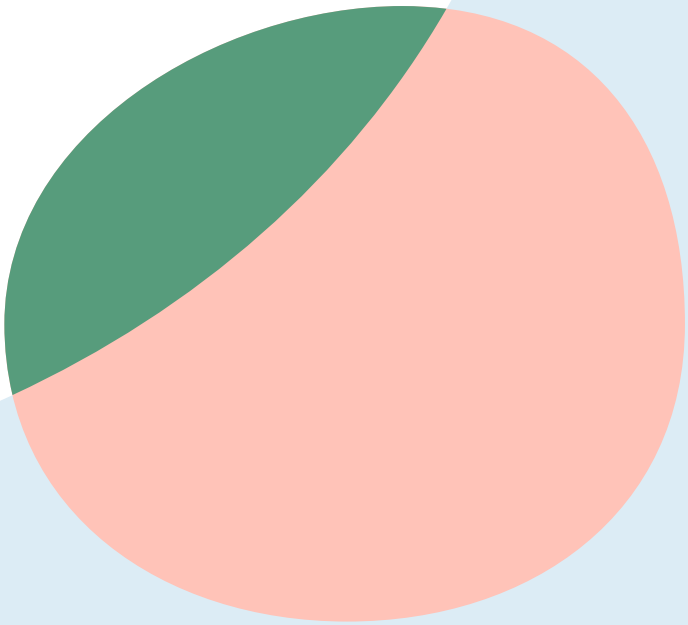
August 2023

PR24: Using collaborative customer research to set outcome delivery incentive rates



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About this document

This document sets out our approach to setting indicative outcome delivery incentive (ODI) rates for the 2024 price review (PR24).

Executive summary

Outcome delivery incentives (ODIs) align the interests of companies and their investors with the interests of customers and the environment by directly linking performance with expected financial returns. We want these payments to provide powerful incentives on companies to focus on performance, taking account of the value to customers of each aspect of service.

At the 2019 price review (PR19), companies proposed their own ODI rates as part of their business plan submissions, with supporting evidence. Companies' analysis resulted in customer valuations which varied between companies, with no credible underlying drivers that could explain such variation.

A greater emphasis on common performance commitments (PCs) at PR24 provided an opportunity to do things differently. Therefore, at PR24, we intended to use the same research to set indicative ODI rates across all companies. This research was led by Ofwat, working closely with the Consumer Council for Water (CCW), companies and stakeholders as part of the collaborative customer research for PR24.

The research consisted of:

- an **impact-based exercise** where respondents were asked which of a pair of service incident failures would have the most impact on their household, for example a 6-hour unplanned water supply interruption or a serious pollution incident in a river within 5 miles of their house; and
- a **compensation-based exercise** where respondents were asked whether they would rather experience a service failure and receive a specified amount of compensation, or not experience the service failure and not receive the compensation.

The survey and analysis produced customer valuations for 26 different service incidents at a company specific level, as well as for England and Wales.

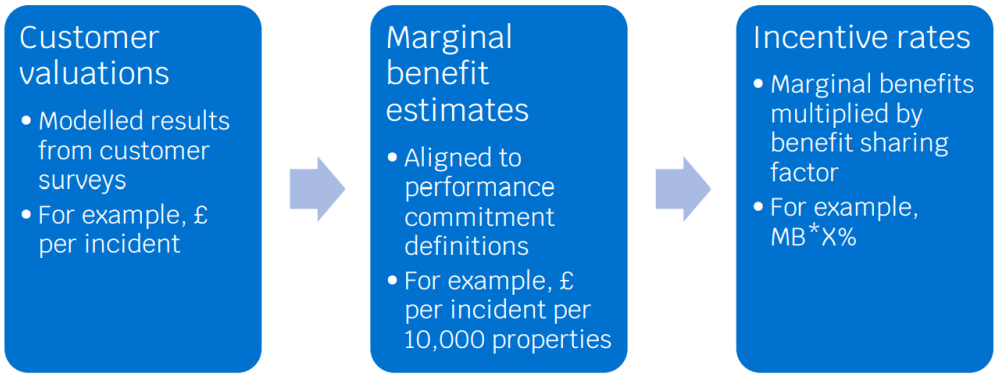
For the majority of PCs, we planned to use a 'bottom-up' approach to set indicative ODI rates primarily based on estimates of marginal benefit from the collaborative customer research. In some areas, for example asset health, we recognised that a 'top-down' approach might be appropriate because these incidents do not affect customers directly.[1] [2]

In the survey, we intentionally described service failures in a way that was meaningful to customers so that the valuations could be as robust as possible. For example, customers were

[1] Ofwat, 'PR24 final methodology – Appendix 8', December 2022, pp. 6-7.
[2] A 'top-down' approach is where incentive rates are derived from a company's overall potential payments, for example as a proportion of a company's regulatory capital value (RCV) divided over a selected performance range, and informed by customers' priorities and regulatory judgement.

asked about the impact of a hosepipe ban instead of the risk of experiencing water restrictions. However, these descriptions of service failures do not exactly align with our PC definitions. We therefore needed to 'map' between the service incidents customers valued and the PC definitions.

Process for setting incentive rates using collaborative customer research



However, we encountered a number of challenges when mapping from the service incidents customers valued to PC definitions.

Mapping was more complex than anticipated and relied on good quality historic data, for example how likely it is that drought restrictions would be imposed with changes in leakage levels. In some areas this data was readily available, for others we were unable to identify robust data sets in the time available. This meant we were unable to complete the mapping exercise for half of the PCs.

Where we were able to complete the mapping exercise, the majority of the rates were outside the range of expectations. Some rates were very low, some implausibly so, and would not sufficiently incentivise companies to improve their performance. Other rates were very high, some implausibly so, and were not consistent with the ±1 to ±3% return on regulatory equity (RoRE) each year that we set out in the final methodology.[3] Further qualitative research supported our concern that these rates significantly exceeded customers' underlying willingness to pay.

Without robust marginal benefit estimates from the collaborative customer research and mapping exercise, we decided to set all indicative ODI rates using a 'top-down' approach based on equity return at risk. We continued to use the research to ensure that the incentive rates reflect the importance customers place on each outcome.

The use of a top-down approach across all PCs ensures consistency in how we set rates across the package of ODIs. And the collaborative customer research informs the indicative ODI rates we set, with a higher proportion of regulated equity being assigned to the areas prioritised by customers.

[3] Ofwat, 'Creating tomorrow, together: Our final methodology for PR24', December 2022, p. 69.

The indicative ODI rates we have developed using a top-down approach are set out in Appendix 4. As part of our quality and ambition assessment, companies must use these indicative rates in their business plans or provide compelling evidence to support any alternatives.[4]

Working with companies and industry, we will continue to learn and build on this approach to set ODI rates as part of PR24 determinations and at future price reviews.

[4] Our expectations and requirements for the quality and ambition assessment are set out in Ofwat, 'Creating tomorrow, together: Our final methodology for PR24', December 2022, chapter 11.

Contents

1. Introduction

This document sets out our approach to setting indicative outcome delivery incentive (ODI) rates using collaborative customer research which forms part of the preparatory work for Ofwat's 2024 price review (PR24). This price review will set controls for the period from 2025 to 2030 for water and wastewater monopoly service providers in England and Wales.

Within PR24, an outcomes framework holds water companies to account for the outcomes that customers pay for and incentivises companies to go further where it is in the interests of customers and the environment. We do this by defining performance commitments (PCs) which measure the level of service provided for a particular outcome.

In previous price reviews, PCs have been defined for each regulated company, with some overlaps. The approach at PR24 is to have a set of PCs which are common across all companies with a small number of 'bespoke' PCs specific to an individual company.

PR24 will set performance levels for each company for each of the common PCs and financial incentives for under- and (for some PCs) over-performance against those targets. These financial incentives are known as ODI rates. For the majority of PCs, we planned to set these rates at a level consistent with the benefits to consumers of the improvement in service (sometimes referred to as 'marginal benefit'). This incentivises companies to improve services if the cost of doing so is less than the customer benefit.

At the 2019 price review (PR19), and previous price reviews, companies proposed their own ODI rates as part of their business plan submissions, with supporting evidence. As part of this evidence, most companies submitted customer research designed specifically to estimate customer benefit. Typically this research took the form of a survey in which customers are asked to answer a set of questions designed to elicit their preferences and valuations of services and outcomes related to the PCs.

Customer surveys were first used to assess demand for services in the 1999 price review and have featured in every price review since.[5] Data from these surveys were modelled using econometric techniques to generate valuation estimates of the benefit to customers of various aspects of their service. These, in turn, were used as inputs into financial and cost benefit investment appraisal and into price reviews.

The application of these methods has always been challenging. Research commissioned by the Consumer Council for Water (CCW) in 2019 found that many customers had low awareness and interest in the sector overall and some felt that related decisions were too technical for

[5] See Willis and Sheldon, 'Research on customers' willingness-to-pay for service changes in UK water company price reviews 1994–2019', Journal of Environmental Economics and Policy: 1-17, May 2021.

them to make.[6] Customer surveys often involve respondents having to make trade-offs based on risks around service delivery and/or putting monetary values on individual or multiple service attributes based on stimulus material within the research. In many other sectors where these methods are used, eg transport, research participants can draw on well-formed preferences based on experience, but in water the stimulus material is in part educational and preferences have to be formed based on this.

At PR19 the approaches adopted by companies and quality of research undertaken varied substantially. Most notably, we observed that results from customer valuations of common PCs could greatly vary across companies.[7]

A meta-analysis of past ODI rates research reported in a paper by Metcalfe and Sen (2021) provided strong empirical evidence that much of the variation between company estimates of marginal benefit were attributable to differences in research design, particularly the way questions were asked, rather than underlying consumer preferences.[8] The research also highlights the importance of survey questions being as close as possible to what customers know and understand.

A greater emphasis on common PCs at PR24 provided an opportunity to do things differently and has resulted in the same research being commissioned to underpin the setting of ODI rates across all companies – the 'ODI Rates Research'. This research has been led by Ofwat, working closely with CCW, companies and stakeholders as part of the collaborative customer research for PR24.[9]

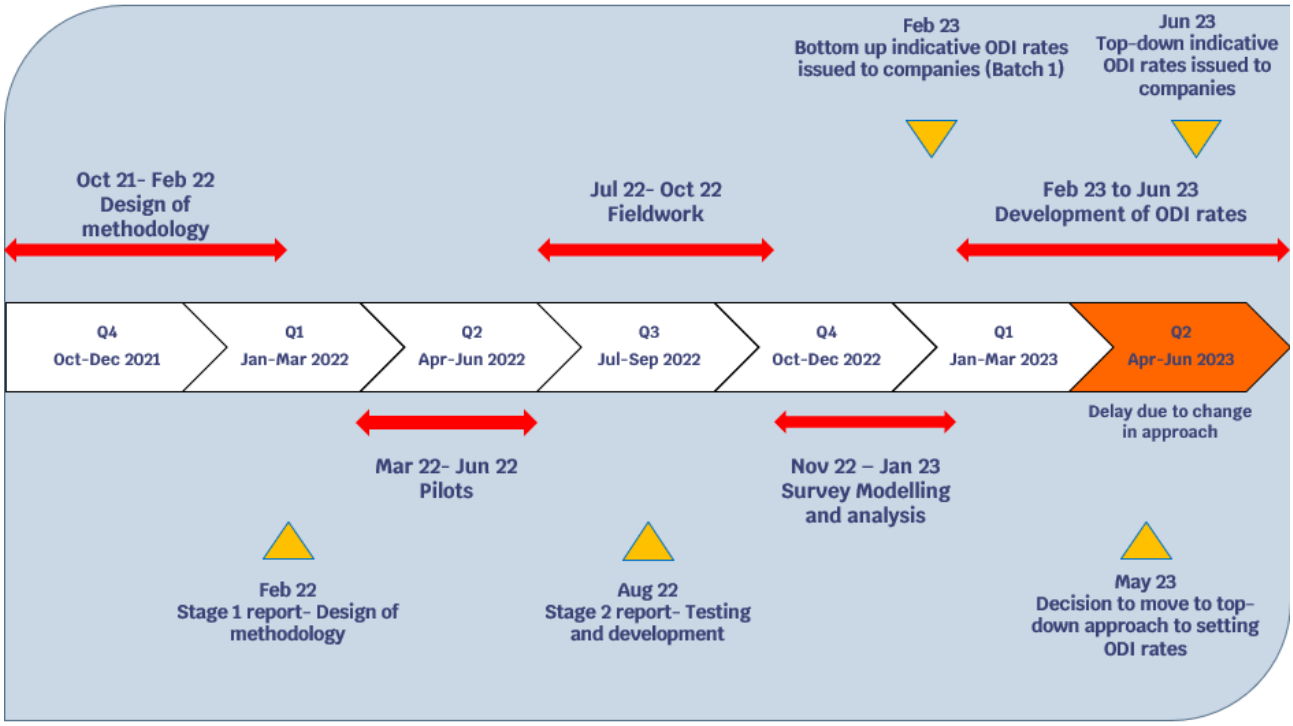
The ODI Rates Research covers a large body of work and is reported here in four separate sections:

- Chapter 2: Design of methodology;
- Chapter 3: Survey design and fieldwork;
- Chapter 4: Survey modelling and analysis; and
- Chapter 5: Developing ODI rates

Chapter 6 then describes the 'top-down' approach to setting indicative ODI rates subsequently adopted for reasons set out within this report.

[6] Consumer Council for Water (CCW), 'Engaging water customers for better consumer and business outcomes', May 2020.
[7] Ofwat, 'PR24 and beyond: Our reflections on lessons learnt from PR19', December 2020, p. 6.
[8] Metcalfe and Sen, 'Sensitivity to scope of water and wastewater service valuations: A meta-analysis of findings from water price reviews in Great Britain', Journal of Environmental Economics and Policy, Volume 11, Issue 1 (2022), pp. 21 – 38.
[9] Ofwat, 'PR24 and beyond position paper: Collaborative customer research for PR24', October 2021.

Figure 1.1: ODI rates research timeline



2. Design of Methodology

In October 2021, Ofwat and CCW jointly commissioned Accent and PJM Economics to develop a methodology for the collaborative customer research to support the setting of ODI rates for PR24.[10] The contract was in two stages, the first was to review approaches to setting ODI rates and recommend a preferred approach. The second was to develop the detailed design of the preferred approach. This chapter will focus on the first of these stages.

A review of possible approaches to ODI rates research was completed in November 2021 with the delivery of the following reports (all authored by Accent and PJM Economics unless otherwise stated):

- initial consultation;
- industry literature review;
- academic literature review;
- review of ODIs in other countries and sectors (Frontier Economics).

2.1 Initial Consultation

Accent and PJM Economics conducted wide-ranging interviews with representatives of the water companies, customer challenge group chairs and Water UK, aimed at capturing relevant insights and perspectives on the development of ODI rates research for PR24.[11]

Key points coming out of these interviews were as follows:

- stakeholders broadly supported the rationale for the collaborative research programme and there were no significant concerns regarding the governance of the programme;
- companies queried the extent to which customer valuations would also form the basis of a broader valuation framework for asset planning, some arguing that different contexts required different valuations;
- most companies said that they would conduct their own willingness-to-pay/valuations research, eg for bespoke PCs and enhancement cases, with some saying that they would also conduct ODI research for triangulation with the collaborative research; and
- some companies commented on the risks of the results of collaborative ODI research coming out late in the business planning process and necessitating late changes.

We also received the following views on research methods:

[10] Accent and PJM Economics, 'ODI Research: Design of Methodology – Stage 1 report', January 2022.
[11] Accent and PJM Economics, 'ODI Research: Design of Methodology - Initial Consultation Report', November 2021.

- stakeholders highlighted the need for engaging and accessible survey materials, with several mentioning the importance of thorough testing;
- other conceptual issues included whether to ask ODI rates directly in the research and whether customers be asked to participate in the research as citizens or individuals;
- some stakeholders pointed out the risk of relying on a single approach to the research rather than triangulating the results of several different ones;
- while most supported a centralised approach to the fieldwork, whereby the survey for the ODI rates research is commissioned under a single contract for all companies, some risks were identified associated with commissioning an agency specifically for fieldwork rather than combining it with analysis;[12]
- some larger companies had concerns that survey sample sizes might not be large enough to be meet their analytical needs;
- sample source was also raised with differing views on the use of online panels for surveying households; and
- one company suggested using retailers as a conduit for recruiting non-household customers.

Detailed consideration of stakeholder responses can be found in the Initial Consultation Report.[13]

2.2 Review of approaches to setting ODI rates

As part of the industry literature review Accent and PJM Economics reviewed:

- research by water companies for PR19, and how it influenced the setting of PC levels and ODI parameters;
- research conducted by energy companies for RIIO-2, and how it influenced the setting of output levels, consumer value proposition cases, and ODI parameters.[14]

Frontier Economics also conducted a review of ODIs in other countries and sectors.[15]

Water

In its PR19 final methodology, Ofwat presented the conceptual framework for setting performance commitment levels (PCLs) and ODI rates. One of the principles was that PCLs were set based on the efficiency principle of setting a target at a level where marginal cost to the company of improving performance is equal to the marginal benefit to customers.

[12] The alternative is referred to in papers as the 'standardised' approach under which the research design is specified, but each company is then responsible for implementing the research with its own customers, including commissioning a market research company to carry out the research. An example of this is the approach subsequently adopted for affordability and acceptability testing.
[13] Accent and PJM Economics, 'ODI Research: Design of Methodology – Initial Consultation Report', November 2021.
[14] Accent and PJM Economics, 'ODI Research: Design of Methodology – Industry Literature Review', November 2021.
[15] Frontier, 'Review of ODIs in other countries and sectors', November 2021.

Companies were encouraged to use a range of information to determine valuations of the marginal benefit to customers. Companies employed a wide range of valuation methods, including:

- extensive use of Stated Preference (SP) research among customers;[16]
- revealed preference;
- behavioural experiments;
- value transfer methods;
- subjective wellbeing approaches;
- gross value added approaches;
- deliberative valuation workshops; and
- market price studies.[17]

Energy

In the price review for the energy sector in the UK, the network price controls 2021-2028 (RIIO-2), energy companies conducted a range of customer engagement activities to inform the level of the ODI rates in their business plans.[18] Energy companies typically used uninformed research to obtain high-level customer priorities and informed research to identify customers' specific priorities.[19]

SP approaches were widely used by companies for valuation in the RIIO-2. For instance, the four transmission operators in Great Britain conducted joint customer valuation research to estimate customers' willingness to pay for improvements in the services provided by the transmission operators.[20] The joint study aimed to maintain consistency in research methods across all transmission operators.

