A4: Designing outcome delivery incentives

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OVERVIEW

In this appendix we explain how we have designed our outcome delivery incentives (ODIs). At the heart of our process is designing appropriate frameworks that allow us to determine each key parameter of an ODI, notably:

- Structure of incentives:
    - financial v reputational;
    - use of deadbands, caps and collars;
    - meeting regulatory expectations on asset health;
    - interaction with enhancement expenditure; and
- calculation of *incentive rates*

In **Part 1** we expand on our earlier description from Chapter 9 and explain our approach to designing ODIs. This relates to both the structure of the incentives and setting the incentive rates.

In **Part 2** we apply our frameworks to develop our package of ODIs. In this section we particularly focus on the development of the incentive rates, analysis of outliers and the interventions we have made to ensure robust valuations that protect the interests of customers.

We conclude by presenting our package of ODIs consistent with the App1 data table.

For further information please see:

- **Appendix A1** - Engaging Customers– which provides further detail on our customer engagement and valuation studies;
- **Appendix A3** - Designing performance commitments – which details how we have defined each performance commitment and associated service levels;
- **Appendix A8 –** Securing cost efficiency - which provides further information on our real option mechanisms, the rationale and associated triggers.

In this appendix we've redacted information that relates to the location of some of our water sites.

Contents

PART A - OUR APPROACH

1. Improving the design of our ODIs - an overview

In AMP6 we embraced the outcomes framework and use of ODIs. Not only did we commit to amongst the biggest potential range of penalties and rewards in the industry – but we fully embraced their potential limiting the use of caps, collars and deadbands. Over the past three years we recognise the power of incentives to align the interests of customers with investors.

Looking to PR19 we have sought to strengthen the design and application of ODIs. Below we summarise key features of our approach before discussing in more detail the relevant parameters.

1.1 Structure of ODIs - designing incentives to be even more effective

Our starting point for ODIs is ensuring that our customers remain supportive of the concept.

We've tested the principle of ODIs with our customers and found that customers support the incentive and penalty mechanism for performance commitments (PCs), and are prepared to pay more for better service (see Appendix A1 - Uncapping Research and Choices research). Similarly, they would prefer to avoid worse performance, even if their bills were lower. Also, most customers are prepared to pay more for performance that drives performance benchmarks for the sector as a whole. Encouraged by this customer support, we've made increasing the effectiveness of incentives for all stakeholders our overarching objective for our ODI framework.

This means, unless there are specific justifications and supporting evidence otherwise, our default position has been to make our ODIs financial. We see this as critical to their effectiveness, not just because of the financial impact to us, but also because the financial impact raises the profile of the incentive and thereby increases the reputational effect at the same time.

Wherever possible, we've used annual targets and incentives. By creating a clearer and more immediate link with the service experienced by customers each year, this reinforces their effectiveness in both financial and reputational terms.

And we will continue to report our performance transparently and accessibly for our customers. Over the course of AMP6 we've worked to improve our reporting – testing new ideas and channels with customers. We'll continue to do so – using 'Tap Chat' - our online panel to test and improve our proposals for reporting every year. This again heightens the reputational strength of incentives.

1.2 Incentive rates - using a rich picture of customer valuations

We have also improved our ODIs by using more robust incentive rates.

Our starting point has been to use a wide range of customer valuations to set incentive rates, instead of using a single willingness to pay (WTP) valuation as occurred at PR14. Our plan utilises a range of valuations including stated preference WTP studies, our 'Choices' research and, in one instance, revealed preference. We've set a strong ODI package on a bottom up basis, founded on customer valuations.

Our 'Choices' research	**Our Choices research** was designed to gain deep qualitative and quantitative insight into customers' views on areas of choice within our plan, including the PCs, targets, investment choices and incentives. We conducted extensive research including deliberative workshops, in-depth interviews and an online survey with household and non-household customers across our region. Within the research we tested our proposed performance targets with customers, illustrating our current and proposed future comparative position in relation to the industry. We used trade-off exercises to understand customers' relative priorities for service improvements, as well as developing our understanding of how customers relate their own experience to service measures and what drives an emotional reaction that goes beyond the perceived personal impact. We also tested customer support for the incentive and penalty mechanism, including the effect on bills. Whilst we found that customers were previously unaware of the framework, after some exploration they found it an appropriate way to encourage good service. Of our customers, 61% agreed that an equivalent range of ± 3% of RORE would be acceptable, with only 10% finding it unacceptable. For those objecting, the data suggests that opposition results from the mechanism itself, rather than the amount of the bill linked to incentives and penalties. We used an interactive exercise to give customers the opportunity to feedback on our proposed incentive rates, including reducing the rate to zero if they felt an incentive was not appropriate for that measure. This insight feeds in to the rich evidence base we have used to set the final incentive rates.

We recognise that one of the shortcomings of the PR14 process across the sector was a lack of scrutiny of outliers. We have therefore consistently sought independent challenge and scrutiny via our Water Forum and its dedicated PC-ODI subgroup, chaired by Dr Steven Wade. This challenge and scrutiny has included a number of areas, including our overall approach, triangulation of customer valuations, identifying and resolving outliers and the proposed ODI rates.

This has allowed us to reach robust calculations of incentive rates that have then been independently assured by Frontier Economics.

