(0)	-4949.62	-3742.70	-2841.62	-1330.44
LL(β)	-4669.02	-3598.22	-2780.40	-1298.68
Pseudo-R2	0.057	0.039	0.022	0.024

Note: 1 * p<.1; ** p<.05; *** p<.01.

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Final Report | May 2022

Navigating our DWMP

We've developed a comprehensive document suite to share our final DWMP. This includes five summary documents that contain increasing levels of detail. To help you to navigate around our document suite and to find key DWMP content, we provide a Navigation index below and on our DWMP webpage. The orange cells refer to where key DWMP content can be found across our final document suite.

Navigation index		Protecting the environment and providing a reliable, sustainable wastewater service							Best value and delivery					Working together		DWMP stages and data				
		Storm overflows	Sewer flooding	Level of ambition & pace of delivery	Growth & climate change	Resilience: flooding & power	Groundwater	Environmental assessments	Affordability & bill impact	Best Value	Base vs Enhancement	Solutions & deliverability	Programme alignment	Partnership working	Stakeholder & customer engagement	DWMP stages & process	Level 2 regional summaries	Level 3 regional summaries	Data tables	Risk & Assurance
Summary documents	Customer summary	■	■											■	■	■				
	Non-technical summary	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	Technical summary	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	The Plan	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	Catchment Strategic Plans x13	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■		
Technical appendices x11	Appendix A - Strategic context												■			■				
	Appendix B - Risk-Based catchment screening															■				
	Appendix C - Baseline risk and Vulnerability assessment				■	■										■				
	Appendix D - Options development and appraisal	■										■				■				
	Appendix E - Programme appraisal	■		■		■			■	■	■	■	■			■				
	Appendix F - Stakeholder engagement														■	■				
	Appendix G - Adaptive pathway planning	■	■		■															
	Appendix H – Customer engagement Part A – Draft DWMP														■	■				
	Appendix I - Risk and uncertainty											■								■
	Appendix J - DWMP and WRMP alignment												■							
	Appendix M - Assurance																			■
New technical appendices x9	Appendix N - You Said, We Did (YSWD)	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
	Appendix O - What base buys										■									
	Appendix P - Response to July 2021 Floods		■	■	■	■			■			■	■	■	■					
	Appendix Q - Storm overflows	■		■	■				■				■							
	Appendix R - Delivery of SuDS and nature-based solutions	■	■	■	■	■			■	■		■	■	■	■					
	Appendix S - Partnership opportunities and working			■								■		■	■					
	Appendix T - Groundwater quality						■													
	Appendix U - Resilience		■		■	■							■	■	■					
	Appendix V – Customer engagement Part B – Consultation Survey Report														■					
Environmental assessments	Appendix K - Strategic environmental assessment (SEA)							■												
	Appendix L - Habitats regulations assessment (HRA)							■												
Portals and data	Customer portal	■	■							■		■		■	■	■	■	■		
	Practitioner portal	■	■											■	■		■	■		
	Data tables			■							■								■	
	Data tables commentary																		■	

We welcome your views on our DWMP. Please share them with us by emailing: DWMP@thameswater.co.uk.

This document reflects our DWMP 2025-2050 as published in May 2023.