Many countries and sectors explored set the ODIs for water or energy sector on the basis of a 'top-down' approach. This may involve for example, a desired level of performance is set for a service, typically involving some improvement. The regulator then sets financial incentives, based on percentages of revenue or profits for over or under performance against the target.

[16] Stated Preference studies refer to analyses and estimates of consumer preferences based on what customers say their preferences are, typically in surveys, whereas revealed preference studies are based on actual behaviour, for example changes in water usage by metered customers following a change in the unit price of water.
[17] For explanations of these technical methods please refer to Accent and PJM Economics, 'ODI Research: Design of Methodology – Industry Literature Review', November 2021.
[18] Accent and PJM Economics, 'ODI Research: Design of Methodology – Industry Literature Review', November 2021, Section 3.
[19] 'Uninformed research' in this context means that research participants' were asked their preferences based on what they already knew. In contrast, 'informed research' is where information is provided within the research before preferences are asked.
[20] Namely, National Gird Gas Transmission, National Grid Electricity Transmission, SP Transmission and Scottish Hydro Electricity Transmission.

2.3 Academic literature review

Over the past three decades, much of the previous non-market valuation for the water sector used in price reviews has been based on SP methodologies. SP approaches typically consist of statistical sample surveys asking individuals, directly or indirectly, for their preferences on a non-market goods based on hypothetical scenarios.

There are two main types of SP methods:

- **contingent valuation methods** consist of survey questions asking respondents whether they would be willing to pay or accept a certain amount for a certain hypothetical policy outcome (eg a house-pipe ban);
- **choice experiment methods** involve asking individuals to make hypothetical choices usually involving a number of different 'attributes', for example setting out two scenarios for water supply interruptions involving different numbers of times the water is cut off, durations and times of day, and different water bill amounts.

The academic literature review sets out the pros and cons of these methodologies as well as discussing less commonly applied alternatives.[21]

A paper by Chalak and Metcalfe proposes a methodology which combines these two SP approaches.[22] It involves two SP exercises:

- an **impact-based exercise** where respondents are asked which of a choice of service incident failures would have the most impact on their household, for example a 6 hour unplanned water supply interruption or a serious pollution incident in a river within 5 miles of their house; and
- a **package valuation (or compensation-based) exercise** where respondents are asked to choose between combinations of service levels combined with bill impacts.

Each of the exercises is modelled separately and resultant estimates are combined to derive estimates of valuation of service failure incidents. The impact-based exercise does not require obtaining relative values from participants, which is difficult for services that customers are unfamiliar with paying for individually.

A variant of the method was used in a limited way in PR19. Respondents were asked whether they would rather experience a service failure and receive a specified amount of compensation, or not experience the service failure and not receive the compensation. The method avoids the need for participants to evaluate small changes to service levels which are

[21] Acceny and PJM Economics, 'ODI Research: Design of Methodology, Academic Literature Review', November 2021.
[22] Chalak and Metcalfe, 'Valuing water and wastewater service improvement via impact-weighted numbers of service failures', August 2021, pp. 39 - 55.

often poorly understood, or relate to a package of service levels which is difficult to assess. This makes the survey easier to complete for participants.

2.4 Collaborative Research Discussion

Following the review of methods, monthly Collaborative Research Steering Group meetings were held to discuss options for the survey methodology as well as options for survey administration and sampling.

At the January 2022 meeting of the Steering Group, Ofwat and CCW presented their thinking on various aspects of the design. The proposed approach was to use the SP method based on combining an impact-based exercise with a contingent valuation exercise.[23]

It was also proposed that a centralised approach would be used for survey delivery and analysis and this was supported by most stakeholders. Under this approach, the research would be commissioned and managed by Ofwat, working closely with CCW, while most of the cost of the research would be shared between companies.

Companies were invited to respond to these proposals and comment on the draft survey questionnaire. Their submissions covered a wide range of issues and these were summarised at the February Steering Group meeting with responses provided for each of the main points.[24]

Many of the points made by companies were repeated, and in some cases, developed further in the submission by 4 companies – Anglian Water, Northumbrian Water, South West Water and Wessex Water – of a peer review of the ODI Rates Research methodology they had jointly commissioned from Eftec.[25] The issues raised in the report were discussed between Ofwat, CCW, Accent, PJM Economics and their academic peer reviewers – Professors Ken Willis and Giles Atkinson, and Ofwat's peer reviewer Professor Stephane Hess and responses to the main points published.[26] [27]

Ofwat wrote to companies on the 3 February 2022 asking for their written agreement in principle to pursue a centralised approach to the conduct of the survey, summarising the benefits of a centralised as follows:

[23] A description of the method and example questions are provided in PJM Economics, 'Collaborative ODI Research: Final Survey Values Report', June 2023, pp 13-24.
[24] Ofwat, CCW, Collaborative customer research steering group meeting, February 2022.
[25] Eftec, 'Ofwat ODI Research Peer Review', April 2022.
[26] Stephane Hess is Professor of Choice Modelling and Director of the Choice Modelling Centre at the University of Leeds. For his peer review report refer to Hess, 'Collaborative ODI research - Review by Professor Stephane Hess', July 2023.
[27] Ofwat, 'ODI rates research: Efrac report themes', September 2022.

- **sampling efficiency** – to enable a more efficient sample to be drawn, integrating the different provider areas for water and wastewater within a single design and eliminating unnecessary duplication;
- **comparability** – to ensure comparability and consistency between companies providing more analytical and modelling capability, including national models that can be used to test for and understand differences in results between companies and, for example, preferences of consumers on low incomes; and
- **cost savings** – associated with a single design and procurement exercise rather than separate exercises for each company.

A range of issues and questions were raised by companies in their responses, including some relating to procurement, financing and data protection. Issues were discussed at the February meeting of the Collaborative Research Steering Group.[28] No company said that they would not participate in the research.

2.5 Stage 1 report

The Accent/PJM stage 1 report assessed the main options for the methodological design of the ODI rates research as well as key aspects of survey design and administration.[29] The main recommendations of the report were as follows:

- the core survey design should be based on the SP method which combines an impact-based exercise with a contingent valuation exercise;
- the contingent valuation exercise should ask surveyed customers about levels of compensation that would be acceptable for incurring service incident failures (willingness to accept in SP terminology), rather than how much they were willing to pay to avoid service incident failures;
- estimates from these two exercises should be combined to derive valuations for all the service failures;[30]
- two different methods should be tested for the household part of the customer survey:
    - a postal address file (PAF) approach, in which letters are sent to a random sample of addresses offering an incentive to complete a survey questionnaire either online or by requesting a paper version by post;
    - an online panel approach, supplemented with a face-to-face sample for sub-populations less likely to engage in panels;[31]
- for the non-household survey, the pilot should be based on a sample drawn from a commercial list of businesses and further work should be conducted to explore the feasibility of using customer lists obtained from retailers;

[28] Ofwat, CCW, Collaborative customer research steering group meeting, February 2022.
[29] Accent and PJM Economics, 'ODI Research: Design of Methodology – Stage 1 report', January 2022.
[30] For a description of the calculation see PJM Economics, 'Collaborative ODI Research: Final Survey Values Report', June 2023, pp. 91-92.
[31] An online panel is comprised of individuals who have expressed a willingness to participate in research, most commonly to respond to surveys. Most panels are recruited and managed by market research agencies.

- a minimum sample size of 500 household and 200 non-household customers per company (except for Hafren Dyfrdwy where smaller sample sizes would apply);
- a rigorous econometric analysis should be conducted to obtain the valuation estimates necessary to derive ODI rates;
- additional research should be conducted later in the business planning process to measure customer preferences with regard to the overall relationship between bills and service levels, alongside measurement of the acceptability and affordability of the business plan.

The report also highlighted an important additional step in the analysis necessitated by the overall design, which was ascribed the name of 'mapping'. Many of the SP methodologies adopted by companies in previous price reviews provided unit valuations that were consistent with the units of measurement for the corresponding PC, for example, a direct valuation for percentage change or volume change in water leakage. This was not the case for the proposed approach for PR24 which instead values a set of incidents that could impact the customer in some way, eg a supply interruption or a boil water notice making the questions simpler to answer for the respondent.

Mapping requires the marginal value associated with each of these PCs to be modelled ('mapped') as a function of the likelihood of each of the incidents for which valuations are estimated in the research.

For some PCs this mapping would be relatively straight forward, for example, internal sewer flooding, for which the research will provide a valuation for the impact on a household of an internal sewer flooding incident and the mapping exercise requires a calculation to multiply these values up to the PC definition of the number of internal sewer flooding incidents per 10,000 households, for each of the water companies.

For other PCs the mapping would be considerably more complicated, for example, leakage. The proposed PR24 approach provides descriptions (and subsequently valuations) of three types of customer-focussed incident which are potential consequences of leakages - a hose hosepipe ban, a drought restriction and low flows in rivers (due to more water needing to be abstracted). The mapping requires estimates of the how likely these incidents are to occur with changes in leakage levels.

The report defines an incident or incidents for each common PC within the research scope, together with an outline method of the mapping methodology.[32] It also sets out a method for avoiding double counting as well as addressing a particular issue regarding the mapping methodology for water quality contacts.

[32] See Accent and PJM Economics, 'ODI Research: Design of Methodology – Stage 1 report', January 2022, Section 3.4 and Appendix 1.

2.6 Ofwat View

Ofwat accepted the recommendations of the Stage 1 report. Our starting point was a desire for ODI rates to be, as far as possible, driven by customer preferences. Despite inherent difficulties, a large-scale customer sample survey containing questions relating to some form of stated preference choice methodology is the clearest way in which to give voice to a large and representative body of both household and non-household customers.

SP approaches are widely accepted and practised for valuing non-market goods, including changes in water services. However, our experience and findings from academic literature suggest that such methodologies can result in distorted valuations if not designed carefully. The key to the design of this type of research is to make the survey questionnaire as relatable and straightforward as possible for research participants.

We believe that the Chalak and Metcalfe approach achieves this by presenting customers with descriptions of incidents that may affect them, rather than less relatable metrics of the performance indicators themselves. It then reduces questions about these incidents to the most straight forward set of choices possible within the requirement of being able to model responses to provide the valuation estimates required.

We were confident that basing the contingent valuation of two services on willingness to accept had as much validity as the more commonly utilised willingness to pay, while recognising that it could result in higher valuations. The method did not attempt to explore 'package effects' – customers preferences regarding the potential cumulative impact on bills of over performance against a number of PC levels and this may, again, remove a potential constraint on customers' overall preferences, providing further reason for some over estimation. We concluded that other mechanisms could be bought into play to adjust for these potential over-valuations including calibration of the benefit sharing factor and an analysis of the risks to companies and to customers of the package of incentives as part of the wider price review.[33]

This method represented a radical step towards a more customer-focused experience of water and wastewater services, but it was largely untested which carried risks. A more meaningful engagement with customers also incurs a trade-off in the sense that the research generates a set of valuations which are a step removed from PC definitions, requiring an additional mapping stage. This was recognised as being analytically and conceptually challenging for some PCs, but we did not have significant doubts about its feasibility at this stage.[34]

The recommendations regarding survey methodology were less of a departure from previous practice. On the household side, Ofwat initially favoured the PAF-based approach based on a

[33] Ofwat, 'Creating tomorrow, together: Our final methodology for PR24', December 2022, pp. 66-70.
[34] At this stage, we anticipated PCs relating to water demand and water quality as being the most difficult. Asset health PCs were a special case, acknowledged from the outset as a stretch for this research.

random probability sample. However, most companies expressed a preference for an online panel approach and we agreed that the practical and cost benefits of this approach merited it being tested alongside the PAF-based approach. On the non-household side, the only feasible option available for the testing phase of the research was the use of commercial lists due to the lack of other sources.[35] However, there was general agreement that if Ofwat could develop an approach based on retailer lists (company lists in Wales) then that would be preferable for the main stage of the fieldwork.

Minimum sample sizes were based on advice about the requirements of the econometric models and also by consideration of the practicalities of time and cost.

[35] Such as Dun and Bradstreet's business directory.

3. Survey design and fieldwork

This chapter summarises work by Accent and PJM Economics to develop the detailed design of the preferred survey approach and conduct the survey fieldwork.[36]

The development of the survey materials was iterative, with a first draft of the survey questionnaire and associated service level descriptions shared with companies for comment in February 2022. More developed drafts were shared in April, May and June 2022 for final sign off. Progress was discussed at monthly meetings of the Collaborative Research Steering Group, which included some detailed discussions on various aspects of the survey design.

The design was also informed by three rounds of qualitative research and two pilots undertaken with samples of customers. The first pilot took place in April 2022 and the second at the end of May 2022. Accent/PJM's report of this stage of the project gives a detailed account of the design and testing.[37]

3.1 Survey design

Much of the survey questionnaire comprised of questions which were not contributing directly to valuations, ie were not part of the Stated Preference question set. These included questions to:

- ensure that the respondent was eligible for the survey;
- establish experience of water service failures;
- understand the respondents' use of water and water services;
- record the ease with which respondents had been able to answer the SP questions; and
- determine the socioeconomic characteristics of the respondent (characteristics of the organisation for a non-household respondent).

The design of the SP questions was more challenging. The impact exercise involved asking respondents which of two service failure incidents would have the most impact on their household, for example, a water supply interruption or a storm overflow spill. Each survey respondent would be asked ten such questions with different combinations of service failures in each.

This presented two design challenges. First, the service failures had to capture outcomes that the customer could easily relate to but which could also be mapped into PC definitions.

[36] The commissioning of this research was put out to competitive tender and Accent/PJM Economics scored highest in our evaluation of bids.
[37] Accent and PJM Economics, 'ODI Research: Testing and Development - Stage 2 report', August 2022 and Accent and PJM Economics, 'ODI Research: Testing and Development Appendices', August 2022.

For example the Compliance Risk Index performance commitment, a complex metric designed to measure risk from treated water compliance failures, was measured by testing the impact on households of boil water and do not drink notices relative to other possible service failure incidents.

Second, each of the service failure incidents had to be described in an appropriate way. For example an external sewer flooding incident would need to convey a 'typical' severity of such a flooding event to ensure that respondents didn't systematically over- or under-assess their impacts. A total of 26 service incident descriptions needed to be developed.

Key factors to be included in service issue definitions were:

- type of issue, and its impact;
- whether any notification can be given;
- cause; and
- duration and timing.

There were several rounds of consultation to refine the descriptions with companies and stakeholders including the Environment Agency (EA), Natural Resources Wales (NRW), the Drinking Water Inspectorate (DWI). The definitions were also informed by cognitive testing with customers, as described below.

The second set of SP questions, the compensation exercise, asked survey participants whether they would prefer to experience a specific service incident with compensation, or not experience a service incident. For example, a boil water notice lasting 48 hours and compensation of £100, or no boil water notice and no compensation. The challenges for these questions were to choose two service failure incidents, referred to as 'pivot incidents', to which customers could reasonably assign a monetary value and to choose appropriate compensation amounts.

Testing was important for choosing which service failure incidents should be used in these questions and analysis of the survey data from the pilots enabled the compensation amounts to be appropriately calibrated.

3.2 Testing and piloting

Accent and PJM Economics undertook pilots alongside cognitive interviews to test the stated preference design and fieldwork methodology.

The cognitive interviews were completed in four waves and involved an interviewer asking a customer to complete the survey followed by questions about their experience of doing so

and their understanding and formulation of answers to individual questions. A full account of the cognitive interviews can be found in the Phase 2 report.[38]

3.2.1 First pilot and design changes

The first pilot was undertaken by Accent and PJM Economics to test the stated preference design and fieldwork methodology.

The following issues were examined in relation to the fieldwork methodology:

- response rates by customer group and characteristics, by mode, particularly focusing on Postcode Address File (PAF) approach for households; and
- feedback and variance of responses with respect to whether the non-household survey worked by telephone only, without the participant being able to see information on screen.

The sample size was 1,058 households, separated 50:50 between PAF and Panel methods. 80 non-households were surveyed.

The PAF and Panel samples both provided a higher age profile than Census data, and each had a similar level of ethnicity bias towards white participants. The PAF sample was closer to the Census age level but had a bias towards the highest social grade occupations. As a result of the strengths and weaknesses of both samples, Accent/PJM recommended that household sample is taken 50:50 from PAF and Panel.

A further set of issues were examined for the stated preference design. Accent/PJM highlighted two main findings in order to improve the survey:

- many participants were rejecting the highest compensation levels, which suggested that compensation amounts had been set too low and should be raised;
- relative value of the two service incident failures ('pivots') used in the compensation exercise were significantly different to those obtained from the impact exercise, indicating inconsistency in choice of participants between the exercises and suggesting the wrong choice of service failure incidents for this exercise.

Ofwat, CCW, Accent, PJM Economics and three academic peer reviewers agreed that due to the issues mentioned, a third set of cognitive interviews and a second pilot should be undertaken. These would assess two approaches to stated preference testing.

Version 1 used the same approach as Pilot 1, but changed the two service failure incidents for the compensation exercise to a 6 hour unplanned water supply interruption and a 48 hour

[38] Accent and PJM Economics, 'ODI Research: Testing and Development – Stage 2 report', August 2022, p. 13.

boil water notice, and the introduction of "one-off payment" replacing "compensation" in the question.

Version 2 combined the impact and compensation exercise into a single choice. This version was advocated by Ofwat's peer reviewer, Stephane Hess, who had explained how this approach would improve the accuracy of modelled valuation estimates, subject to testing that respondents would be able to engage well with the re-formulated questions.

3.2.2 Second pilot and design changes

Pilot 2 was used to test the two stated preference design versions. This included the examination of the same issues tested in Pilot 1. The sample used in Pilot 2 resulted in 402 households and 102 non-households completed questionnaires, split between the two versions tested.

Accent/PJM reported that the testing provided strong evidence in support of Version 1. The compensation questions provided a better distribution for modelling purposes and estimates of the relative value of the two pivot incidents were also more closely aligned across the two exercises. However, the use of "one-off payment" caused some issues, with some respondents thinking that this required a payment from the customer.

The issues identified with Version 2 were more complex overall. The impact ratings were highly consistent with expectations, however participants were insensitive to the compensation amounts offered. This meant that it was impossible for Accent/PJM to derive estimates from models of the responses.