1.3 Incentive rates - principles for setting rewards and penalties

At PR14, we put forward the largest number of performance commitments and the greatest number of financial ODIs. For each measure we almost universally adopted symmetry between upside and downside incentive rates. While slightly different from Ofwat's methodology, this approach was accepted by Ofwat given its strong justification:

- symmetric incentives will benefit customers, as they are likely to be more effective in encouraging innovation and a shift from risk-averse behaviour than asymmetric incentives;
- where stretching targets are set, there is an equal balance between risk of underperformance and potential for outperformance; and
- a symmetrical approach has greater simplicity, both computationally and for the customers' understanding.

Given the strong justification, the benefits it's driven for customers in the current AMP, and Ofwat's call for balanced incentives, we've retained the approach to setting symmetrical incentives that we used for our 2015-20 plan.

The majority of customers believe it is fair that incentive and penalty rates are the same, although there is some pushback about penalties going back to customers rather than invested in infrastructure and service improvements.

The exception to our approach is where an ODI is required to be penalty only (such as for PCs targeting 0% or 100%) or reward only. In addition, we made sure to test the concept of symmetrical ODIs with Water Forum and gain its support. And, we have tested customer support for symmetrical penalty and reward rates as further support for retaining our approach.

It is also worth noting, in the context of the PR19 methodology, the PC level may be set at a level different to the level implied by cost benefit analysis (CBA). This is because Ofwat is looking for companies to set ambitious and stretching targets and CBA is only one of six methods that Ofwat is expecting companies to use.

If a target is set beyond the CBA level, then applying the standard Ofwat formula would result in some counter-intuitive results (such as a less stretching target). We would also likely see some very low or even negative under-performance penalty rates, because the estimate of marginal cost would exceed the valuation level. In Ofwat's methodology, the conclusion from these difficulties would be that the internal marginal cost estimate exceeds the efficient hypothetical marginal cost. However, it is not necessarily straightforward for a company to refine its marginal cost estimates. Therefore, our approach provides a relatively simple way of protecting against such counter-intuitive outcomes.

We are also aware that that the design of the Ofwat formula is aimed to protect customers against more material underperformance – as underperformance moves further below the cost-beneficial level, the valuation-per-unit would increase and the marginal cost falls. Were incentives being constructed around existing performance levels to drive incremental improvement, the Ofwat formula would generally result in penalties rates that exceed reward rates. However, as we are in situation of setting stretching targets, it becomes much more likely that the standard formula would provide penalty rates that are either below the reward rate or even negative. Consequently, it becomes more challenging and less appropriate to apply asymmetric penalty and reward rates.

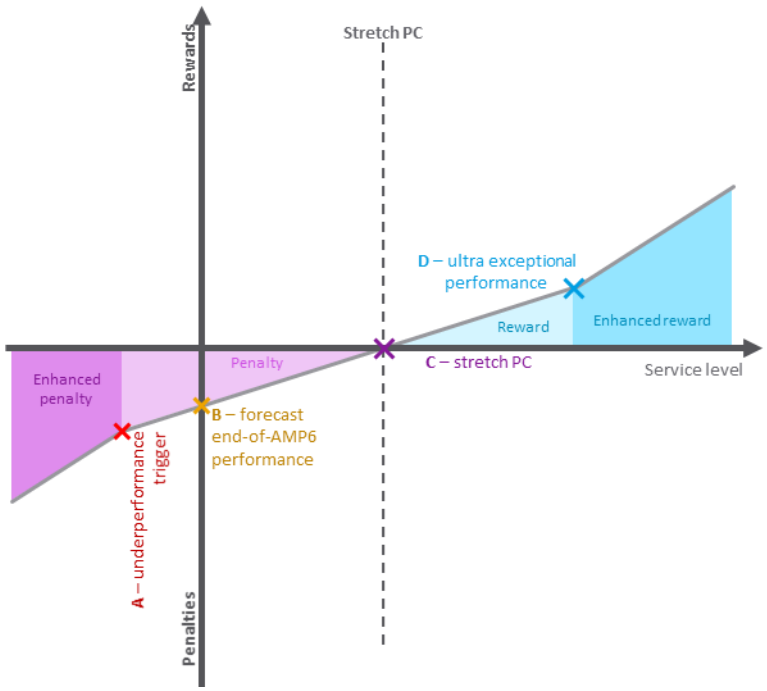
Even if the reward and penalty rates are the same, the reputational impacts and enforcement options ensures that the incentives to avoid underperformance are more than adequate. A further consideration is that the incentive of symmetrical ODIs, in behavioural economics terms, may well prove asymmetric. This is because, in the presence of loss aversion, avoiding a financial loss is more important that incurring a financial gain of the same monetary value.

1.4 Incentive rates - developing enhanced ODI rates

We intend to apply enhanced ODI rates for two common PCs – internal sewer flooding and total pollutions – where we are currently upper quartile for the industry. In this situation, both penalty and reward rates will become enhanced beyond certain thresholds. While it may appear at first glance that we've selected measures where we are already a strong performer (and therefore find it easier

to achieve the enhanced outperformance payments) we are setting extremely challenging trigger-points for both penalty and rewards (as set out further below).

Setting enhanced ODI rates to drive exceptional performance



In consultation with the Water Forum, where we invited their challenge and feedback, we have developed a clear and logical framework and accompanying method for setting enhanced ODI rates that will further motivate performance. Importantly, we have made sure to keep the proposed rates grounded in the customer valuations used to set the standard ODI rates. The difference here is that, rather than the rate reflecting 50% of the customers' valuation of changes in service levels (the standard method used at PR14), the enhanced rate is based on 75% of the customers' valuation. In effect, the enhanced ODI rate becomes 1.5 times the standard rate.