Accent/PJM suggested that this may be due to some participants viewing the "one-off payment" as a payment from the customer, and that some participants were more focused on the service issues rather than the compensation offered.[39]

On the basis of these pilot results, we agreed with Accent/PJM's recommendation that Version 1 should be adopted for the main stage of the research. This included the two new pivot service issues in the compensation exercise, and the return to using "compensation" rather than "one-off payment" in the wording of the survey question.

3.3 Fieldwork

Accent was commissioned to conduct the fieldwork stage of the ODI rates research, with support from PJM Economics. The commission included a base sample of 8,654 household and 3,462 non-household interviews. Additionally, seven companies took up the opportunity

[39] There is a good theoretical basis for the version 2 approach and had more time been available for testing it may have been possible to design a viable approach.

to pay for 'booster' samples, totalling an extra 3,910 household and 280 non-household interviews. These were mainly the larger companies who wanted a larger sample to support analysis of sub-populations such as different areas of supply. A detailed account of the survey fieldwork can be found in 'Outcome Delivery Incentives Research: Main Survey Fieldwork'.[40]

The household survey took place between July 2022 and September 2022, whilst the non-household survey took place between August 2022 and October 2022. It is important to understand the context in which the fieldwork took place as this may have some bearing on the interpretation of results. Both surveys were conducted during the hottest English summer on record, and the 8th hottest Welsh summer.[41] The dry summer put pressure on the water sector, with many regions issuing hosepipe bans. Storm overflow spillages and their impacts were also being reported frequently in the media in the summer of 2022.

3.3.1 Household Survey

Part of the household sample was based on a random sample of addresses drawn from the Postal Address File (PAF) for each geographical area representing each water/wastewater supplier combination. Letters were sent to sampled addresses inviting them to complete an online survey, or request a paper copy of the questionnaire to complete offering a £10 incentive. The other part was based on a sample of online panel members who were invited to complete the survey online. A Welsh language version of the questionnaire was available to survey participants who lived in Wales.

With the combination of the Panel and PAF surveys, Accent undertook a total sample of 12,567 interviews and achieved the minimum sample of 500 household responses for each provider, except for Hafren Dyfrdwy for which lower targets applied for reasons of proportionality. 58% of the overall interviews were obtained via the PAF method and 42% using online panels meeting the stipulations of the sample design.

Respondents from both sample sources were broadly representative by sex and household size. However, both sources had more older respondents than the population as well as an over-representation of white respondents and those from socio-economic groups. Weighting was applied to the responses to ensure representativeness by sex, age and socio-economic group at individual company level.

3.3.2 Non-household Survey

A 'retailer list' approach was used to sample non-household customers. The approach relied on drawing a sample from MOSL's, Central Market Operating System, which holds a near complete record of non-household supply points in England, and matching these with

[40] Accent and PJM Economics, 'ODI Research: Main Survey Fieldwork - Stage 3 report', December 2022.
[41] Met Office, 'Joint hottest summer on record for England', September 2022.

contact details supplied by retailers.[42] In Wales, an alternative approach was used based on company lists. This approach had three clear advantages over alternatives:

- full coverage of non-household customers from which to draw a sample;
- sampling could be done at supply point level for which the MOSL database had a definitive record of water and wastewater suppliers; and
- retailer lists provided contact details (different combinations of email, telephone and postal address, often with named contacts) that were directly relevant to the organisations' purchase of water and wastewater services.

Customers were categorised for sampling purposes into three size bands according to their water usage and the higher band a customer was in, the higher their probability of being selected.

A total of 3,728 interviews were completed, which exceeded the overall target, and all targets for water-wastewater supplier combination targets were met ensuring a minimum achieved sample of 200 responses per supplier, again with the exception of Hafren Dyfrdwy for which a lower target was agreed. Of these 53% were based on email contacts, 29% on letters sent to customers inviting them to complete the survey online and 18% were completed by telephone.

Larger water users were, in practice, more difficult to survey and were under-represented against targets. Some industry sectors, notably 'Accommodation and Food Services' were over-represented in the achieved sample while others such as 'Administrative and Support Service Activities' were under-represented. Weighting was applied to at supplier level to make the sample representative by business size.

In our view, the surveying of non-household customers for the ODI Rates Research was innovative in the industry and was the most robust surveying approach to be utilised for a non-household customer sample survey in the water industry since the advent of the retail market. Nonetheless, the difficulty in surveying large customers and the low response rates, together with smaller samples overall compared to the household survey underlined the difficulties of achieving a high quality non-household customer survey dataset.

[42] Alternative arrangements were made to include missing non-household customers such as self-suppliers.

4. Survey modelling and analysis

PJM Economics were commissioned by Ofwat to conduct the modelling and analysis phase of the ODI Rates Research. The commission covered three main tasks:

1. analysis and reporting of the survey questions which did not fall under the choice methodology, such as those relating to whether respondents had experienced various service issues;
2. econometric modelling of responses to the incident impact and compensation exercise survey questions, this formed the major part of the work; and
3. analytical support to Ofwat for the mapping exercise, including spatial analysis using GIS software.

This stage of the research is reported in detail in 'Collaborative ODI Research: Final Survey Values Report'.[43]

4.1 Impact exercise analysis and findings

The relative impact for all 26 service incidents were obtained via an econometric analysis of responses to the impact stated preference exercise. The impact scores are shown in table 4.1 below for England and Wales combined. Impact scores measure the size of the relative impact of the described service failure on a customer, compared to other service failures and are scaled to sum to 100 within each sub-population.

Table 4.1: Impact scores of service incidents for household and non-households

Service incident	Household impact score	Non-household impact score
Sewer flooding: inside your property (1 month)	31.1	35.7
Sewer flooding: outside your property (1 week)	11.0	14.3
Emergency drought restrictions (2 months)	7.3	7.5
Unexpected water supply interruption (24h)	6.2	8.4
Do not drink notice (48h)	5.7	4.5
Boil water notice (48h)	4.1	3.2
Unexpected water supply interruption (6h)	3.8	5.9
Significant pollution incident nearby (4 weeks)	2.9	1.2
Water taste and smell (24h)	2.5	1.8
Discoloured water (24h)	2.4	1.8
Significant pollution incident elsewhere (4 weeks)	2.4	1.2
Discoloured water (6h)	2.2	2.0

[43] PJM Economics, 'Collaborative ODI Research: Final Survey Values Report', June 2023,

Water taste and smell (6h)	2.2	1.6
Planned water supply interruption (6h)	2.0	3.3
Unexpected low pressure (6h)	1.9	1.7
Low flows in rivers nearby (2 months)	1.7	0.7
Minor pollution incident nearby (1 day)	1.4	0.9
Low flows in rivers elsewhere (2 months)	1.3	0.6
River water nearby is not high quality	1.3	0.5
Storm overflow nearby	1.2	0.8
Hosepipe ban (5 months)	1.2	0.5
Minor pollution incident elsewhere (1 day)	1.1	0.5
River water elsewhere is not high quality	1.0	0.4
Storm overflow elsewhere in region	0.9	0.5
Coastal bathing water is not good quality	0.7	0.2
Coastal bathing water is not excellent quality	0.7	0.2

Internal sewer flooding incidents were by far the highest impact scenarios, and the impact ranking of the various other service issues was almost universally as expected based on previous customer research. For example, longer duration service issues were found to have a greater impact than shorter service issues of the same kind; nearby incidents were found to have a greater impact than similar incidents occurring further afield.

Furthermore, relative impacts also varied across people in a manner also consistent with expectation. For example, those using a hosepipe or sprinkler assigned higher impacts to a hosepipe ban; those frequently using rivers for recreation assigned higher impacts to service issues affecting rivers; those regularly visiting beaches assigned higher impacts to bathing water quality.

While impact scores for household customers were precisely estimated, the confidence intervals around non-household impact scores were wider, leading to wider confidence intervals around non-household customers' valuations. This lack of precision could be at least partly attributed to the substantially smaller sample size of the non-household survey in comparison to the household survey, but could also be attributable in part to a more heterogeneous population amongst non-households.

There was one case only, across all household and non-household results, which appeared anomalous, which was that the non-household impact score for a 6-hour discoloured water incident slightly exceeded the non-household impact score for a 24-hour discoloured water incident. The size of the difference in this case was small, but was found in England, Wales and England and Wales results.

4.2 Compensation exercise analysis and findings

Valuations for the two pivot service issues, i.e. a planned 6 hour supply interruption, and a boil water notice lasting 48 hours, were obtained via an econometric analysis of responses to the compensation stated preference exercise.

The results showed that, regardless of the sample (HH/NHH), company, and region (England/Wales), the median willingness to accept compensation for a boil water incident was substantially higher when compared with a planned water supply interruption lasting 6 hours. For households in England & Wales, the median value estimate for avoiding a planned water supply interruption lasting 6 hours was £55.93; while for a boil notice it was £177.46.

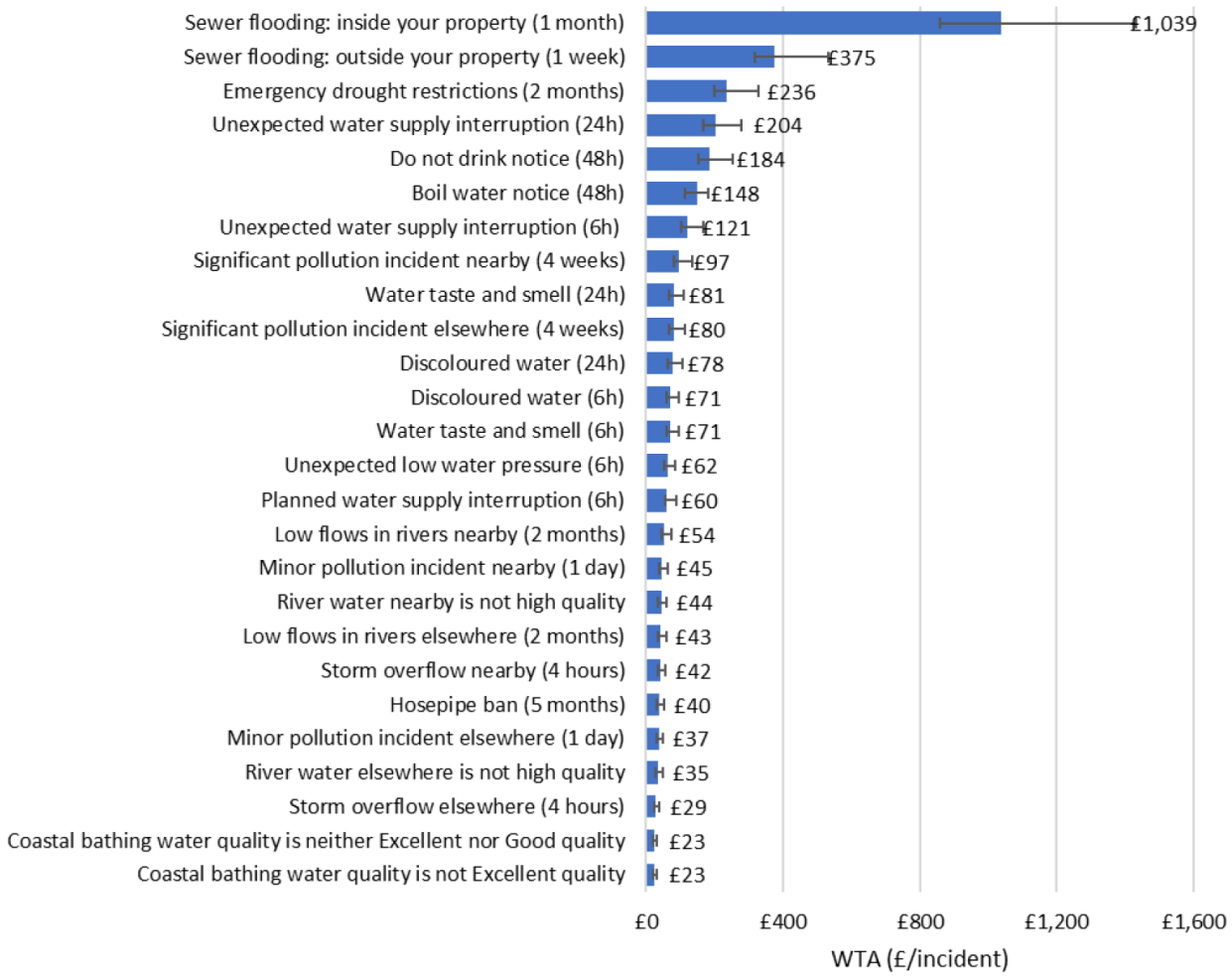
The confidence ranges around valuations were relatively narrow for households. For non-households, the confidence ranges were slightly wider, reflecting a substantially smaller sample size of the non-household survey in comparison to the household survey.

4.3 Service incident valuations

The valuation estimates for the 26 service incidents were obtained by combining the results from the compensation exercise and the impact exercise. These are shown in figure 4.1 (households) and 4.2 (non-households) below.

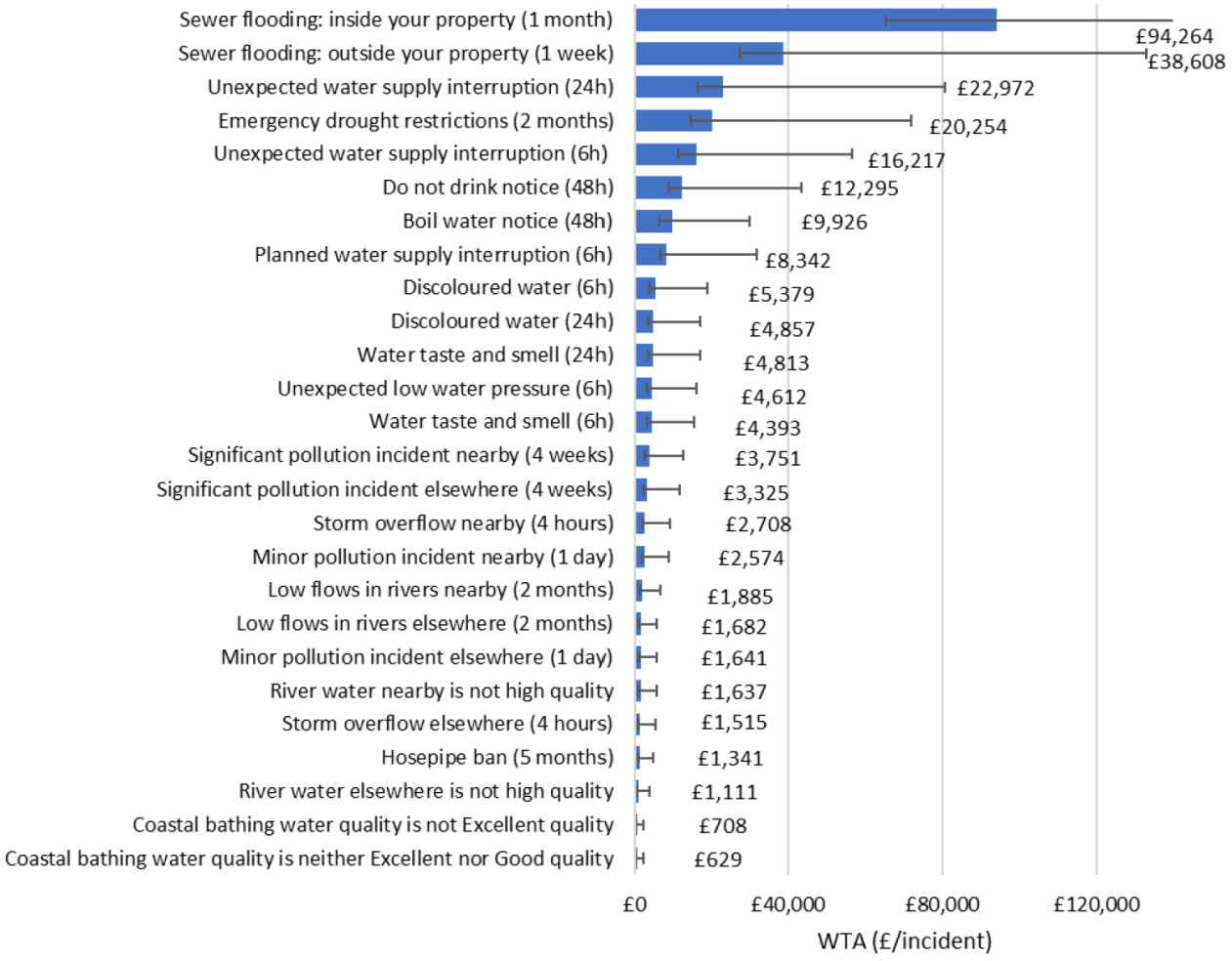
The initial valuations were made available to companies in January 2023. Subsequently PJM Economics identified an error in their calculations that underpinned the non-household valuations and these were re-issued to companies in April 2023.

Figure 4.1: Household valuation results, England and Wales



In comparisons to values for service incidents from PR19 studies, the household results appeared to be broadly consistent in most cases, where comparable, and generally towards the low end of this range. A prominent exception to this pattern, however, is that the values for sewer flooding were found to be materially lower in comparison to PR19.

Figure 4.2: Non-household valuation results, England and Wales



A second theme arising from the comparison against PR19 results was that the non-household valuation estimates from the present study tended to lie above the top end of the range in most cases. These comparisons give pause for consideration, particularly given that the non-household results have been less reliably measured than household results.

Finally, comparisons to PR19 values were not possible for environmental service issues at this stage due to the need for a further mapping stage to be undertaken. However, PJM Economics recognised that an alternative reasonable approach that relied on willingness to pay for environmental improvement, rather than the compensation required for environmental harms, would have returned values lower than those actually measured. This suggests that the environmental service issue values obtained are likely to be at the upper end of the justifiable range.

4.4 Ofwat view

We believe that the modelling and estimation conducted by PJM Economics was rigorous and implemented to a very high standard for applied econometrics of this sort. The outputs of this

stage of the analysis enabled more meaningful comparisons against PR19 valuations and gave the first insight into how the research might translate into estimates of marginal benefits for common PCs and hence indicative ODI rates.

For households, an initial view suggested that many of the incidents that directly affected households were within the ranges of comparable valuations at PR19.