One effect of this approach is that, in the event of poor performance, we would bear a significantly higher proportion of the consequences for customers. On the upside, the increased rate would allow us to pursue the most challenging improvements to achieve while still delivering benefits that are of value to the customer. Overall, our approach makes sure the proposed rates both remain grounded in the economic evidence gathered from customers and are certain to deliver net benefits to customers as and when rewards applied.

We are aware that it could be possible to set these enhanced rate with a multiple greater than 1.5. However, we consider the level of enhancement is appropriate given the potential innovation risks and effort required to achieve the enhancement performance level. We also see that this rate strikes an appropriate balance between providing an incentive to drive the industry forwards, whilst asking our customers to pay more for the positive externality of higher industry standards that will accrue benefits for the customers of other companies. This is an important consideration for us given that a number of our areas suffer from economic deprivations, with approximately 10% of our household customers experiencing water poverty[1].

Under our proposal, it is still possible that its customers will contribute an amount greater than their own valuation for outperformance (i.e. 75% of their valuation through the enhanced ODI plus 50% of any totex spend associated with the out-performance). Such an outcome would be consistent with Ofwat's guidance.

The threshold for enhanced reward will, at the very most, be set to start at the point (point **D**) that doubles the improvement from expected end-of-AMP-6 performance (point **B**) to the stretch PC (point **C**). Variously, an earlier start-point may be defined, such as where we are driving UQ or frontier performance. Therefore, to achieve accelerated rewards, performance must improve from **B** and, pass through **C** and then pass **D**, before any enhanced rewards can be earned. This approach also allows us to set a threshold that will become tougher incrementally, on an annual basis.

[1] Based on the proportion of residential customer paying 5% or more of their disposable annual income on their combined bill for water and waste.

For the penalty, the enhanced rate would apply from point **A**, which will be set with reference to the difference between the performance for the final year of AMP7, and the performance forecast for the final year of AMP6. The penalty will then be set by an amount below the end-of-AMP6 performance that is equal to this difference. This approach allows us to set the penalty threshold on a constant basis over the AMP. Overall, performance only has to slip back from **B** to **A** before accelerated penalties are applied.

We have taken into account the expectation for step-change improvements for both the frontier and UQ in AMP7. Given the absence of useful comparators we adopted the aforementioned approach for setting trigger levels, which we are confident that these trigger levels are more stringent than expected in Ofwat's guidance and will provide greater protection for customers from underperformance.

We also note that there is the potential for asymmetry in terms of the relative changes in performance levels needed before enhanced penalty or reward rates apply. Where this occurs, relative to expected performance at the end of AMP6, our performance will need to travel further for accelerated rewards to apply, than it would before accelerated penalties are incurred.

Our approach allows the enhanced ODI to be set in advance of the beginning of the AMP, and avoids them changing dynamically over the subsequent five year period. For the avoidance of doubt, the enhanced rates payments will be cumulative after the threshold point – before the threshold the standard rate will apply.

For the two PCs where we are setting enhanced rates, we intend to share knowledge on our successes with companies by the end of, or soon after, the 2020-25 price review period. To do this successfully, we will produce a report that will set out the key components that have driven our success – be it leadership, appropriately designed remuneration, technical skills and process, or physical innovation. We will also share the report with Water UK/UKWIR and publish on our website. In addition, we will invite use of our academy to other water only companies, so that structured learning about our UQ successes is available to the customers of other companies.

In the event, enhanced penalty rates are incurred, we will submit action plan to our Water Forum that will set out the reasons for the poor performance and explain how we will improve.

2. The structure of ODIs - our framework

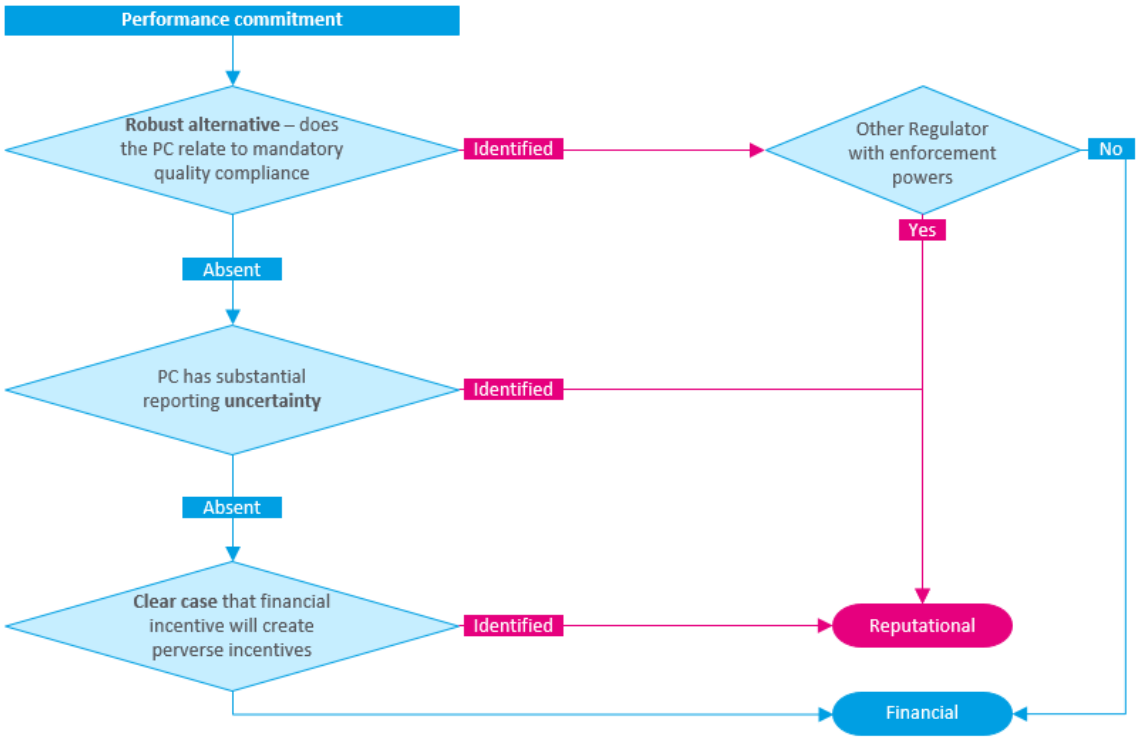
To heighten the impact of our incentives, and drive further improvements for customers, we're ready to put more revenue at stake.