The exception was sewer flooding where valuations for both internal and external sewer flooding were below the minimum of the range of equivalent values at PR19. PJM Economics' report puts forward three possible explanations for this:

- methods used at PR19 may have over-estimated the value of low frequency events, such as sewer flooding;
- the present research may be less reliable for sewer flooding than for other services because they are more sensitive to respondent error;
- it is possible that participants factored in insurance cover they might have for flooding when answering survey questions and the present study would only capture the additional compensation required rather than the full social value.[44]

We consider that an additional difficulty arises with the heterogeneity of the severity of flooding incidents measured by this PC. The description of sewer flooding incidents used in the survey material and of that of the studies conducted for PR19, will influence interpretation, and hence choices expressed by survey participants in the responses they make.

The non-household valuations were, in many cases, considerably higher than equivalent values at PR19. While we regard the sampling methodology for the non-household survey to be better than the methods used at PR19, samples were smaller than for households, and there is greater heterogeneity among non-household than household customers. This results in estimates that are less precise and may be less reliable than those for households. Inconsistency between the results of the impact and compensation exercises cast some doubt about the suitability of the question design for non-household customers.

We note the lack of confidence in the non-household valuations in PJM Economics' report and the recommendation that a downward adjustment would be prudent which would rely on expert judgement.

A consequence of the high non-household valuations is that they make up the majority of overall customer marginal benefit, despite non-household customers accounting for a minority of the water industry's overall business (whether measured by water usage or revenue). This finding may be sensitive to the potential over-valuation of non-household customer benefits, but it may also be possible that it is a true reflection of the relative

[44] PJM Economics, 'Collaborative ODI Research: Final Survey Values Report', June 2023, pp. 103-104.

benefits between household and non-household customers, perhaps because of the potential financial implications for non-household customers of service failures.

More information on the survey modelling and analysis can be found in the PJM Economics report 'Collaborative ODI Research: Final Survey Values Report'.[45] A full set of results can be found in the SP results workbook.[46]

[45] PJM Economics, 'Collaborative ODI Research: Final Survey Values Report', June 2023.
[46] PJM Economics, 'ODI Research: SP Results Workbook', March 2023.

5. Developing ODI rates

In this section we explain how we set out to develop ODI rates by 'mapping' from the service incidents customers valued to performance commitment (PC) definitions.

5.1 'Bottom-up' mapping approach

In the survey we intentionally described service failures in a way that was meaningful to customers so that the valuations could be as robust as possible. For example, customers were asked to value a hosepipe ban instead of the risk of experiencing water restrictions. However, these descriptions of service failures do not exactly align with our PC definitions. We therefore needed to undertake a mapping exercise to transform the valuations into marginal benefit rates.

In some areas the mapping is straightforward, for example for sewer flooding where the service failure described in the survey closely matches the PC definition. For other PCs there are multiple relevant service failures that need to be considered together to derive a single rate. For example, for supply interruptions respondents were asked to value three different types of interruptions and these valuations all need to be combined to derive the appropriate rate for the interruptions PC. In some cases, for example river water quality, the same service failure is relevant to more than one PC. We need to consider this carefully to avoid double counting.

The survey included both customer-facing and environmental service failures. The tables below set out the common customer-facing and environmental PCs and the relevant service failures included in the survey.

Table 5.1: High level mapping of customer facing PCs to service failures

Customer facing PCs	Customer research valuations
Total water demand (leakage, PCC, business demand) Ml/d	Hosepipe bans Emergency drought restrictions Low flows in rivers nearby Low flows in rivers elsewhere
Customer contacts about drinking water quality Per 1,000 population	Discoloured water – 6 hours Discoloured water – 24 hours Taste or smell of water – 6 hours Taste or smell of water – 24 hours External sewer flooding
Compliance risk index	Boil water notice Do not drink notice
Water supply interruptions Minutes over 3 hours per customer	Planned interruption – 6 hours Unplanned interruptions – 6 hours

	Unplanned interruption – 24 hours
Internal sewer flooding Per 10,000 connections	Internal sewer flooding
External sewer flooding Per 10,000 connections	External sewer flooding

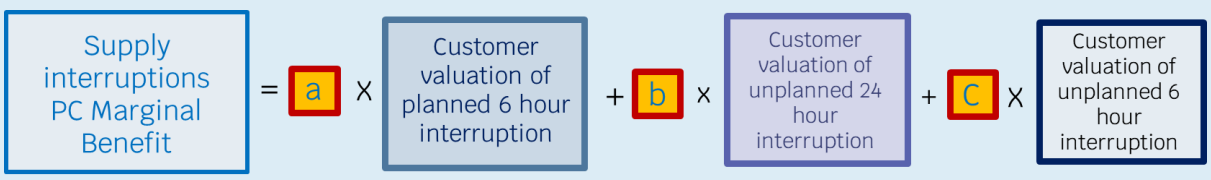
Table 5.2: High level mapping of environmental PCs to service failures

Environmental PCs	Customer research valuations
Pollution incidents Per 10,000km sewer network	Minor pollution incident – nearby Minor pollution incident – elsewhere Significant pollution incident – nearby Significant pollution incident - elsewhere
Serious pollution incidents	Significant pollution incident – nearby Significant pollution incident – elsewhere
Discharge permit compliance	River water quality not high – nearby River water quality not high – elsewhere
River water quality	River water quality not high – nearby River water quality not high – elsewhere
Bathing water quality	Bathing water quality not excellent Bathing water quality not good
Storm overflows Spills per storm overflow	Storm overflow spill – nearby, 4 hours Storm overflow spill – elsewhere, 4 hours

For each PC we started by defining at a high level the theoretical relationship between the service failures and each PC. We shared and discussed our proposed mapping approaches with companies and other stakeholders via working groups.

Box 5.1 Example of simplified mapping approach – Supply interruptions

- Customers valued three different failures – all of which linked to the interruptions PC.
- Customers place a different value on each of these failures.
- We need to combine these values to calculate the marginal benefit for the PC overall
- We need to estimate how much each of the service failures contributes to the overall PC – these are shown by the weights "a", "b" and "c" below.
- The rate would then be scaled by the number of customers to reflect the definition of the PC.



Where the mapping required us to combine valuations, often this relied on good quality historic data. For example, for supply interruptions we used historic data on the different types and duration of interruptions to weight the three different valuations. For some PC mappings this data was readily available, for others it was more difficult to identify robust data sets.

We received the customer valuations from the survey in January 2023. We then used the valuations as inputs into our conceptual mapping to produce the indicative marginal benefits.

5.2 'Bottom-up' marginal benefit estimates

The survey and analysis of the results produced valuations at a company specific level, as well as for England, Wales and combined England & Wales valuations. We used the combined England & Wales valuations to calculate the marginal benefit rates. This is because the error margins around the company estimates are wide and customer preferences were generally similar between companies.

This finding is an important development from PR19 and supports the common approach adopted for PR24. By using consistent valuations across the industry, each company has been given the same indicative incentive rate for a unit improvement in performance eg £ per minute of supply interruption to use in their business plan submissions.[47]

Whilst the underlying customer valuations we used were the same across companies, the mapping exercise accounts for the different size and scale of companies. Most PCs are 'normalised' for example, reported per 10,000 properties and this will lead to different incentive rates between companies due to different property numbers.

Given the different levels of complexity in mapping the PCs, we split them into batches with the most straightforward mappings completed first in batch 1.

Figure 5.1: List of PCs assigned to batches

Batch 1	Batch 2	Batch 3
Internal sewer flooding	Unplanned outage	Total water demand (leakage, PCC and business demand)
External sewer flooding	Mains repairs	River water quality
Customer contacts about drinking water quality	Sewer collapses	Discharge permit compliance
Bathing water quality	Compliance risk index	Total pollution incidents
Water supply interruptions		Serious pollution incidents
		Storm overflows

[47] Companies can propose alternative ODI rates where they are supported by compelling evidence to do so.

5.2.1 Batch 1 marginal benefit estimates

The table below presents the marginal benefit estimates for batch 1 PCs. More detail on the mapping and assumptions underpinning the estimates can be found in Appendix 2.

Table 5.3: Batch 1 marginal benefit estimates (FYA 2021-22 prices)

Performance commitment	Mapped unit value	Mapped marginal benefit estimate (normalised for company size)		
		Median (m)	Min (m)	Max (m)
Internal sewer flooding	£5,057 per incident	£0.99	£0.01	£2.95
External sewer flooding	£2,023 per incident	£0.39	£0.01	£1.18
Customer contacts about drinking water quality	£24,482 per contact about taste or smell £9.547 per contact about appearance	£33.79	£2.79	£147.34
Bathing water quality	£51 per improvement in classification	£4.39	£0.07	£7.93
Water supply interruptions	£1.99 per minute of interruption	£2.18	£0.20	£7.59

While we didn't want to put undue weight on PR19 rates given the range of methodologies used, it was important to sense check whether the rates were the same order of magnitude and consider the implications of any significant changes. The marginal benefit estimates for sewer flooding were an order of magnitude smaller than at PR19, while the estimate for customer contacts was more an order of magnitude larger. The estimates for bathing water quality and water supply interruptions were approximately double the PR19 rates.

For the rates that were significantly higher than at PR19, we were concerned about the level of risk companies could be exposed to for any single PC. We also needed to ensure consistency with an expected return on regulatory equity (RoRE) of ±1 to ±3% each year that we set in the final methodology. Using the mapped marginal benefits, this range could be exceeded for a relatively small change in performance on a single PC.

For the rates that were significantly lower than PR19, we were concerned that companies would not be sufficiently incentivised to improve in areas that were a high priority for customers.

5.2.2 Batch 2 marginal benefit estimates

The asset health PCs, consisting of mains repairs, unplanned outage and sewer collapses, do not directly affect customers or the environment. This meant there was no customer

valuation from the research that could be directly mapped to these PCs. Following similar approaches undertaken by several companies at PR19, our initial approach was to map these PCs to other customer valuations and PC marginal benefit rates. We call this the 'inferred benefits' approach.

When conducting the 'inferred benefits' mapping we found that some of the relationships between the asset health performance and performance on customer-facing PCs were complex. Quantifying these links would have required us to collect a significant amount of additional data from companies. When speaking to companies there was broad consensus that given existing monitoring practices the data may not be complete or of high quality requiring us to make additional assumptions.

Given the timeframes for developing marginal benefit rates it would have been very difficult to produce reliable marginal benefit rates on time. Additionally, the marginal benefits rates for these PCs would have relied on robust marginal benefit rates for other PCs which was not guaranteed, eg linking mains repairs to leakage, which posed a risk in terms of producing a reliable rate. On consultation with companies through the Outcomes working group, we decided to adopt a top-down approach for the three asset health PCs. This top-down approach is described in chapter 6.

The table below presents the marginal benefit estimate for the compliance risk index (CRI) PC. More detail on the mapping and assumptions underpinning the estimate can be found in Appendix 2.

Table 5.4: Batch 2 marginal benefit estimates (FYA 2021-22 prices)

Performance commitment	Mapped unit value	Mapped marginal benefit estimate (normalised for company size)		
		Median (m)	Min (m)	Max (m)
Compliance risk index	£643 per boil water incident £796 per do not drink incident	£1.25	£0.11	£4.33

The marginal benefit estimate for CRI was only slightly above the rates set at PR19.

5.2.3 Batch 3 marginal benefit estimates

We encountered a number of challenges with the mapping approach for batch 3 PCs where the relationship between the incidents customers valued and the PC definition was typically more complex. We were ultimately unable to calculate marginal benefit estimates using a mapping approach for any of the batch 3 PCs. We set out the detailed reasons for each below.

Demand

Demand is a challenging outcome for customers to value. In the survey we therefore intentionally described service failures in a way that was meaningful. Customers were asked to value hosepipe bans, emergency drought restrictions and low flows in rivers nearby and elsewhere.

There are three PCs associated with demand (leakage, PCC and business demand) which are defined in terms of a change in megalitres per day or litres per person per day. Our indicative mapping was therefore based on understanding the likelihood of each customer incident occurring with a 10% change in demand.

This data was not readily available and had to be collected from companies. For some companies, eg those with a healthy supply-demand surplus, it was impractical to generate a meaningful calculation of a change in probability. Our final data set therefore had significant gaps, with only half of companies able to provide robust data to underpin the mapping.

We undertook significant further work to develop alternative approaches, including generating a national or regional average to apply across companies. However, wide variations remained between company data sets, and we did not have confidence that the averages we generated were sufficiently robust.

Discharge permit compliance

For discharge permit compliance, the relevant incidents customers valued were river water quality nearby and elsewhere. Following discussions with the Environment Agency and Natural Resources Wales we concluded that there was not a measurable relationship between these customer valuations and discharge permit compliance because:

- a single breach of a discharge permit is likely to have a negligible (or no) impact on river water quality; and
- the reasons for not achieving good status (RNAG) score we had planned to use as a measure of good river water quality is not measured in a way that enables us to measure the immediate impact on river water quality.

We were therefore unable to calculate an estimate of marginal benefit for this PC using customer valuation data.

River water quality

The river water quality PC measures the percentage reduction in phosphorus emissions to river catchments as a result of water company activities. Through discussions with the Environment Agency and Natural Resources Wales we identified a potential mapping

approach linking phosphorus load reduction to the percentage of water bodies achieving good status for phosphorus.[48]

Unfortunately the data set that would have underpinned this mapping was not available at the time to enable us to produce a marginal benefit estimate for this PC. We were therefore unable to calculate an estimate of marginal benefit using the customer valuation data.

Storm overflows & pollution incidents

The early marginal benefit estimates we derived for the storm overflows and pollution incident PCs were many orders of magnitude larger than other PCs.

The values were calculated by multiplying individual customer valuations by the number of customers in the radius of a storm overflow or pollution incident. For a 'nearby' valuation within 5 miles of a pollution incident, on average 57,000 household customers and 3,000 non-household customers would be considered to be affected and therefore included in the calculation. The size of the estimates was therefore driven by a combination of the number of customers considered to be affected, the frequency of incidents as well as the underlying customer valuations.

Given the size of the marginal benefit estimates, we were concerned that the rates may not be robust. We were also concerned about the level of risk companies could be exposed to for any single PC which would exceed the expected return on regulatory equity (RoRE) of ±1 to ±3% each year.

We therefore commissioned further qualitative research from Savanta to ensure that we were sufficiently clear for customers in setting the context for the questions they were asked relating to environmental service failures.

We asked Savanta to explore several hypotheses about how the very high valuations may have arisen including:

- incident descriptions not being sufficiently clear;
- customers thinking about the phenomenon of storm overflows/pollution incidents rather than a single event;
- customers may not be willing to pay the amounts implied by the research; and
- survey participants may have internalised the impact on other people of environmental impacts.

Key findings from this research were that:

- respondents made their choices by thinking primarily about the impact on their own household;

[48] Environment Agency, State of the water environment indicator B3: supporting evidence, May 2023

- respondents were thinking about a single storm overflow or pollution incident event when answering the survey;
- they were able to consider geography in their answering, although they did not always interpret nearby as 'within five miles', implying an over-estimation of marginal benefit;
- for storm overflows in particular, frequency of occurrence was much higher than respondents had envisaged which may have led to an over-statement of the impact of a single spill, but also may indicate strong feelings about water companies' practices; and
- when asked about willingness to pay directly for storm overflows, respondents felt that the figures to prevent one incident were far too high – in part because they did not believe they should have to foot the bill for preventing these issues.

The research did not provide a basis for quantifying any adjustments to the mapping approach or underlying valuations. Given the inappropriate level of risk associated with the early marginal benefit estimates and the lack of additional data to inform a reduction in rates, we did not have confidence that we could calculate robust marginal benefit estimates using the customer valuation data.

5.3 Moving to a 'top-down' approach

Following challenges in producing robust marginal benefit estimates for the batch 3 PCs, it was appropriate to review our overall approach to setting ODI rates.

Without robust marginal benefit estimates from the collaborative customer research and mapping approach, we changed our approach to set indicative ODI rates using a 'top-down' approach based on equity return at risk.

In the top-down approach we have made sure to use the collaborative customer research to inform the ODI rates we set, with a higher proportion of regulated equity being assigned to the areas prioritised by customers.

The use of a top-down approach across all PCs ensures consistency in our approach to setting rates across the package of ODIs.

In the top-down approach incentive payments are based on a proportion of a company's regulatory capital value (RCV). This means we can ensure financial incentives are meaningful whilst maintaining a reasonable risk range. On reflection, we don't consider it is possible to achieve this balance by relying on the results of the collaborative customer research alone, but we continued to use the research to ensure that the incentive rates reflect the importance customers place on each outcome.

6. Top-down approach

In this section we set out our methodology for deriving indicative ODI rates using a top-down approach. A 'top-down' approach is where incentive rates are derived from a company's overall potential payments, for example as a proportion of a company's regulatory capital value (RCV) divided over a selected performance range and informed by customers' priorities and regulatory judgement.

We have several principles for generating indicative ODI rates using this top-down approach, which align with our objectives for setting ODI rates at PR24.[49] These principles are:

- we should generate indicative ODI rates which provide a strong incentive to companies to deliver good service outcomes;
- we should set a consistent valuation per incident across all companies eg £ per minute of supply interruption; and
- we should reflect customer preferences for different service outcomes in setting the indicative ODI rates.

The indicative ODI rates produced through the top-down approach form a robust starting point from which we will calibrate final rates for each PC during the determinations phase of PR24. There are many approaches, assumptions and data that could be used to generate an ODI rate through a top-down approach. These indicative ODI rates serve as a reasonable anchor point for us to adjust the rates around. We will require companies to use these indicative ODI rates in their business plans unless they can provide compelling evidence for why they should differ. We will use companies' evidence and feedback as well as our own additional analysis to further inform and calibrate the ODI rates during the determinations phase of PR24. Such inputs for calibrating the ODI rates include:

- the degree of confidence in the estimates of marginal benefits;
- wider benefits or strategic priorities;
- information on marginal costs; and
- our approach to cost sharing rates.

6.1 General methodology

There are two key inputs to the top-down approach. First, we need to assign an amount of a company's RCV that will be at risk for each PC. Second, we need to identify a 'stretching but achievable' performance range that RCV at risk will be spread over. Dividing the RCV at risk by the performance range gives an indicative ODI rate for each unit of under- or over-performance.

[49] Ofwat, 'Creating tomorrow, together: Our final methodology for PR24', December 2022, p. 66

Our starting point was to allocate a level of risk equivalent to 0.5% return on regulated equity (RoRE) to each PC for each company. The basis for this assumption is set out in section 6.1.1 and is calculated based on actual ODI payments in 2020-21 and 2021-22. We adjusted this allocation up or down based on the relative importance of the PC to customers, informed by customer research.