2.1 Determining the case for reputational or financial incentives

A fundamental feature of an ODI is the instrument used to incentivise performance. There are effectively two choices – financial incentives or reputational incentives. We recognise Ofwat's concern raised at PR14 and again in the PR19 methodology that companies were too cautious in applying financial incentives. Although our package at PR14 included many financial incentives, we have sought to improve on that position for PR19.

We've created a robust framework to make sure that we're only using reputational incentives were set only in specific circumstances and when justified, in line with Ofwat's methodology.

Criteria for financial or reputational ODIs



2.2 Well-timed incentives

Our ODIs will be applied in-period wherever possible, in line with those performance commitments that are set to report annually. This aligns with our current approach and Ofwat's approach to the common performance commitments that, other than for the two resilience measures, will have in-period ODIs. Where we have selected end-of-period ODIs, this is done only where we have sufficient justification that it is in the interest of our customers. And, in all instances we intend that our ODIs will be revenue-linked.

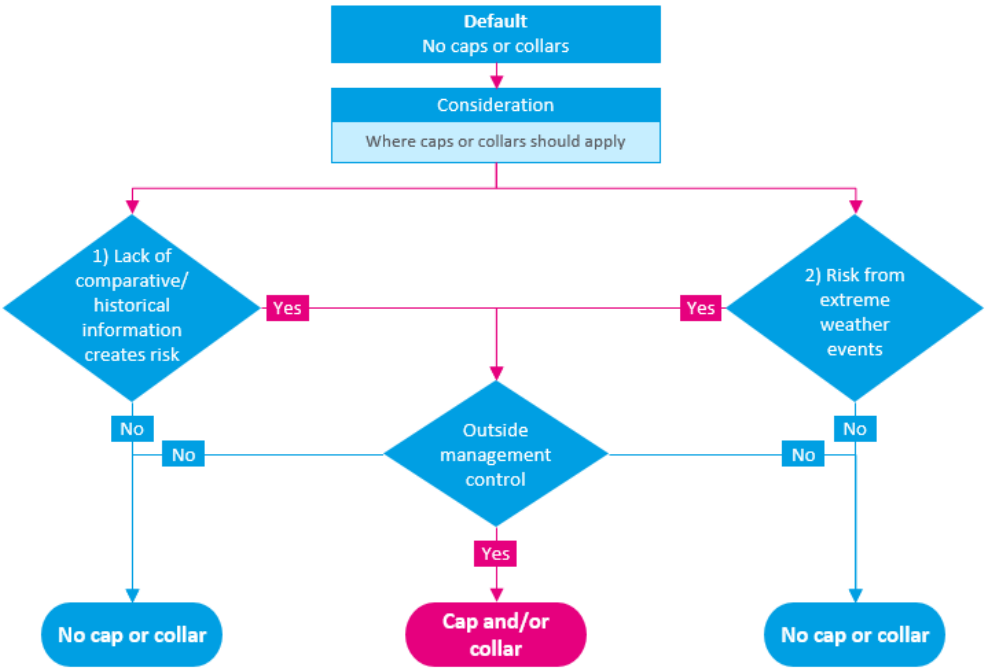
2.3 Proportionate use of caps and collars

An important feature of financial incentives is the calibration for when they apply and do not apply. In relation to ODIs the terminology *caps and collars* is used to describe the maximum and minimum performance ranges that incentives would be applied to.

Although Ofwat has abolished the 3% overall cap, we recognise Ofwat expects companies to take steps to protect customers from extreme outcomes. We have made sure that caps and collars are only be used in exceptional circumstances. This is consistent with our 2015-20 plan, where we only used these for 3 out of 31 financial incentives.

Importantly, when it comes to performance-reporting, unlike the current AMP, there will be no exclusions for extreme weather in the next AMP. So, following Ofwat guidance, we have included an option for collars to be applied only for those measures affected by this performance-reporting change. Specifically, this is necessary to protect against extreme weather jeopardising financeability.

Caps and collars decision tree

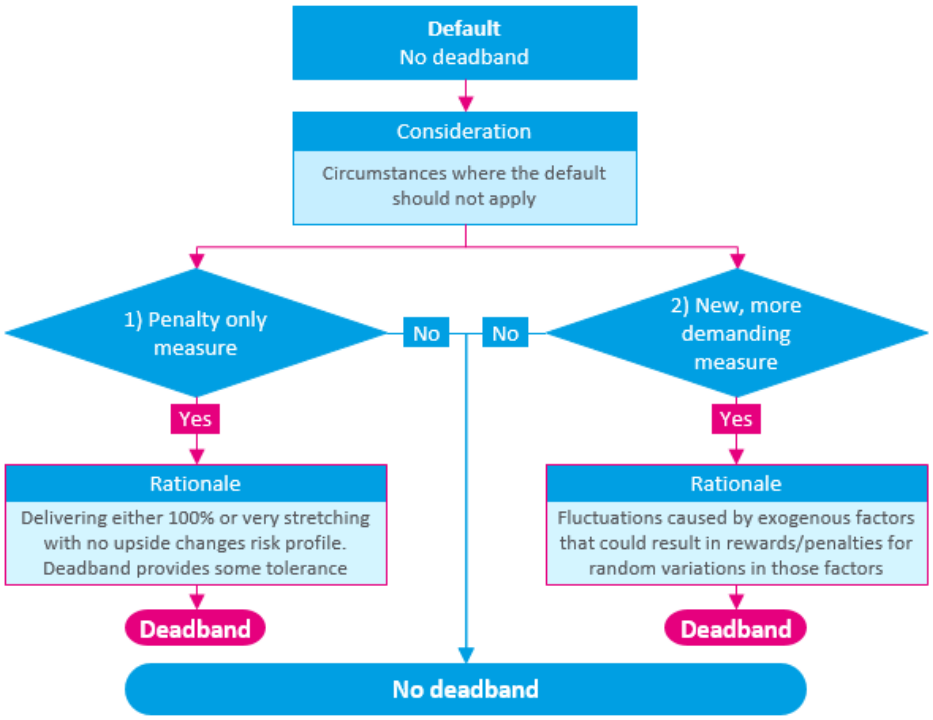


2.4 Deadbands applied only where there is a strong case

Another important design element of an ODI is how strongly the incentive applies for performance above or below the target. This is referred to as a deadband and can be used to effectively dampen incentives either side of the target.

We note that for PR19 Ofwat has stated that, "we are discouraging companies from proposing deadbands because they remove the incentive for companies to improve their performance, require judgement and reduce transparency to customers." In response we've developed a simplified framework for deadbands that fully reflects Ofwat's concerns. This means that deadbands would only be proposed on a very limited basis, and only where there is a strong case for doing so.

Robust criteria for choosing deadbands only selectively



2.5 Asset health

As a provider of an essential public sector, we have a responsibility to safeguard our assets for future generations. And as such we have given a specific focus to asset health metrics in developing ODIs. This has included building a broader view of customer valuations of changes in asset health performance, most notably our deliberative research, which gave participants a greater understanding of asset health challenges and past performance.

In its methodology, Ofwat set out its expectations on asset health outcomes. One of these is for companies to have explained to their CCGs, the size of asset health underperformance penalties and outperformance payments as a percentage of RoRE. This is to allow Ofwat to compare the size of penalties and rewards across companies. Therefore, we have incorporated the modelling of asset health scenarios in our approach as follows:

- engaged an external modelling company SEAMS to model the interdependencies between our key asset health metrics – for example, if we underinvest on maintenance, what are the implications for bursts and what other asset health metrics are affected and to what extent;
- modelled the ODI impact of the above interdependencies – to establish the level of reward or penalty would we receive if we out or under performance on the asset health metrics; and
- translated the monetary rewards or penalties into a percentage of RoRE.

2.6 Enhancement expenditure - protecting customers

Our PR19 plan includes proposals to increase expenditure on a number of key areas to deliver improved service levels. This is referred to as enhancement expenditure and in Appendix A8 we explain how this fits into our wider plan.

The material enhancement projects drive service improvements across five key areas:

- supply and demand balance – metering activity;
- supply and demand balance - new supply capacity;
- security;
- resilience; and
- improvements in wastewater quality (water framework directive).

For each area we have proposed an improvement in performance, which is underpinned by the enhancement expenditure. Consistent with PR14, we also recognise that this improvement needs to be supported by financial ODIs. This ensures customers are protected by ensuring we have appropriate incentives to deliver the underlying performance improvement and hold us to account if we do not deliver.

These PCs/ODIs are also important as they support the recovery, or payback, of costs where delivery of investment may fall short of what was assumed. In effect these PCs make the necessary adjustments that would occur with a logging mechanism.

As we explained in Appendix A3 (PCs) and Appendix A8 (Costs), these ODIs have been proposed on the basis that the enhancement expenditure is approved.

2.7 Real option mechanisms

We have also introduced a new concept at PR19 called the real option mechanisms. These mechanisms are designed to provide a more targeted and proportionate way to manage uncertainty. This tool protects the interests of customers by not exposing them to the risk of unnecessary upward pressure on bills; and instead supports effective response to new information that reduces uncertainty.

We have proposed these mechanisms in relation to three areas of uncertainty:

- climate change uncertainty (new supply capacity PC);
- metering uncertainty;

- Water Framework Directive uncertainty (WFD PC); and
- water trading interconnector feasibility.

Under these mechanisms, delivery is only undertaken upon confirmation of the need. This is why, for these measures, we have also defined a trigger that would prompt us to deliver above the PC level. We also note that this approach has advantages over cost adjustments in that customers only pay after delivery.