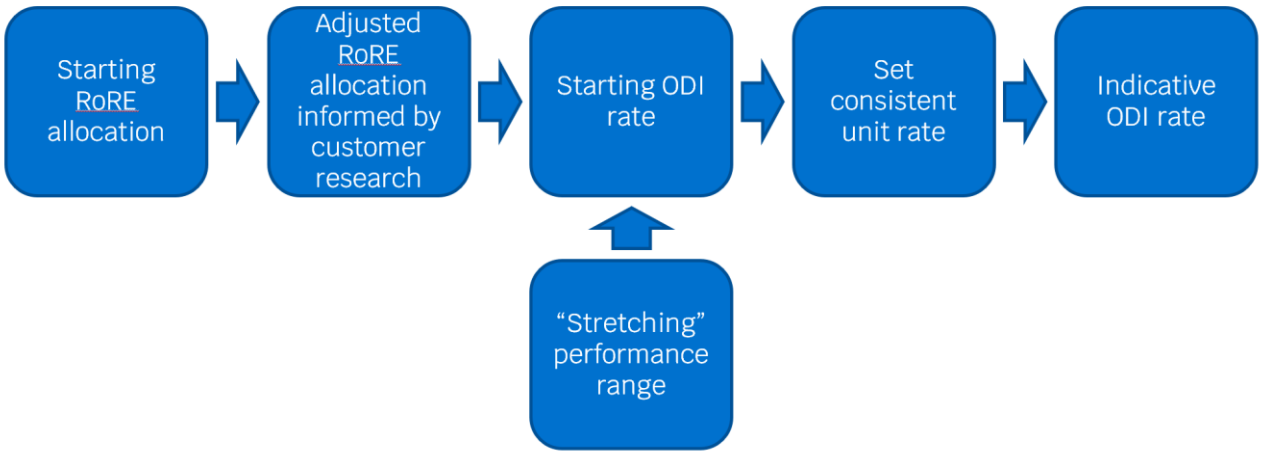
To identify a stretching but achievable level of performance we analysed historic deviations in performance from the PCL to calculate an industry-wide 10th and 90th percentile. We then divided the risk allocation by this performance range to get a value per unit increase in performance difference from the PCL. This gave us a starting incentive rate defined according to the measurement unit of each PC.

We unnormalised the starting incentive rate for each company to get an incentive rate per individual unit eg converting the rate per pollution incident per 10,000km sewer network to the rate per individual pollution incident. We did this for all companies and all PCs then set the consistent unit rate at the median value per incident. We used the median value since it represents a typical rate per company, while being more robust to outliers than the mean.

We re-normalised this median valuation per incident according to the PC definition for each company to get the indicative ODI rate eg converting a rate per pollution incident to a rate per pollution incident per 10,000km of sewer network. For larger companies the indicative ODI rate is higher since the rate per incident is being applied over a greater scale eg a larger company will have a larger sewer network so one pollution incident per 10,000km network translates to a higher number of total pollution incidents.

Figure 6.1 shows how each stage fits together. The following subsections provide further details on each stage of the top-down approach.

Figure 6.1: Flow diagram of each stage of the top-down approach



6.1.1 Setting an allocation of risk for each PC

This subsection sets out how we allocated a level of risk to each PC which will form the total ODI payment based on a 'stretching but achievable' performance deviation from the PCL.

The starting allocation of 0.5% RoRE represents the ODI payment from a 'stretching but achievable' level of performance deviation from the PCL for every PC. The amount of RoRE we allocate should represent a theoretical maximum amount of risk a company is exposed to through ODI payments ie if it was very significantly underperforming or outperforming on a PC.

This level was informed by analysis of payments from common PCs during PR19. We calculated hypothetical payments for each common PC or each company in 2020-21 and 2021-22. We multiplied the performance deviation from the PCL by the underperformance rate.[50] We excluded risk protections such as caps and collars from this payment calculation since the RoRE allocation we used for the top-down approach did not include risk protections. We calculated the upper quartile and 90th percentile payments in RoRE terms across all PCs in both years, which represent payments from a 'stretching but achievable' level of performance. These are shown in table 6.1.

Based on this, we set an average RoRE allocation per PC of 0.5% which falls between the upper quartile and 90th percentile payments across all common PCs during 2020-22.

Table 6.1: range of theoretical payments from PR19 common PCs

PC type	PR19 average UQ payment per PC	PR19 average P90 payment per PC	Midpoint between UQ and P90
Water PCs	0.35%	0.70%	0.53%
Wastewater PCs	0.25%	0.74%	0.50%

For PCs related to water service outcomes, the 0.5% RoRE allocation is assigned to the combined regulated equity of 'Water Resources' and 'Water Network Plus'. For PCs related to wastewater service outcomes, this allocation is assigned to the combined regulated equity of 'Bioresources' and 'Wastewater Network Plus'. The regulated equity is derived from the regulatory capital value (RCV) and assumes a notional gearing ratio of 55%, based on current policy assumptions.[51] The notional gearing ratio follows the approach we have taken in the final methodology. We provide an example of how this works in Box 6.1.

Box 6.1 – Example of calculating equity at risk for a 'stretching but achievable' level of performance

[50] All PCs in PR19 have an underperformance rate. Using only this rate regardless of outperformance or underperformance ensures consistency of theoretical payments across PCs.
[51] Ofwat, 'RCV-PR19_2023_Overall', Spring 2023.

Eg for total pollution incidents we use company's wastewater RCV.

If 2022-23 wastewater RCV for a fictional company is £3,000m, regulated equity is (1-0.55) x £3,000m = £1,350m.

We assign 0.5% of RoRE to total pollution incidents, therefore the amount of equity at risk for this PC is 0.005 x £1,350m = £6.75m.

The 2022-23 RCV is used as an estimate to help scale the indicative incentive rates. We will use the latest RCV forecasts when calibrating the ODI rates at the determinations phase. The estimated RCV that we will use will reflect future investment requirements and past performance adjustments as well as the current stock. It is likely that the average RCV across PR24 will be higher than the values used at this stage, however we have not had a clear view of this level of adjustment across the sector at the time of generating indicative ODI rates.

The starting RoRE allocation of 0.5% for each PC should not be considered as a view of ODI risk. In the final methodology we said that we expect revenues at risk from ODIs to be equivalent to around a ±1 to ±3% return. This is the expected return for an efficient company with a mix of out- and underperformance across the different PCs and with risk protections such as caps and collars applied. We will be assessing ODI risk at draft determinations when additional information is available.

6.1.2 Using customer preferences to adjust the risk allocation

This subsection sets out our methodology for using customer preferences to rank the relative importance of each PC. It also explains how we adjust the RoRE risk allocation for each PC up or down based on the relative value a service outcome brings to a customer.

A key policy objective we set in the final methodology was that 'incentive rates should be based on the importance customers place on each outcome'.

When applying the top-down approach, we assigned a different allocation RoRE based on the relative value an incident or avoided incident brings to a customer. We assigned a score between 1 and 3 to reflect this value (1 being higher, 3 being lower). All of these service outcomes are important to customers. These scores were assigned based on stakeholder input, our expert judgement and past customer surveys.

In line with CCW's recommendations for triangulation at PR24, we used a range of inputs to inform our customer ranking including primary research and our expert judgement.[52]

[52] CCW, 'Triangulation – A review of its use at PR19 and good practice', April 2021.

Our starting point was to compare the outputs of the following pieces of customer research, which were the most recent relevant sources of information at the time of calculating the indicative ODI rates:

- PJM economics, Collaborative ODI research, June 2023;
- Yonder, Preferences research, April 2022;[53]
- Savanta, Customer spotlight, April 2022.[54]

In these pieces of research, customers were asked to value or express their views about a range of service incidents that are related to the PCs, but often don't map directly to the definition that has been set. For example, in the collaborative ODI research customers were asked about three different types of supply interruption that need to be combined into a single ranking for the PC.

Generally, customer preferences were consistent across the service incidents that map to a single PC. Where they weren't, we used the highest preference expressed. For example, for pollution incidents and river water quality we used the 'nearby' value rather than the 'elsewhere' value.

We converted the results of each piece of customer research into a score between 1 and 3 based on whether customers place the PC in the top, middle or lower third as shown in table 6.2. The overall proposed ranking was then formed by weighting each piece of research equally eg two medium and one lower rating results in a medium rating overall.

We excluded discharge permit compliance and demand PCs from the ranking of the collaborative ODI research valuations given we were unable to establish a robust relationship between the service incidents and the PC definitions.

Table 6.2: Ranking of PCs according to customer research valuations

Performance commitment	Customer research 1 ranking of valuations	Customer research 2	Customer research 3 % customers ranking as high importance	Combined score
Internal sewer flooding	1 (1)	H (1)	84% (1)	**1**
External sewer flooding	2 (1)	H (1)	84% (1)	**1**
Water supply interruptions	3 (1)	H (1)	83% (1)	**1**
Compliance risk index (CRI)	4 (1)	H (1)	87% (1)	**1**
Customer contacts about water quality	5 (2)	H (1)	87% (1)	**1**
Discharge permit compliance	N/A	M (2)	82% (2)	**2**

[53] Ofwat, CCW, 'Yonder preferences research', April 2022.
[54] Ofwat, CCW, 'Savanta customer spotlight: People's views and experiences of water', April 2022.

Serious pollution incidents	6 (2)	M (2)	82% (2)	**2**
Storm overflows	8 (2)	L (3)	82% (2)	**2**
Total pollution incidents	7 (2)	M (2)	82% (2)	**2**
River water quality	9 (3)	M (2)	82% (2)	**2**
Leakage	N/A	M (2)	81% (3)	**2**
Per capita consumption	N/A	L (3)	79% (3)	**3**
Business demand	N/A	L (3)	79% (3)	**3**
Bathing water quality	10 (3)	L (3)	82% (2)	**3**

We used the combined score to adjust the initial RoRE allocation for each PC. A PC with a score of 1, reflecting a higher importance to customers, received an allocation of 0.6% RoRE (there is more money at risk for a company), while a PC with a score of 3 received a 0.4% RoRE allocation. The adjusted allocations are set out in table 6.3. The size of adjustment based on these scores was based on our regulatory judgement that all service outcomes are important to customers and that a greater adjustment risks under-incentivising those PCs given a score of 3.

Table 6.3: Adjusted RoRE allocation based on combined customer valuation score

Combined score	RoRE allocation
1	0.6%
2	0.5%
3	0.4%

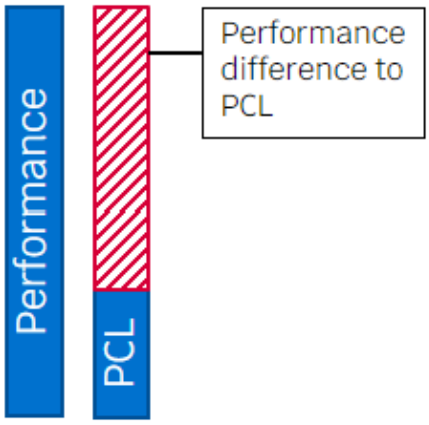
For each PC, we took the assigned RoRE allocation and multiplied this by either the water or wastewater regulated equity for each company.

6.1.3 Calculating a 'stretching but achievable' performance range

To calculate the ODI rate we spread the equity at risk for each PC over a stretching but achievable performance range.

We calculated this performance range using the historic difference between actual performance and the PCL. We calculated this difference for each company and for each year for which we have historic data. Pooling this data across all companies, and all years of available data gave a distribution of under- and outperformance for each PC.

Figure 6.2: Performance difference to PCL



To remove the impact of extreme outliers on our estimation, we calculated the 10th percentile (P10) and 90th percentile (P90) from the pooled data. We set the 'stretching but achievable' level of performance at either the P10 or P90 depending on which was largest in absolute terms. We used the same range for under- and outperformance in order to set a symmetric incentive rate.

The final step was to multiply the performance range by the latest available PCL for each company. This tended to be the 2024-25 PCL. This scales the performance range to a level that is closer to what it might be going into AMP 8. The performance range is expressed in the same units as the performance commitment (PC). We provide an example of how the 'stretching but achievable' performance range around the PCL is calculated in box 6.2.

Box 6.2: Example of calculating a 'stretching but achievable' performance difference from the PCL

Eg for total pollution incidents, the P10 is -25% below the PCL and the P90 is 42% above the PCL. We therefore set the performance range at 42%.

The 2024-25 PCL is 19.5 pollution incidents per 10,000km of sewer length.

The performance range is therefore 19.5 x 0.42 = 8.2 pollution incidents per 10,000km of sewer length.

We are introducing some new PCs in PR24. For these PCs there are no historic PCLs to compare company performance against. For these PCs we developed 'proxy' PCLs using relevant data to calculate a realistic performance range. We set out our approach for each PC in section 6.2.

6.1.4 Setting a consistent unit rate across companies

A key objective at PR24 is to increase the consistency of incentive rates across companies. For the indicative ODI rates, we therefore want to set a consistent unit rate across all companies eg the same value per individual pollution incident. This mimics the approach we would have taken when mapping the customer valuation from a service outcome from the collaborative customer research to each PC definition.

To do this, we divided the RoRE at risk for each company by the 'stretching but achievable' performance range to get an initial ODI rate for each PC. Next, we unnormalised the initial ODI rate to get a unit rate eg a rate per individual pollution incident, rather than per pollution incident per 10,000km of sewer length. We provide an example of how we unnormalise the incentive rate in box 6.3.

Once we calculated the unit rate for each company, we set the consistent unit rate at the industry median. We used the median value since it represents a typical rate per company, while being more robust to outliers than the mean.

Box 6.3: Example of unnormalising the incentive rate to get to a rate per individual unit

Eg for total pollution incidents, the initial ODI rate for our fictional company would be £6.57m ÷ 8.2 = £0.801m per pollution incident per 10,000km sewer length.

To get a unit rate, we multiply by 10,000 and divide by the total length of the company's sewer network:

(£0.801m x 10,000) / 55,000 = £0.146m per pollution incident.

6.1.5 Normalising to get the ODI rate

The final step was to re-normalise the median unit rate for each PC. This forms the indicative ODI rate expressed in the same units as the PC. An example is shown in box 6.4.

Box 6.4: Example of normalising the median unit rate to get the indicative ODI rate

Eg if the industry median unit rate is £0.2m per pollution incident, to get the final ODI rate we would divide by 10,000 and multiply by the total length of the company's sewer network:

(£0.2m / 10,000) x 55,000 = £1.1m per pollution incident per 10,000km sewer length

7. Conclusions and next steps

For PR24 we set out to design and implement collaborative customer research that would enable us to set indicative ODI rates in a consistent way across the sector.

The research was a major sector-wide customer engagement exercise. Our partnership with CCW and collaborative approach to working with companies and stakeholders enabled us to take account of their experience in conducting research in the water sector.

The survey and analysis conducted by Accent and PJM Economics produced customer valuations for 26 different service incidents at a company specific level, as well as for England and Wales. An important finding of the research was that customer preferences were generally similar between companies. This supports the common approach adopted for PR24 and has enabled us to use consistent valuations across the industry. Every company has therefore been set the same indicative incentive rate for a unit improvement in performance eg £ per minute of a supply interruption, for inclusion in their business plans in October

A second theme arising from the research was that non-household valuations were, in many cases, considerably higher than equivalent values at PR19. A consequence of this is that they make up the majority of the overall estimated marginal benefit despite accounting for a minority of the water industries' overall business. This may be due to the smaller sample size for non-households which results in estimates that are less precise and may be less reliable than those for households, or to other aspects of the survey design. But it may be possible that it is a true reflection of the relative benefits between household and non-household customers.

We encountered a number of challenges when mapping from the service incidents customers valued to PC definitions.

Mapping was more complex than we anticipated and relied on good quality historic data. In several areas we were unable to identify robust data sets in the time available which meant we could not complete the mapping exercise for half of the performance commitments (PCs). These data requirements should have been identified earlier on in the process to achieve a robust link through the mapping approach.

Where we were able to complete the mapping exercise, the majority of the rates were outside the range of expectations. Some rates were very low, some implausibly so, and would not sufficiently incentivise companies to improve their performance. Other rates were very high, some implausibly so, and were not consistent with the ±1 to ±3% return on regulatory equity (RoRE) each year that we set out in the final methodology.[55] Further qualitative research

[55] Ofwat, 'Creating tomorrow, together: Our final methodology for PR24', December 2023, p. 69

supported our concern that these rates significantly exceeded customer benefit and underlying willingness to pay.

Without robust marginal benefit estimates from the collaborative customer research and mapping exercise, we decided to set indicative ODI rates using a 'top-down' approach based on equity return at risk.

We consider these indicative rates provide companies and Ofwat with a robust starting point from which we will calibrate final rates for each PC during the determinations phase of PR24.

Companies should consider the following when submitting their business plans:

For the quality part of our quality and ambition assessment, companies must use the indicative ODI rates in their business plans or provide compelling evidence to support any alternatives.[56]

Where companies use the indicative ODI rates, we would still encourage them to provide feedback on both the top-down approach and the indicative rates as part of their business plan submission. This will help to inform how we set rates at draft determinations.

Working with companies and industry, we will continue to learn and build on this approach to set ODI rates at future price reviews. Such considerations could include:

- further work to assess of the ease of understanding and familiarity of the service issues customers are being asked to rank and value;
- investigating the drivers behind high non-household valuations and further improvements that can be made to the sampling and reliability of results;
- how challenges of the mapping approach might be overcome, for example developing research questions in tandem with the PC definitions to identify data requirements early on in the process to achieve a robust link through the mapping approach; and
- the role of customer valuations in informing ODI rates either directly or indirectly.

We would like to thank the sector for its engagement throughout this process and we look forward to receiving business plans in October 2023.

[56] Our expectations and requirements for the quality and ambition assessment are set out in Ofwat, 'Creating tomorrow, together: Our final methodology for PR24', December 2022, chapter 11.

A1 Mapping approach for Batch 1 performance commitments

This appendix sets out the theoretical mapping approach and common assumptions underpinning the marginal benefit estimates for the batch 1 PCs.

The theoretical mapping approach for the PCs in batches 2 & 3 is set out in Appendix 5.

Figure A2.1: List of PCs assigned to batches

Batch 1	Batch 2	Batch 3
Internal sewer flooding	Unplanned outage	Total water demand (leakage, PCC and business demand)
External sewer flooding	Mains repairs	River water quality
Customer contacts about drinking water quality	Sewer collapses	Discharge permit compliance
Bathing water quality	Compliance risk index	Total pollution incidents
Water supply interruptions		Serious pollution incidents
		Storm overflows

A1.1 Common data and assumptions

This section sets out the common assumptions we made when mapping from customer valuations to performance commitment (PC) definitions.