In the interests of simplicity, we have not created new metrics. Instead we have included additional elements for ODIs. The practical implication is the supply capacity ODI and WFD ODI both have (i) rewards; and (ii) a defined trigger to initiate delivery above the committed PC level. For the water trading interconnector we have introduced a new PC that is reward only, thereby facilitating further activity if the defined trigger is met.

We discuss the real options in more detail in Appendix A8 – Wholesale costs.

3. Turning customer valuations into meaningful ODIs

To develop a high quality business plan we need to understand the value customers place on different service improvements. In undertaking these valuations we are conscious of challenges from Ofwat, CCWater and our Water Forum.

3.1 The need to develop robust customer valuations

We've focussed on Ofwat's concerns that at PR14 there were wider variations in company valuations. This suggests some weakness with the data set which needed to be improved. A number of options were proposed by Ofwat including using a broader data set and trying different techniques.

The challenge from CCWater was similar but more focused on how companies might use different data sources. In its paper *Defining and applying 'triangulation' in the water sector*, a number of recommendations were put forward to inform companies approaches:

- specify research objectives for individual areas and describe existing hypotheses or questions;
- identify possible data sources and analyse the data;
- identify key findings from each evidence source;
- weigh-up evidence and compare and contrast findings;
- assess existing hypotheses and research questions against the weighted evidence; and
- communicate and test findings, coordinate with business planning.

As explained in chapter 5, we've created a strategic customer insight framework. This underpins how we developed our customer engagement, the tools we have used and our sampling approach.

Our research framework ensures that each project we undertake contributes explicitly to our understanding of our customers and the hierarchy of needs. It also means we have more accurate and contextualised values in the WTP research, and it enhances our ability to triangulate the research outputs effectively.

For PR19 we have considered the views of our stakeholders, including the Water Forum. In addition, we identified four important changes that we needed to make to develop high quality valuations and improve on our approach in PR14:

- undertake more robust customer engagement with a particular focus on improving the cognitive burden of the research;
- use a wider data set, including reaching out to a wider range of customers;
- triangulate different values;
- investigate outliers; and
- validate results with customers.

By doing so we believe have taken full account of both Ofwat's final PR19 methodology and CCWater's recommendations in conducting our valuation studies. Where the results are consistent, and where there is not robust contrary evidence to suggest otherwise, we have used these in setting the ODI rates.

In undertaking the above we have been very conscious of the need to be proportionate about our research and faced strong challenge from our Water Forum not to undertake research and data tourism. Instead every piece of research has been targeted and designed to build a coherent picture that addresses the weaknesses with the historical approaches.

3.2 Our approach to establishing customer valuations

Over the past 18 months we have undertaken a number of projects that allow us to meet these requirements. We have improved on existing techniques for stated preference WTP; and sought to test specific hypotheses which might reveal weaknesses with core WTP valuations – many of which reflect challenges from our Water Forum. Our specific valuation studies have involved:

- improved core WTP values – conducted by REDACT and Frontier Economics;
- contextualised WTP for customers with experience of specific service failures;
- WTP values for customers that initially do not respond to surveys – which was motivated by a valuable challenge from the Forum and a primary weaknesses with previous surveys; and
- WTP valuations where customers had participated in a deliberative workshop and been immersed in the challenges water companies face.

Importantly, the changes in our approach for PR19 mean that, where wider research does not reduce the variation in results, we will have a range of internal cross-checks. Furthermore, where results are internally consistent, this would act as a strong counter-balance to any wider variations from other companies' results.

We've also been careful about using research where we have concerns about the robustness of the results in the context of ODI setting. For example, we undertook a budget game in which customers could build their own plan, alongside our core valuation work. The budget game involved two distinct exercises for customers – in the first exercise, customers were introduced to three of the WTP attributes and asked about relative satisfaction for two different levels of improvement. In the second exercise, they were able to "build their own plan", selecting from costs levels of improvement for the main willingness-to-pay attributes. We have note used the relative satisfaction results for valuations because we were concerned that the results were not particularly robust – something that our Water Forum also noted.

3.3 Setting meaningful ODIs by triangulating and testing valuations

Through this programme of work we have developed a much wider valuation data set. This has allowed us to triangulate the different results into a single value. The benefit of this approach is that it reduces the weight placed on outliers. This is the same technique Ofwat adopted when it triangulated its three econometric cost models at PR14 by taking an average across the models.

We designed our triangulation process, for determining a single set of values, to make sure our valuations underwent comprehensive analysis and testing and were fully-considered with reference to a wide-range of comparator results. To do so we:

- combined the results of our 2017 WTP studies into a single metric;
- sense-checked the 2017 combined results against those of other companies to identify possible outliers;
- compared our 2017 results for the possible outliers with the historic WTP results from PR14;
- where our results did not pass the sense-check, we established whether there were reasonable explanations for difference between WTP metrics;
- if the difference could not be explained, we then identified potential solutions and, following scrutiny and challenge from Water Forum, determined the most suitable solution; and
- finalised our valuations once the above steps were completed.