A1.1.1 Valuations

The survey and analysis of the results produced valuations at a company specific level, as well as for England, Wales and England & Wales combined. We have used the combined England & Wales valuations to calculate the marginal benefit rates. This is because the error margins around the company estimates are too wide to discern clearly meaningful differences in customer preferences between companies.

A1.1.2 Household and Non-Households

The survey covered both households (HH) and non-households (NHH). Our PCs also cover both household and non-household customers, therefore we combined the HH and NHH valuations to produce an overall valuation for each service failure. We did this by weighting the two values by the number of connections for the relevant service at an industry level.

Table A2.1: Industry total connections, water and wastewater, 2021-22

	Water		Wastewater	
	HH	NHH	HH	NHH
Industry total connections	24,263,655	1,292,661	23,671,353	1,066,127

A1.1.3 Normalising data

Most of our PC definitions include normalisation to reflect the different size of companies. For example, sewer flooding incidents are defined per 10,000 of sewer connections. Unless otherwise stated we have used 2021-22 data to carry out the normalisation.

A1.1.4 Price Base

We have assumed that the outputs from the survey are in FY average 2021-22 prices.

A1.1.5 Weightings

For some mappings we need to use historic data to calculate the appropriate weightings when combined two or more valuations. We have considered on a case-by-case basis whether these weightings should be calculated on a company specific or industry basis. We set out for each PC below what approach we have used and why.

A1.2 Customer contacts about water quality

The table below sets out the definition for this PC and the relevant service failures that were included in the survey. For each of the service failures the survey produced a valuation for household and non-household customers.

Table A2.2: Customer contacts definition

PC Definition	The number of times the company is contacted by consumers due to the taste and odour of drinking water or because the drinking water is not clear, reported per 1,000 population. Calculation is the number of contacts for all appearance, taste and odour contacts multiplied by 1,000 divided by the resident population as reported to the Drinking Water Inspectorate (DWI)

Relevant service failures	Discoloured water incident (6hours) Discoloured water incident (24hours) Water taste and smell incident (6hours) Water taste and smell incident (24hours)

A1.2.1 Mapping calculation

To calculate the marginal benefit for the PC we need to combine the valuations of the service failures. We do this using weightings calculated using historic data and expert opinion. The survey asked customers to value incidents and the PC measures contacts. Not all incidents result in a contact so we also need to apply a weighting factor to ensure the valuations used to calculate the marginal benefit reflect this.

The flow chart below sets out the steps we took to calculate the marginal benefit rate for this PC, using the valuations as a starting point. Steps 1 to 3 (green boxes) were calculated using industry data and are the same for all companies. Steps 4 and 5 use company-specific data and therefore result in different values for each company.

Figure A2.2: Customer contacts, steps to calculate marginal benefit

Step 2 – more detail on the calculation

The valuations relate to *incidents* of poor water quality and the PC definition refers to *contacts*. As part of the mapping we need to identify an incidents to contacts ratio to ensure the valuation is being applied consistently. The table below shows the data we used to calculate this ratio – and the source of each data item.

Table A2.3: Data used to calculate the incident to contact ratio

Data	Source
Number of contacts 2021	Provided by the DWI
Number of customers experiencing the incidents in the previous 12 months	This question was asked in the survey. The fieldwork was undertaken in summer 2022

To calculate the ratio we used the proportion of survey respondents that had experienced each type of incident and applied that across the whole customer base to get an estimate of the total number of customers impacted. We then divide this by the number of contacts received.

A1.2.2 Key specific assumptions

The table below sets out the key assumptions we made at each stage of the calculation process. We have not included the assumptions we made about weighting household and non-household valuations or normalisation as we did this consistently across all PCs.

Table A2.4: Customer contacts, key assumptions

Step	Assumption	Justification
STEP 1: Combining the valuations for different length service failures	For water taste and smell we used: 25% for the 6hr failure and 75% for the 24hr failure. For appearance we used: 50%: 50%	Ofwat nor the DWI had data to enable us to calculate weightings mechanistically. Based on discussion with DWI we have assumed that for discolouration contacts they would cover the full range of durations with no obvious tendency for long durations. For taste and odour contacts there was a tendency for these to reflect longer incidents as the underlying cause of these is often something that is not quick to resolve eg chlorine or algal issues at reservoirs
STEP 2: Calculating the incident to contact ratio	We used 2021 contacts data and the incidents data covered the previous 12 months from when the	The 2021 data was the period that most closely correlates with the survey responses.

	survey was undertaken (summer 2022) We calculated the ratio at an **industry-level**.	No reason to suggest the ratio varies across companies.
STEP 4: Combining the valuations for the different types of contacts (T&O and appearance)	We calculated the weights using the **company-specific** average of the 2019,2020 and 2021 number of each type of contact.	We consider that the historic split of type of contact will be a reasonable proxy for the future split. We have used company specific averages as the types of contact can be driven by company-specific geographic factors and can be outside of companies' control.

A1.3 Internal and external sewer flooding

These are two separate PCs but the definitions are very similar and our approach to mapping is the same, so we have included them together in this section. The table below sets out the definitions for these PC and the relevant service failures that were included in the survey. For each of the service failures the survey produced a valuation for household and non-household customers.

Table A2.5: External sewer flooding definition

PC Definition	The number of external sewer flooding incidents normalised per 10,000 sewer connections
Relevant service failures	Sewer flooding outside your property

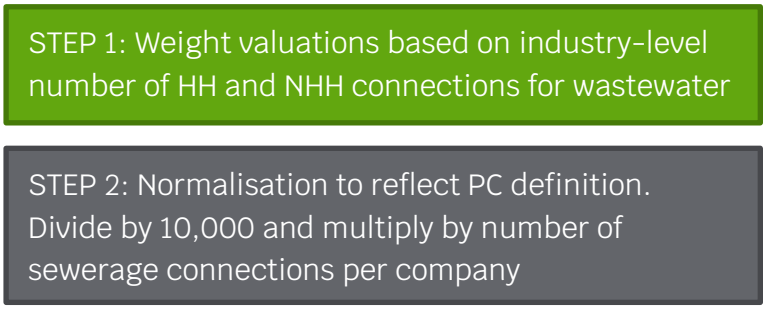
Table A2.6: Internal sewer flooding definition

PC Definition	The number of internal sewer flooding incidents normalised per 10,000 sewer connections
Relevant service failures	Sewer flooding inside your property

A1.3.1 Mapping calculation

For these PCs the mapping is more straightforward as there is only one service failure related to each measure. To convert the valuations into a marginal benefit we need to combine the household and non-household valuations and then normalise the results to reflect the PC definition. The flow chart below sets out the steps we took to calculate the marginal benefit rate for these PC, using the valuations for each type of sewer flooding incident as the starting point. Step 1 was calculated using industry data and is the same for all companies. Step 2 uses company-specific data and therefore results in different values for each company.

Figure A2.2: Internal and external sewer flooding, steps to calculate marginal benefit



A1.3.2 Key specific assumptions

For these PCs we did not need to make any additional specific assumptions. The common assumptions we used are set out above.

A1.4 Water supply interruptions

The table below sets out the definition for this PC and the relevant service failures that were included in the survey. For each of the service failures the survey produced a valuation for household and non-household customers.

Table A2.7: Water supply interruptions definition

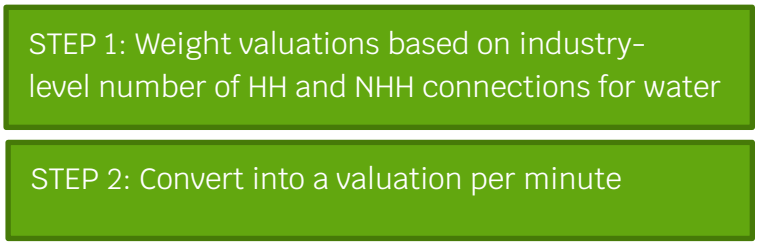
PC Definition	The average number of minutes lost per customer for the whole customer base for interruptions that lasted three hours or more
Relevant service failures	Unexpected water supply interruption 6 hours Unexpected water supply interruption 24 hours Planned water supply interruption 6 hours

A1.4.1 Mapping calculation

To calculate the marginal benefit for the PC we combine the valuations for the different service failures. We do this using weightings calculated from historic data on the different types and duration of interruptions. Because the valuations are for service failures of different durations we convert them into valuations per minute before combining them together.

The flow chart below sets out the steps we took to calculate the marginal benefit rate for this PC, using the valuations as a starting point. Steps 1 to 3 (green boxes) were calculated using industry data and are the same for all companies. Step 4 uses company-specific data and therefore result in different values for each company.

Figure A2.3: Water supply interruptions, steps to calculate marginal benefit



STEP 3: Weight valuations based on industry-level historic split of total mins lost per type of interruption

STEP 4: Normalisation to reflect PC definition. Multiply by number of water connections per company.

A1.4.2 Key specific assumptions

The table below sets out the key assumptions we made at each stage of the calculation process. We have not included the assumptions we made about weighting household and non-household valuations or normalisation as we did this consistently across all PCs.

Table A2.7: Water supply interruptions, key assumptions

Step	Assumption	Justification
STEP 3: Combining the valuations for different types of service failures	We have used industry level averages for 2019-20 to 2020-21 for types and duration of interruption. We have applied the proportion of: • unplanned interruptions between 3 and 12 hrs to the 6hr unplanned service failure • unplanned interruptions over 12 hrs to the 24 hr unplanned failure • planned interruptions to the 6hr planned service failure	We have used industry-level data because the level and type of interruption aren't consistently driven by company-specific factors. The service failures fall within the duration categories set out.

A1.5 Bathing water quality

The table below sets out the definition for this PC and the relevant service failures that were included in the survey. For each of the service failures the survey produced a valuation for household and non-household customers.

Table A2.8: Bathing water quality definition

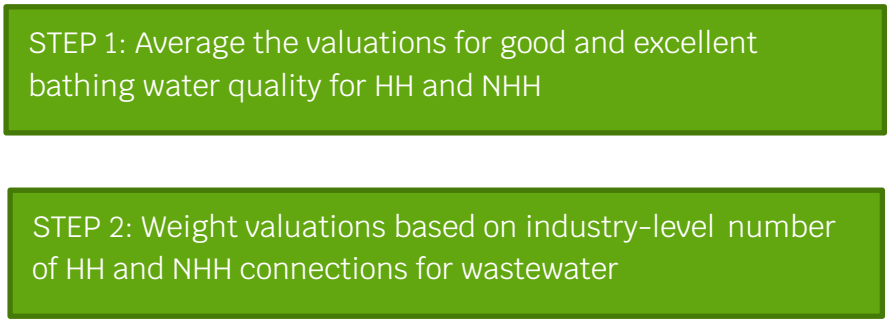
PC Definition	Bathing water quality provides a measure of whether the condition of bathing waters within a company's area will improve or deteriorate over a season. It determines the overall score (%) for the bathing waters in a company's region. Each classification is assigned a score: Poor = 0% Sufficient = 33% Good = 66% Excellent = 100% The overall score is the average of scores for all bathing waters in the company's region.
Relevant service failures	Coastal bathing water is *not Excellent quality* Coastal bathing water is *neither Excellent nor Good quality*

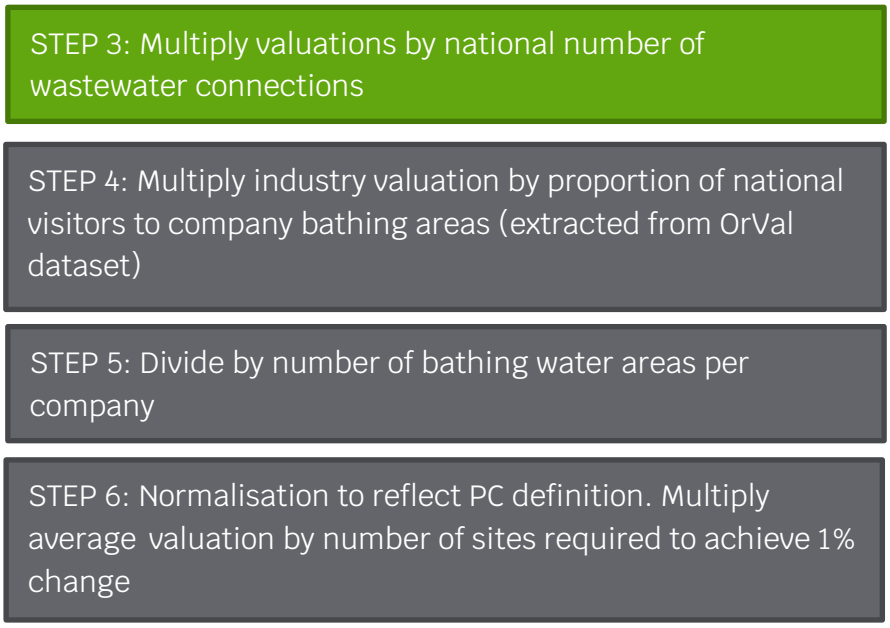
A1.5.1 Mapping calculation

To calculate the marginal benefit for the PC we combine the valuations for the different service failures. For this PC we have done this by taking a straight average as the valuations were so similar. We then calculate the total valuation over the whole of England and Wales and apportion it to companies based on the proportion of England & Wales visitors each company has to its bathing waters.

The flow chart below sets out the steps we took to calculate the marginal benefit rate for this PC, using the valuations as a starting point. Steps 1 to 3 (green boxes) were calculated using industry data and are the same for all companies. Steps 4-6 use company-specific data and therefore result in different values for each company.

Figure A2.4: Bathing water quality, steps to calculate marginal benefit





A1.5.2 Key specific assumptions

The table below sets out the key assumptions we made at each stage of the calculation process. We have not included the assumptions we made about weighting household and non-household valuations or normalisation as we did this consistently across all PCs. As with all our mappings we have used industry-wide valuations and not company-specific valuations. Whilst for the bathing water quality measures there was some variety in valuations across companies, we consider that the visitors to bathing waters can be from any water company area and therefore a national valuation is more appropriate.

Table A2.9: Bathing water quality, key assumptions

Step	Assumption	Justification
STEP 1: Combining good and excellent valuations	Averaged the valuations for good and excellent bathing water quality for HH and NHH	Valuation for not being good and not being excellent were not significantly different from each other so we took an average
STEP 4: Calculating the proportion of national visitors in each company area	For inland waters we assumed the number of visitors to each site was equal to the average number of visitors to all coastal sites	The OrVal dataset that we used to calculate visitor numbers to bathing water only covers coastal sites. We did not have visitor numbers for inland bathing waters, we have therefore assumed they have the average number of visitors.

A2 Top-down approach by performance commitment

A2.1 Internal sewer flooding

This PC measures the number of internal sewer flooding incidents per 10,000 connected wastewater properties.[57] This PC applies to water and sewerage companies (WaSCs) only.

We assign a starting wastewater RoRE allocation to this PC of 0.6%, consistent with this being in the top third of PCs as shown in table 6.2.

We use the difference between the historic performance and the PCL for each company where data exists from 2016-17 until 2021-22 in percentage terms. This is used to calculate the historic industry-wide P10 and P90 values. We use the P90 as it is the larger of the two in absolute terms. This represents the 'stretching but achievable' performance range, while removing outliers.

To convert this percentage performance range into a numerical range which matches the PC definition we apply this P90 value to the 2024-25 PCL for each company. We divide the RoRE allocation by this performance range to get an initial ODI rate.

We unnormalise this rate using the number of connected wastewater properties to get the unit incentive rate per individual internal sewer flooding incident. We calculate the median rate from all company unit rates and set a consistent incentive rate per individual sewer flooding incident. We renormalise the unit rate to get an indicative ODI rate for each company. This is the ODI rate that we expect companies to use in their business plans and will be used as a starting point of forming the ODI rate that will apply to performance during AMP8.

Table A3.1: Internal sewer flooding, key inputs

Component of top-down approach	Description
Starting RoRE allocation	0.6% wastewater RoRE
Historic performance data	2016-17 to 2021-22 number of internal sewer flooding incidents per 10,000 connected wastewater properties
Historic PCL data	2016-17 to 2021-22 normalised to match PC definition
Forward-looking PCL	2024-25 PCL for internal sewer flooding
Normalisation data	2021-22 number of connected wastewater properties

[57] Ofwat, 'PR24 Performance commitment definitions', 2023

A2.2 External sewer flooding

This PC measures the number of external sewer flooding incidents per 10,000 connected wastewater properties.[58] This PC applies to water and sewerage companies (WaSCs) only.

We assign a starting wastewater RoRE allocation to this PC of 0.6%, consistent with this being in the top third of PCs as shown in table 6.2.

This PC exists as a bespoke PC for 9 companies in AMP7 but existed for only 5 companies through AMP6. We decided to exclude the performance deviation from the PCL from AMP6 because we believe that the range is wider and less representative of future expected performance difference to the PCL. Including this data would lead to a performance range beyond what we would consider to be 'stretching but achievable'.

We use the difference between the historic performance and the PCL for each company where data exists from 2020-21 until 2021-22 in percentage terms. This is used to calculate a historic industry-wide P10 and P90. We use the P90 as it is the larger of the two in absolute terms. This represents the 'stretching but achievable' performance range, while removing the impact of significant outliers.

To convert this percentage performance range into a numerical range which matches the PC definition we apply this 90th percentile value to the 2024-25 PCL for each company. We divide the RoRE allocation by this performance range to get an initial ODI rate.

We unnormalise this rate using the number of connected wastewater properties to get the unit incentive rate per individual external sewer flooding incident. We calculate the median rate from all company unit rates to ensure a consistent incentive rate per individual sewer flooding incident. We renormalise the unit rate to get the indicative ODI rate. This is the ODI rate that we expect companies to use in their business plans and will be used as a starting point of forming the ODI rate that will apply to performance during AMP8.

Table A3.2: External sewer flooding, key inputs

Component of top-down approach	Description
Starting RoRE allocation	0.6% wastewater RoRE
Historic performance data	2020-21 to 2021-22 number of external sewer flooding incidents per 10,000 connected wastewater properties
Historic PCL data	2020-21 to 2021-22 normalised to match PC definition
Forward-looking PCL	2024-25 PCL for internal sewer flooding
Normalisation data	2021-22 number of connected wastewater properties

[58] Ofwat, 'PR24 Performance commitment definitions', 2023

A2.3 Water supply interruptions

This PC measures the average number of minutes lost per customer for the whole customer base for interruptions that lasted three or hours or more.[59] This PC applies to all companies.

We assign a starting water RoRE allocation to this PC of 0.6%, consistent with this being in the top third of PCs as shown in table 6.2.

This PC exists as a common PC for all companies in AMP7 and existed for 11 companies through AMP6. Underperformance on this PC is subject to large variations due to external impacts such as extreme weather. We decided that these variations should be included in the performance range since it is likely that such variations will continue to occur in the future. Using the P10 and P90 values will remove significant outliers driven by these external factors.

We use the difference between the historic performance and the PCL for each company where data exists from 2016-17 until 2021-22 in percentage terms. This is used to calculate a historic industry-wide 10th and 90th percentile. We use the 10th percentile as it is the larger of the two in absolute terms. This represents the 'stretching but achievable' performance range, while removing the impact of significant outliers.

To convert this percentage performance range into a numerical range which matches the PC definition we apply this 10th percentile value to the 2024-25 PCL for each company. We divide the RoRE allocation by this performance range to get an initial ODI rate.

We unnormalise this rate using the number of connected water properties to get the unit incentive rate per individual minute of interruption beyond 3 hours. We calculate the median rate from all company unit rates to ensure a consistent incentive rate per minute. We renormalise the unit rate to get the indicative ODI rate. This is the ODI rate that we expect companies to use in their business plans and will be used as a starting point of forming the ODI rate that will apply to performance during AMP8.

Table A3.3: Water supply interruptions, key inputs

Component of top-down approach	Description
Starting RoRE allocation	0.6% water RoRE
Historic performance data	2016-17 to 2021-22 average minutes of interruption to supply per property for interruptions above 3 hours
Historic PCL data	2016-17 to 2021-22 normalised to match PC definition
Forward-looking PCL	2024-25 PCL for water supply interruptions
Normalisation data	2021-22 number of connected water properties

[59] Ofwat, 'PR24 Performance commitment definitions', 2023

A2.4 Compliance risk index (CRI)

This PC measures the annual CRI for a company, which is the sum of the individual CRI scores for every compliance failure reported during the year.[60] This PC applies to all companies.

We assign a starting water RoRE allocation to this PC of 0.6%, consistent with this being in the top third of PCs as shown in table 6.2.

This PC exists as a common PC for all companies in AMP7 and companies are required to reach the statutory target of 0 set by the EA and NRW for England and Wales respectively. We use this statutory target of 0 as the PCL for all companies across all years of performance data.

We use the difference between the historic performance and the PCL for each company from 2017-18 until 2021-22 in percentage terms. Since this unidirectional PC (companies cannot achieve a performance level better than 0), we only calculate the P10 of performance. This represents the 'stretching but achievable' performance range, while removing the impact of significant outliers.

To convert this percentage performance range into a numerical range which matches the PC definition we apply this 10th percentile value to the 2024-25 PCL for each company. We divide the RoRE allocation by this performance range to get an initial ODI rate.

We unnormalise this rate using the number of water customers, according to the DWI definition, to get the unit incentive rate per customer. We calculate the median rate from all company unit rates to ensure a consistent incentive rate of CRI per customer. We renormalise the unit rate to get the indicative ODI rate. This is the ODI rate that we expect companies to use in their business plans and will be used as a starting point of forming the ODI rate that will apply to performance during AMP8.

Table 3.4: Compliance risk index, key inputs

Component of top-down approach	Description
Starting RoRE allocation	0.6% water RoRE
Historic performance data	2017-18 to 2021-22 CRI
Historic PCL data	2017-18 to 2021-22
Forward-looking PCL	2024-25 PCL for CRI
Normalisation data	2021 number of water customers (DWI reporting)

[60] Ofwat, 'PR24 Performance commitment definitions', 2023

A2.5 Customer contacts about water quality

This PC measures the number of times the company is contacted by consumers due to the taste and odour of drinking water or because the drinking water is not clear, reported per 1,000 population.[61] This PC applies to all companies.

We assign a starting water RoRE allocation to this PC of 0.6%, consistent with this being in the top third of PCs as shown in table 6.2.

This PC exists as bespoke PCs for appearance and taste & smell for 11 companies in AMP7 and existed for 15 companies through AMP6. Because of the complexity of combining historic PCLs for each element of the PC where not all companies had bespoke PCs for both, we form a 'proxy' PCL based on historic performance data. Companies report combined performance data on customer contacts for appearance and taste and smell. We calculate an annual PCL based on the upper quartile of performance across all companies. We choose the upper quartile because it represents a high performing, efficient company, where most companies were incentivised to improve performance through bespoke PCs.

We use performance data according to the PR19 PC definition rather than the PR24 definition. This is due to less data being available for the latter. We have judged that a greater number of data points provides a greater value than matching the definition. There is a 9% difference between the performance values of the two definitions on average across all data points.

We use the difference between the historic performance and the 'proxy' PCL for each company where data exists from 2017-18 until 2021-22 in percentage terms. This is used to calculate a historic industry-wide P10 and P90. We use the P10 as it is the larger of the two in absolute terms. This represents the 'stretching but achievable' performance range, while removing the impact of significant outliers.

To convert this percentage performance range into a numerical range which matches the PC definition we apply this 10th percentile value to the 2024-25 'proxy' PCL for each company. To form this PCL, we form a linear trend from the historic 'proxy' PCL and extend it to 2024-25. We divide the RoRE allocation by this performance range to get an initial ODI rate.

We unnormalise this rate using the number of water customers, according to the DWI definition, to get the unit incentive rate per customer contact. We calculate the median rate from all company unit rates to ensure a consistent incentive rate per customer contact. We renormalise the unit rate to get the indicative ODI rate. This is the ODI rate that we expect companies to use in their business plans and will be used as a starting point of forming the ODI rate that will apply to performance during AMP8.

Table A3.5: Customer contacts, key inputs

[61] Ofwat, 'PR24 Performance commitment definitions', 2023

Component of top-down approach	Description
Starting RoRE allocation	0.6% water RoRE
Historic performance data	2017-18 to 2021-22 number of customer contacts for appearance and taste and smell (according to PR19 definition)
Historic PCL data	Annual 'proxy' PCL formed by the upper quartile of normalised performance applied to each year between 2017-18 and 2021-22
Forward-looking PCL	2024-25 'proxy' PCL formed from a linear trend of 2017-18 to 2021-22 'proxy' PCL values
Normalisation data	2021 number of water customers (DWI reporting)

A2.6 Discharge permit compliance

This PC measures the extent of compliance of sewage treatment works (STW) and water treatment works (WTW) with their numeric permits. It is measured as number of STWs and WTWs not failing a numeric permit in a year as a proportion of permitted discharges, in line with the EA and NRW definitions.[62] This PC applies to all companies.

We assign a starting wastewater RoRE allocation to this PC of 0.5%, consistent with this being in the middle third of PCs as shown in table 6.2. For WaSCs the price control allocation for ODI payments for this PC will be split between wastewater and water regulated equity. However, at the time of developing indicative ODI rates we have not confirmed what this split will be. Since STWs are more numerous than WTWs, we use wastewater regulated equity for the RoRE allocation.

This PC exists in PR19 for all WaSCs as a measure of treatment works compliance for STWs only. However, all companies are required to reach the statutory obligation of 100% compliance across STWs and WTWs set by the EA and NRW. For this exercise we set the historic PCL at the 100% compliance rate, in line with the PR19 PCL and the statutory obligation.

We use the difference between the historic performance and the PCL for each company from 2017-18 until 2021-22 in percentage terms. Since this unidirectional PC (companies cannot achieve a performance level better than 100%), we only calculate the P10 of performance. This represents the 'stretching but achievable' performance range, while removing the impact of significant outliers.

As the discharge permit compliance is already measured in percentage terms, we do not need convert the percentage change to PCL into a numerical range. We divide the RoRE allocation by this performance range to get an initial ODI rate.

[62] Ofwat, 'PR24 Performance commitment definitions', 2023

We unnormalise this rate by calculating the number of sites that are required to fail a numeric permit to achieve a 1% change in discharge permit compliance using the three year average of the number of discharges. From this we can calculate an incentive rate per individual STW or WTW in breach of a numeric permit. We calculate the median rate from all WaSC unit rates to ensure a consistent incentive rate per individual STW or WTW failing a permit. We exclude WoCs from this median rate calculation since the number of WTWs and the number of discharges is much lower. The median rate across WaSCs is still applied to WoCs to ensure a consistent unit rate as a starting point for all companies.

We renormalise the unit rate to get the indicative ODI rate. This is the ODI rate that we expect companies to use in their business plans and will be used as a starting point of forming the ODI rate that will apply to performance during AMP8.

Table A3.6: Discharge permit compliance, key inputs

Component of top-down approach	Description
Starting RoRE allocation	0.5% wastewater RoRE (WaSCs); 0.5% water RoRE (WoCs)
Historic performance data	2017-18 to 2021-22 discharge permit compliance score
Historic PCL data	Statutory target of 100% compliance
Forward-looking PCL	Statutory target of 100% compliance
Normalisation data	3 year average of number of numeric discharges from STWs and WTWs (2019-2021)

A2.7 Total pollution incidents

This PC measures the total number of category 1-3 pollution incidents from wastewater assets per 10,000 km wastewater network on an annual basis.[63] The recording of a pollution incident follows the Environmental Performance Assessment (EPA) set out by the EA (England) and NRW (Wales).[64] [65] This PC applies to water and sewerage companies (WaSCs) only.

We assign a starting wastewater RoRE allocation to this PC of 0.5%, consistent with this being in the middle third of PCs as shown in table 6.2.

This PC exists as a common PC for all companies in AMP7 and existed as a comparable PC for ten companies in AMP6. This allows us to compare incentivised performance data against a PCL for almost all companies across an extended period of time. We use the difference between the historic performance and the PCL for each company where data exists from 2014-15 until 2021-22 in percentage terms. This is used to calculate the historic industry-

[63] Ofwat, 'PR24 Performance commitment definitions', 2023.
[64] Environment Agency, Natural Resources Wales, 'Environmental Performance Assessment version 9', June 2021.
[65] Environment Agency, Natural Resources Wales, 'Environmental Performance Assessment version 8', January 2021.

wide P10 and P90 values. We use the P90 as it is the larger of the two in absolute terms. This represents the 'stretching but achievable' performance range, while removing outliers.

To convert this percentage performance range into a numerical range which matches the PC definition we apply this P90 value to the 2024-25 PCL for each company. We divide the RoRE allocation by this performance range to get an initial ODI rate.

We unnormalise this rate using the length of each company's sewer network in 2021-22 to get the unit incentive rate per individual pollution incident. We calculate the median rate from all company unit rates to ensure a consistent incentive rate per individual pollution incident. We renormalise the unit rate to get the indicative ODI rate. This is the ODI rate that we expect companies to use in their business plans and will be used as a starting point of forming the ODI rate that will apply to performance during AMP8.

Table A3.7: Total pollution incidents, key inputs

Component of top-down approach	Description
Starting RoRE allocation	0.5% wastewater RoRE
Historic performance data	2014-15 to 2021-22 number of category 1-3 pollution incidents
Historic PCL data	2014-15 to 2021-22 company-specific PCLs for number of category 1-3 pollution incidents
Forward-looking PCL	2024-25 PCL, Hafren Dyfrdwy has a company-specific PCL
Normalisation data	Total length of sewer network 2021-22

A2.8 Serious pollution incidents

This PC measures the number of category 1-2 pollution incidents from all sewerage and water assets as set out by the EA and NRW.[66] This PC applies to all companies.

We assign a starting wastewater RoRE allocation to this PC of 0.5%, consistent with this being in the middle third of PCs as shown in table 6.2. For WaSCs the price control allocation for ODI payments for this PC will be split between wastewater and water regulated equity. However, at the time of developing indicative ODI rates we have not confirmed what this split will be. Since serious pollution incidents are historically more likely to occur from wastewater assets, we use wastewater regulated equity for the RoRE allocation.

Since this PC is new at PR24 there are no historic PCLs. However, the EA has set EPA targets for the number of serious pollution incidents per year for all WaSCs in England.[67] We adopt these targets as historic 'proxy' PCLs for England and Wales WaSCs. Because of the lower frequency of serious pollution incidents from WoCs, we set the historic 'proxy' PCL at 0.

[66] Ofwat, 'PR24 Performance commitment definitions', 2023.
[67] Environment Agency, 'Water and sewerage companies in England: EPA metric guide for 2021', July 2022.

We calculate the 'stretching but achievable' performance range for WaSCs by calculating the industry-wide P10 and P90 values for the performance difference to the 'proxy' PCL across 2011-12 to 2021-22 in terms of serious pollution incidents per 10,000 sewer network. We use the P10 as it is the larger of the two in absolute terms. This represents the 'stretching but achievable' performance range, while removing outliers.

We unnormalise this P10 value for WaSCs to get the performance range in terms of the number of category 1-2 pollution incidents. Due to the small number of category 1-2 pollution incidents from WoCs we assume the 'stretching but achievable' performance range is 1. This is in line with historical data.

We calculate the median rate from all company unit rates to ensure a consistent incentive rate per individual category 1-2 pollution incident. This is unadjusted indicative ODI rate.

The purpose of the serious pollution incidents PC is to set a higher incentive rate for category 1-2 pollution incidents to reflect the size of impact that such an incident has on the environment. The intention is that this should not be an additional ODI payment to the payment from the total pollution incidents PC for category 1-2 pollution incidents. For this reason, we make an adjustment to the ODI rates for total pollution incidents and serious pollution incidents to avoid a company paying or receiving ODI payments twice for a marginal change in the number of category 1-2 pollution incidents. We deduct the marginal incentive rate for each pollution incident from the total pollution incidents PC from the serious pollution incidents marginal rate. This yields the adjusted indicative ODI rate. This adjustment only applies to WaSCs since the total pollution incidents PC does not apply to WoCs.

This is the ODI rate that we expect companies to use in their business plans and will be used as a starting point of forming the ODI rate that will apply to performance during AMP8.

Table A3.8: Serious pollution incidents, key inputs

Component of top-down approach	Description
Starting RoRE allocation	0.5% wastewater RoRE (WaSCs); 0.5% water RoRE (WoCs)
Historic performance data	2011-12 to 2021-22 number of category 1-2 pollution incidents
Historic PCL data	Historic EPA targets
Forward-looking PCL	N/A
Normalisation data	2021-22 total sewer network length

A2.9 Storm overflows

This PC measures the average number of spills per storm overflow on an annual basis.[68] This PC applies to water and sewerage companies (WaSCs) only.

We assign a starting wastewater RoRE allocation to this PC of 0.5%, consistent with this being in the middle third of PCs as shown in table 6.2.

The extent of monitoring of spills from storm overflows has been low historically.[69] This has limited the number of years of data which we can confidently use to inform future performance ranges. We use performance data from 2020 to 2022. We calculate the performance level from the historical data as the number of spills per storm overflow where an Event Duration Monitor (EDM) is installed. EDMs were operational on average 95% of the time over this period. We make an additional uplift to the average number of spills where we assume that the number of spills when storm overflows weren't monitored is the same as when they weren't monitored.

Since this PC is new at PR24 there are no historic PCLs. We set a 'proxy' PCL for each year as the midpoint between the 10th percentile and 90th percentile of performance across all 11 companies in each year. Since companies have had no previous financial incentive to reduce the number of spills, we believe this is more reasonable as an anchor point to set the performance range. We considered alternatives such as an annual reduction in spills and the upper quartile number of spills. These alternatives would lead to a performance deviation from the PCL that would be too great since the PCL represents a stretching target while companies weren't being incentivised at that time (the PCL is dynamic while performance is static).

We calculate the 'stretching but achievable' performance range using the industry-wide P10 and P90 values for the performance difference to the 'proxy' PCL across 2020 to 2022 in percentage terms. We use the P90 as it is the larger of the two in absolute terms. This represents the 'stretching but achievable' performance range, while removing the impact of significant outliers.

To convert this percentage performance range into a numerical range which matches the PC definition we apply this P90 value to a reasonable estimated PCL target for performance going into AMP8. We use a value of 20 spills per storm overflow. We divide the RoRE allocation by this performance range to get an initial ODI rate.

We unnormalise this rate using the number of storm overflows with EDMs installed in 2022 for each company to get the unit incentive rate per individual spill from a storm overflow. We calculate the median rate from all company unit rates to ensure a consistent incentive rate per individual spill. We renormalise the unit rate to get the indicative ODI rate. This is the ODI

[68] Ofwat, 'PR24 Performance commitment definitions', 2023.
[69] Environment Agency, 'Event Duration Monitoring – Storm Overflows – Annual Returns', April 2023.

rate that we expect companies to use in their business plans and will be used as a starting point of forming the ODI rate that will apply to performance during AMP8.

Table A3.9: Storm overflows, key inputs

Component of top-down approach	Description
Starting RoRE allocation	0.5% wastewater RoRE
Historic performance data	2020-2022 number of spills per overflow with EDM installed (with uplift)
Historic PCL data	Midpoint between annual industry-wide P10 and P90 values
Forward-looking PCL	20 spills per storm overflow per year
Normalisation data	Number of storm overflows with EDM installed

A2.10 River water quality

This PC measures the percentage reduction from a 2020 baseline of phosphorus entering rivers from water companies and other sources.[70] The ODI rate applies to the percentage reduction in kilogram terms. This PC applies to water and sewerage companies (WaSCs) only.

We assign a starting wastewater RoRE allocation to this PC of 0.5%, consistent with this being in the middle third of PCs as shown in table 6.2.

This is a new PC, meaning that data matching the PC definition is limited. We had previously commissioned the consultancy firm Jacobs to collect data on phosphorus load from sewage treatment works across all WaSCs.[71] Phosphorus load is typically measured in milligrams per litre but we need to convert this into kilograms per year. Jacobs also collected data on mean annual flow in rivers. They used this data to convert phosphorus load from sewage treatment works into kilograms per year.[72] We were able to use 3,261 observations from 512 discharge sites in our analysis out of a total of 3,714 observations from 589 sites where a phosphorus permit exists.

As with other new PCs, we created a 'proxy' PCL to calculate a performance range against. For each observation we calculated the percentage difference between the permitted phosphorus load and the actual load in kilograms per year. This allowed us to form a range of phosphorus load performance against. We set the 'proxy' PCL as the median percentage difference across all sites and all years. We set the performance range as the percentage point difference between the P10 across all samples and this median value. This represents the 'stretching but achievable' performance range, while removing the impact of significant outliers.