In addition, we engaged Frontier Economics to review our approach to triangulation and ensure it is robust. Its findings were:

> *"STW has clearly responded thoughtfully and conscientiously to Ofwat and CCWater's challenge. Both the range of evidence used and the consideration of external evidence show serious intent to identify robust and justified WTP values."*
>
> *"STW has carefully considered its results against external evidence from earlier studies (and from other companies). It has taken a sensible approach to identifying cases where the discrepancies in valuations are so material that it needs to take the values way and give the results further consideration."*

The options for deriving a single aggregate WTP values for each service were:

- **A** – min – the minimum WTP value across all studies;
- **B** – weighted-average participant-based– weightings done according to the number of participants in each of the three studies (core, non-responders and deliberative);
- **C** – straight-average all results – no weightings applied, as all studies considered to be equally statistically valid;
- **D** – weighted-average core & non-responder participants – combined core and non-responders results, weighted by number of responses;
- **E** – weighted-average experience-based – weightings set according to the number of participants in each study who either have experienced service failures or had time to consider the questions in more depth;
- **F** – straight-average combined-core and other results – core and contextualised involved the same face-to-face interview, whereas initial non-responders and deliberative involved different approaches;
- **G** – combined-average Option (D) and deliberative – makes sure we capture WTP values from all surveys; and
- **H** – max – the maximum WTP value across all studies.

In choosing the most suitable forward, we considered the important criteria identified in CCWater's paper *Defining and applying 'triangulation' in the water sector*[2]: which were:

- transparency of approach and robust rationale for any weights applied – so no 'black box';
- flexible to different needs and different situations – avoiding inflexible weights of calculation methods that negate the advantages of evidence gathered from a wide and diverse range of sources; and
- avoids confirmation bias.

Following discussion and consultation with Water Forum, our chosen was Option (F) – the arithmetic average with consolidated core. This reflects the fact that it:

- makes sure that no single method of WTP assessment dominates individual values;
- combines the two components of the core WTP study into a single set of values, thereby making sure that the core results are not over-represented in the final valuation;
- allows for all the various WTP results to be considered in the final valuation;
- minimises the number of assumptions made thus reducing the chances of any "tailoring" of the WTP valuations which would benefit the company the most; and
- is a relatively simple method which can be easily explained and understood.

Our Water Forum noted that as the triangulation options involved some degree of averaging, the remaining critical activity related to identifying and resolving outliers.

Dealing with outliers

We recognise that although we used different techniques for WTP, it is important to undertake further cross checks to eliminate outliers. CCWater's paper also contained a criterion in this regard – the need to be explicit when evidence is contradictory and explain what is learned from these contradictions.

Therefore, we cross-checked our results – including those from each round of the surveys and our selected triangulated results – with our own historic WTP values and sector WTPs. Where we identify outliers, we then need to consider a broader evidence base and make the case for bespoke adjustments.

[2] https://www.ccwater.org.uk/wp-content/uploads/2017/07/Defining-and-applying-triangulation-in-the-water-sector.pdf

Enriching the picture further for customer choices on investment priorities

Alongside the above cross-checks of outliers, our framework also included further tests with customers to validate the results. This information helps give us confidence that the valuations we are using are robust.

We conducted Choices research[3] that gave participants choices about which service areas to prioritise most and prioritise least for service improvements. The initial priority list presented to participants was based on a scaled-score derived from the triangulated WTP results for each service area. So, we used the changed priority rankings in the Choices results to infer a new scaled-score, with the percentage change in this score then used to adjust the triangulated WTP by the same proportion.

Our Water Forum supported both our approach for adjusting the WTP results in this manner and our decision not to apply this approach to outliers, given the need to make separate interventions. The Water Forum did challenge us on how the results would reconcile with overall WTP.

In that regard, our research on ODI uncapping showed strong support from customers for linking performance to rewards and penalties consistent with a RoRE range of +/-3%. We also note that as Ofwat has removed the aggregate cap and collar on ODIs and confirmed an indicative range of ±1 to ±3% of RoRE, this enables companies to propose stronger ODI rates where they are supported by customer valuations.

Bringing revealed preference into the mix

In exploring all options for giving the richest possible picture of customer valuations, we sought to explore the potential for revealed preference valuations to complement our stated preference values and provide further important insight. We invited different companies to propose revealed preference valuations through a public tendering process. Although we received a number of responses badged as revealed preference, in all but one case each proposal was in fact a variation of stated preference. Where we were able to incorporate revealed preference into our framework was in estimating the customer value of avoiding short-term water supply interruptions.

Revealed preference methods are based on the analysis of actual real-life behaviours and outcomes observed in identified markets which can be related to the non-market good or service of interest[4]. *Avertive behaviour* models are a type of revealed preference method where valuations are revealed by people's purchase of substitute (market) 'goods', to counteract the disamenity of a (non-market) 'bad'. The underlying economic rationale is that a person will only continue with the avertive behaviour up to the point at which the cost of the avertive expenditure is less than the value of the disamenity that is avoided[5].

Supply interruptions are a non-market 'bad' which can be mitigated with the purchase of alternative market goods and services, such as bottled water, access to public shower facilities, or the use of launderette services. Therefore, avertive behaviour methods are a useful valuation tool for estimating the value of avoiding short term supply interruptions from the observed market behaviour of customers who have actually been affected by this service disruption. By contrast, other types of RP techniques, such as travel cost or hedonic pricing would have been less suitable given this particular attribute concerned the avoidance of short interruptions.

Our framework then allowed the revealed preference results for short-term water supply interruptions to be triangulated into the overall valuation of this service attribute.