[70] Ofwat, 'PR24 Performance commitment definitions', 2023.
[71] Ofwat, Jacobs, 'Water company phosphorus discharge data 2011-2021', June 2023.
[72] Ofwat, Jacobs, 'Water Quality Performance Commitment Review by Jacobs', June 2023.

To convert this percentage performance range into a numerical range which matches the PC definition we apply this performance range to a reasonable estimated permitted phosphorus load reduction per year during AMP8. We use modelling outputs for the EA of estimated phosphorus load in kilograms per year per company at the end of AMP7 and at the end of AMP8. From this we calculate the average annual phosphorus load reduction. The 'stretching but achievable' performance range for the difference to the permitted phosphorus load is applied to this figure to covert the performance range from a percentage value into a value in kilograms per year.

We divide this performance range by the assigned RoRE allocation to get an initial ODI rate per kg phosphorus reduction. We take the median rate across all companies to get the indicative ODI rate. This is the ODI rate that we expect companies to use in their business plans and will be used as a starting point of forming the ODI rate that will apply to performance during AMP8.

Table A3.10: River water quality, key inputs

Component of top-down approach	Description
Starting RoRE allocation	0.5% wastewater RoRE
Historic performance data	2011-2021 percentage difference in phosphorus load between actual and permitted amount in kg per year
Historic PCL data	Median calculation of percentage difference in phosphorus load between actual and permitted amount
Forward-looking PCL	Modelled data from EA on estimated reduction in permitted phosphorus load per company from end-AMP7 to end-AMP8
Normalisation data	N/A

A2.11 Water demand (Leakage, per capita consumption, business demand)

For PR24, there are three PCs which aim to incentivise a reduction in water demand:

- leakage – this PC measures the percentage reduction of three-year average leakage in mega-litres per day (Ml/d) from the 2019-20 baseline;
- per capita consumption (PCC) – this PC measures the percentage reduction of three-year average PCC in litres per person per day (l/p/d) from the 2019-20 baseline; and,
- business demand - this PC measures the percentage reduction of three-year average business demand in Ml/d from the 2019-20 baseline.[73]

These PCs apply to all companies.

[73] 'Business demand' means consumption at non-household ('business') premises; 'business customers' (also referred to as 'non-household customers') include businesses, charities and public sector organisations.

Customer preferences have been used to inform the RoRE allocation. We assign a starting water RoRE allocation of 0.5% to the leakage PC, consistent with this being in the middle third of PCs as shown in table 6.2. We assign 0.4% to both the PCC and the business demand PCs, consistent with these being in the lower third of PCs as shown in table 6.2. This means that the water demand PCs have an aggregate RoRE allocation of 1.3%.

Leakage and PCC are common PCs for all companies in PR19. Since the business demand PC is new at PR24, there are no historic PCLs. Government has set a statutory water demand target in which it states that non-household demand should be reduced by 9% by 2037-38 from the 2019-20 baseline reporting year figures.[74] This is equivalent to a 0.5% annual reduction over the same time period. Companies have also submitted their forecasts for non-household demand in 2025-30 in their draft water resources management plans (WRMPs). To set a proxy PCL for business demand, we compare the target performance and the forecasted performance and use the lowest performance for each company as their proxy PCL (it requires the largest reduction in non-household demand).

To calculate the indicative unit rate for each PC using a top-down approach, we need to calculate a 'stretching but achievable' performance range. In setting this performance range for demand PCs, it is important for us to consider the impact of the Covid-19 pandemic and subsequent lockdowns on water usage levels and how this might impact on rate setting.

For the past two years, due to the Covid-19 pandemic and subsequent lockdowns, there have been significant changes in PCC and business demand when compared to historic levels. Annual PCC levels increased significantly in 2020-21 and remain higher than before the pandemic. In contrast, business demand levels decreased in 2020-21 and still remain lower than before the pandemic.

These changes do not follow performance trends of previous years and it is unlikely that annual performance will vary so significantly in the future. Therefore, the calculated performance ranges were not representative of a 'stretching but achievable' performance level for PR24. To address this, we aggregated the performance and PCL data from each demand PC to calculate the performance range for aggregate demand. By combining the PCC and business demand levels, this option offsets the impacts of the pandemic on consumption levels.

We calculated the performance range using the difference between the aggregate historic performance and the aggregate PCL for each company from 2019-20 until 2021-22 in Ml/d, and then convert that into percentage terms. The 'stretching but achievable' performance range for companies is found by calculating the industry-wide 10th and 90th percentile values for the performance range. We use the 10th percentile value as the performance range for companies instead of the 90th percentile value as it is the larger of the two in absolute terms, representing 'stretching' performance, while removing outliers.

[74] Defra, 'Environmental Improvement Plan 2023', January 2023.

We set a consistent unit rate across the demand PCs, so a Ml/d reduction in water usage either through leakage, PCC or business demand is valued equally. This reflects the principle that the social benefit from the reduced demand for water is the same regardless of how this is achieved.

To convert this performance range from a percentage into a numerical range which matches the PCs definitions, we apply the 10th percentile value to the 2024-25 aggregate PCL for each company. We divide the RoRE allocation for aggregate demand by this performance range to get the 10th percentile unit rate for each company. We take the median rate across all companies to get the consistent unit rate.

For the leakage and the business demand PCs, the indicative ODI rate is the consistent unit rate, as the incentive payments for these PCs relate to performance changes expressed in Ml/d. For the PCC PC, the incentive payments relate to performance changes expressed in l/p/d, so we renormalise the consistent unit rate using the total household population for 2021-22 to get the indicative ODI rate.

Table A3.11: Demand, key inputs

Component of top-down approach	Description
Starting RoRE allocation	1.3% water RoRE (0.5% for leakage, 0.4% for PCC and business demand)
Historic performance data	2017-18 to 2021-22 for leakage, PCC and business demand
Historic PCL data	PR19 PCL for leakage and PCC. For business demand, use proxy PCL based on the Water Demand Target to reduce NHH demand by 9% by 2037-38, in relation to 2019-20, and based on the companies' NHH demand forecast for 2025-30
Forward-looking PCL	2024-25 PCL for leakage and PCC. For business demand, proxy PCL based on the Water Demand Target to reduce NHH demand by 9% by 2037-38, in relation to 2019-20, and based on the companies' NHH demand forecast for 2025-30.
Normalisation data	2021-22 total household population (for PCC only)

A2.12 Bathing water quality

This PC measures the total quality of bathing waters in each company's area.[75] It measures the average value of a bathing water based on the bathing water classifications assigned by the EA and NRW.[76] [77] We give each classification from 'poor' to 'excellent' a percentage score:

- Poor – 0%
- Sufficient – 33%

[75] Ofwat, 'PR24 Performance commitment definitions', 2023.
[76] Environment Agency, Bathing water quality.
[77] Natural Resources Wales, Bathing water quality.

- Good – 66%
- Excellent – 100%

We take the average score from all bathing waters for each company. This yields a score out of 100 which is the measure of this PC.

We assign a starting wastewater RoRE allocation to this PC of 0.4%, consistent with this being in the lower third of PCs as shown in table 6.2.

For the performance data, we use bathing water classification data from the EA and NRW from 2015 to 2021. We convert each classification into its respective score and take the average score for each company in each year.

Since this is a new PC, there are no historic PCLs that we can use to calculate a performance range. As with other new PCs we form a 'proxy' PCL. Since there hasn't previously been any financial incentives on improving bathing water quality, we do not set the 'proxy' PCL as a stretching level of performance. We instead set it as the median annual score across all years for each company to reflect the more stationary trend in performance.

We calculate the difference in performance as a percentage between the actual score and the company median for each company and each year. We calculate the P10 and P90 values of these performance differences across all years and all companies. The P10 and P90 in this instance are identical so we can use either value. This represents the 'stretching but achievable' performance range, while removing the impact of significant outliers.

An alternative approach to calculating the performance range that we considered was to calculate the year-to-year difference in performance and from there calculate the upper quartile and P90 values across all data points. This led to a similar performance range to our preferred approach. We elected to use the preferred approach since it is more consistent with the approach for other PCs.

To convert this percentage performance range into a numerical range which matches the PC definition we apply this performance range to a reasonable estimated level of performance going into AMP8. Since the trend of performance is relatively flat, we elect to use the average score for each company in 2021 as this performance value. We multiply the percentage 'stretching but achievable' performance range by this 2021 performance value to get the performance range in terms of the bathing water quality PC score.

We divide this performance range by the assigned RoRE allocation to get an initial ODI rate per unitary score improvement. We convert this rate into a rate per classification improvement at a single bathing water site, eg from sufficient to good. We calculate the median rate across all companies for a single classification improvement. This is to ensure a consistent valuation across all companies. We then renormalise this rate to get the indicative ODI rate for a unitary score improvement according to the PC definition. This is the ODI rate

that we expect companies to use in their business plans and will be used as a starting point of forming the ODI rate that will apply to performance during AMP8.

Table A3.12: Bathing water quality, key inputs

Component of top-down approach	Description
Starting RoRE allocation	0.4% wastewater RoRE
Historic performance data	2015-2021 bathing water quality classifications (EA, NRW)
Historic PCL data	Median calculation per company of average bathing water quality score
Forward-looking PCL	2021 bathing water quality score per company
Normalisation data	Number of bating water sites per company

A2.13 Asset health (mains repairs, unplanned outage and sewer collapses)

The three asset health PCs (mains repairs, unplanned outage and sewer collapses) are intended to incentivise companies to maintain their water and wastewater assets to reduce the frequency of poor service outcomes in the future.[78] Since performance against these PCs does not affect customers or the environment directly, we took a slightly different approach to setting the indicative ODI rates. The size of the incentive rate and its effect on performance depends more on how the incentive rate for one additional unit of work, such as one fewer mains repair, compares to the marginal cost of one additional mains repair.

The approach we used follows the top-down methodology for other PCs but also considers analysis of past performance and whether the rates set at PR19 have had a positive impact on performance. We compared the rates derived from the top-down approach against PR19 rates and adjusted them to produce rates that are higher, equivalent to or lower than the respective PR19 underperformance rates based on whether past performance is strong or weak relative to the PCL.

Mixed or poor performance indicates that the PR19 rate could be too low. Good performance indicates that the rate is working but there we have made judgements on whether to reduce the rate if we think performance has been over-incentivised.

For mains repairs, company performance has generally been hitting the PCL. This indicates that the rate should be comparable to PR19, with adjustments for price inflation and RCV growth.

For unplanned outage, company performance has generally exceeded the PCL. Since this was a new PC at PR19 with a new way of monitoring peak week production capacity, it has been difficult to assess whether the PCL has been too easy to achieve or whether the PR19 rate has

[78] Ofwat, 'PR24 Performance commitment definitions', 2023.

provided too strong an incentive. From this, we aimed for a target indicative ODI rate for PR24 to be at or below the median PR19 underperformance rate. All PR19 rates were adjusted upwards to reflect RCV growth and inflation. All indicative ODI rates are stronger in nominal terms than the current PR19 rates.

For sewer collapses, company performance has been mixed, with a number of companies underperforming against the PCL. This indicates that the new indicative ODI rate should be higher than the PR19 rate, with adjustments for price inflation and RCV growth.

This provided a guide for what level of performance should be used in the mechanistic top-down approach, where a greater expected performance range would lead to a lower rate per incident and a smaller expected performance range would lead to a higher rate per incident. However, it should be noted that this assessment of past performance was limited to two years of data since these are the only two years where these common PCs have applied. The analysis is therefore based on a short-term view of performance.

At the start of the mechanistic top-down approach, we assigned starting water RoRE allocations of 0.5% each for mains repairs and unplanned outage. For sewer collapses we assigned a starting wastewater RoRE allocation of 0.5%.

For each PC we calculated the difference between historic performance and the PCL for each year and each company where data exists. For mains repairs we used performance and PCL data from 2015-16 to 2021-22 for all companies which had a PCL. For unplanned outage and sewer collapses, comparable PCLs only existed from 2020-21 onwards so we used only two years of data. After we calculated the difference between performance and the PCL in percentage terms for each company in each year we calculated the industry-wide P10 and P90 values. The P90 was the greater of the two in absolute terms for all three PCs so we used this as the 'stretching but achievable' performance range, while removing the impact of significant outliers.

To convert this percentage performance range into a numerical range which matches the PC definition we applied this 90th percentile value to the 2024-25 PCL for PC and each company. We divided each PC's RoRE allocation by this performance range to get an initial ODI rate.

We unnormalised these initial ODI rate to get a marginal incentive rate per individual incident, eg per additional mains repair. We then calculated the median rate per incident across all companies for each PC. From this we were able to compare these indicative rates per incident against the median adjusted PR19 underperformance rates.

We repeated the process using the 'natural limit' of performance beyond this PCL. This is where a company physically cannot improve any further since it has achieved a performance on zero, eg zero mains repairs across the whole network. This represents an extreme example of performance. We compared the per incident marginal incentive rates derived from this performance range for each PC against the comparable PR19 rates per incident.

For mains repairs, the rate derived from the P90 performance range was 28% less than the PR19 rate, while the rate derived from the 'natural limit' approach was 83% less. Using regulatory judgement, we adjusted the percentage performance range to a point below the P90 value to achieve an ODI rate that was comparable to the PR19 rate per incident. This matches our objective of setting an ODI rate that matches the strength of the incentive from PR19.

For unplanned outage, the rates derived from the P90 performance range and the 'natural limit' approach was 41% and 7% higher than the PR19 rate per incident, respectively. Using regulatory judgement, we selected a performance range that would lead to a lower rate per incident than at PR19. This matches our objective of setting an ODI rate that is weaker than the strength of the incentive from PR19.

For sewer collapses, the rates derived from the P90 performance range and the 'natural limit' approach were 170% and 53% higher than the PR19 rate per incident, respectively. Using regulatory judgement, we used the P90 performance range to get to a rate per incident which is stronger than the PR19 rate.

All PR19 rates were adjusted upwards to reflect RCV growth and inflation. All indicative ODI rates are stronger in nominal terms than the current PR19 rates.

We normalised the selected incentive rate per incident for each PC to get to the indicative ODI rat per company.

Table A3.13: Asset health, key inputs

Component of top-down approach	Mains repairs	Unplanned outage	Sewer collapses
Starting RoRE allocation	0.5% water	0.5% water	0.5% wastewater
Historic performance data	2015-16 to 2021-22	2017-18 to 2021-22	2017-18 to 2021-22
Historic PCL data	2015-16 to 2021-22	2020-21 to 2021-22	2020-21 to 2021-22
Forward-looking PCL	2024-25 PCL	2024-25 PCL	2024-25 PCL
Adjusted performance range 1	Natural limit (100%)	Natural limit (100%)	Natural limit (100%)
Adjusted performance range 2	20% difference from PCL	130% difference from PCL	-
Normalisation data	2021-22 mains length (km)	2021-22 peak week production capacity (Ml/d)	2021-22 sewer length (km)

A3 Indicative ODI rates

These tables set out the indicative ODI rates we have developed using a top-down approach. Companies must use these indicative rates in their business plans or provide compelling evidence to support any alternatives.

Table A4.1: Water and sewerage companies, indicative ODI rates

£m, 2022-23 FYA	ANH	WSH	HDD	NES	SVE	SWB	SRN	TMS	UUW	WSX	YKY
Internal sewer flooding	12.629	6.508	0.094	5.701	18.488	3.412	8.879	26.756	15.098	5.612	10.310
External sewer flooding	5.654	2.914	0.042	2.552	8.277	1.528	3.976	11.979	6.760	2.513	4.616
Customer contacts	12.432	8.207	0.541	11.666	22.093	6.312	6.754	26.183	19.060	3.459	13.928
Compliance Risk Index (CRI)	1.237	0.817	0.054	1.161	2.198	0.628	0.672	2.605	1.896	0.344	1.386
Water supply interruptions	1.356	0.880	0.064	1.242	2.234	0.650	0.685	2.393	2.058	0.379	1.386
River water quality	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Bathing water quality	2.712	5.932	-	1.921	0.056	8.417	4.689	0.339	1.638	2.712	0.960
Total pollution incidents	1.736	0.833	0.011	0.680	2.083	0.518	0.899	2.463	1.777	0.789	1.182
Serious pollution incidents	1.138	1.138	1.138	1.138	1.138	1.138	1.138	1.138	1.138	1.138	1.138
Discharge permit compliance	6.195	4.401	0.344	1.479	5.528	2.482	2.285	2.819	2.878	2.358	2.292
Storm overflows	0.691	1.396	0.032	0.960	1.599	0.868	0.616	0.310	1.293	0.775	1.389
Leakage	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365
Per capita consumption	1.765	1.116	0.075	1.718	3.089	0.907	0.941	3.751	2.570	0.483	1.943
Business demand	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365
Mains repairs	0.339	0.244	0.023	0.231	0.417	0.162	0.121	0.279	0.374	0.106	0.281
Unplanned outage	2.139	1.580	0.089	1.859	3.013	1.111	1.056	4.143	4.058	0.698	1.971
Sewer collapse	1.670	0.801	0.011	0.654	2.004	0.498	0.865	2.369	1.709	0.759	1.137

Table A4.2: Water only companies, indicative ODI rates

£m, 2022-23 FYA	AFW	BRL	SSC	PRT	SEW	SES
Internal sewer flooding	-	-	-	-	-	-
External sewer flooding	-	-	-	-	-	-
Customer contacts	9.874	3.204	4.520	1.928	5.858	1.913
Compliance Risk Index (CRI)	0.982	0.319	0.450	0.192	0.583	0.190
Water supply interruptions	0.916	0.332	0.450	0.195	0.580	0.180
River water quality	-	-	-	-	-	-
Bathing water quality	-	-	-	-	-	-
Total pollution incidents	-	-	-	-	-	-
Serious pollution incidents	1.363	1.363	1.363	1.363	1.363	1.363
Discharge permit compliance	0.168	0.088	0.330	0.044	0.337	0.029
Storm overflows	-	-	-	-	-	-
Leakage	0.365	0.365	0.365	0.365	0.365	0.365
Per capita consumption	1.412	1.431	0.626	0.267	0.815	0.269
Business demand	0.365	0.365	0.365	0.365	0.365	0.365
Mains repairs	0.148	0.061	0.076	0.030	0.131	0.031
Unplanned outage	1.629	0.649	0.719	0.337	0.870	0.290
Sewer collapse	-	-	-	-	-	-

A4 Indicative mapping from service incidents to performance commitments

See separate document.

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