3.4 Setting ODIs where customer valuations could not be established

There are service attributes were identifying customer valuations is not straightforward. This is because some attributes do not have a direct interface with the customer, such as sludge compliance. In other cases, such as protecting schools from lead, the service area is difficult to express to customers in a sufficiently meaningful and tangible manner for drawing out coherent valuations. In these circumstances, we considered three different options for identifying valuations.

We have used marginal cost valuations to set ODIs

Our preference is to use short-run marginal cost values derived from the incremental cost of improving the service area by one increment. On the basis that these marginal costs are used as a proxy for the benefit valuation, these marginal cost values are then

[3] For more information, see Appendix A1.

[4] HM Treasury / DWP (2011) "*Valuation Techniques for Social Cost-Benefit Analysis: Stated Preference, Revealed Preference and Subjective Well-Being Approaches*," p 7.

[5] Courant, P.N and Porter, R. (1981), "*Averting Expenditure and the Cost of Pollution*," Journal of Environmental Economics and Management, vol. 8(4), pp 321-329.

multiplied by 50% in the same way that they would be if they were benefit valuations. This ensures consistency with the totex cost sharing element of Ofwat's methodology. We also consistently followed Ofwat's approach in the event marginal cost is used to set the AIM incentive[6], such that an uplift of 20% is made to provide an incentive beyond cost recovery.

Investment cost have provided valuations for ODI calculations

Cost values are also required to provide ODIs for the PCs designed to allow recovery, or payback, of costs where delivery of investment may fall short of commitments or where there is uncertainty over the number of schemes that will be required. These are PCs that exist to make the necessary adjustments that occur with a logging-up/down mechanism, if such a mechanism existed.

While these ODIs will be set on the basis of cost, we consider that they do not require an uplift to give an incentive beyond cost recovery. This is because these investments relate to meeting regulatory or statutory requirements, which are very powerful incentives by themselves. Instead, these ODIs are set to make sure the company is held cost-neutral in the event the number of schemes deviates from current expectations.

We have adopted PR14 valuations, uprated to PR19 prices, to set ODIs

For certain measures, such as compliance, marginal cost information is not readily available. For example, given that compliance should be the *status quo* and non-compliance a deviation from that *status quo*, it is difficult to identify the incremental service changes necessary for estimating marginal cost. In such cases, our framework adopts the PR14 valuations, uprated for inflation, given these are already successfully driving desired performance outcomes.

4. Managing bill volatility

One consequence of incentive based regulation is that it creates the risk of greater bill volatility, depending on how the company performs.

We are very conscious of this risk and have considered this throughout the current AMP. In 2016/17 and 2017/18 we have chosen to limit the amount of ODI rewards that we take given both the high level of inflation and importance of maintaining stable bills. This has meant deferring ODIs to future periods, thereby creating a more stable bill profile.

Looking forward to PR19, our customers have demonstrated strong support for ODIs (performance payments or penalties). However, this also means we have a responsibility for continuing to manage bill volatility. We have already undertaken deliberative research with our customers to understand their views on volatility and this suggests a much higher tolerance for changes in bills (£5-£10 per month) than we previously thought acceptable. We recognise that this was a small sample size and intend to use our online community to further explore what bill volatility means for different groups of customers. We will then factor this information into our annual in-period ODI submission to Ofwat and annual charges process.

To manage bill volatility associated with in-period ODIs we will therefore:

- undertake further research ahead of AMP7 to explore what bill volatility means for different groups of customers to help identify thresholds(s) that would necessitate different types of action;
- each year we would consider the impact of ODIs in light of the underlying inflation and our performance;
- where the bill impact exceeds a threshold our customers consider as being volatile, we will consider potential mitigations, including deferring ODIs and/or targeted customer engagement; and
- we will invite challenge and scrutiny from our Water Forum.

We believe this commitment builds on our learnings from managing in-period ODIs this AMP.

[6] Ofwat (Dec 2017), "*Delivering Water 2020: Our methodology for the 2019 methodology price review Appendix 2: Delivering outcomes for customers*," p 37.

5. Water Forum scrutiny and challenge

Throughout the process for developing ODIs and the associated framework, Water Forum and its sub-group has played a vital role in scrutinising our plans and proposal and challenging areas requiring either improvement or clarification. The table below highlights the extensive role of Water Forum and demonstrates the value-added benefits that has resulted from its interventions.

The beneficial impact of Water Forum scrutiny and challenge

Challenge	Our response
Incorporate wider customer insight to understand the valuation for low water pressure, as triangulated results was considered an outlier	We revised our approach to set the ODI on basis of days-per-property per-year, rather than per property. We recalculated the WTP valuations on the same basis, dividing the per-property valuation by the number of days in the year
Test the cognitive validity of the WTP research –include assessment of distribution of results	The WTP results were demonstrated as having a log-normal distribution; evidence of cognitive validity
Consider whether absolute WTP can be used to infer priorities	We used our Choices research to assess priorities
For supply interruptions, consider the values from contextualised research and the revealed preference research results	We incorporated the results from the revealed preference study results into final triangulated WTP value, with approach to triangulation agreed with Water Forum
On river water flow, bring more qualitative evidence on customer views	Consolidated ODI set for river water quality that drew on customer WTP valuations for both river water flow and for river water quality
On using the Choices results to update the valuations, make sure to exclude outliers from this process	Triangulated WTPs, if not excluded as an outlier, were revised in proportion to the Choices results
Define how extreme weather events are used to set penalty collars	Extreme weather penalty collar for supply interruptions set at the limit of 17/18 performance (a very challenging year). Internal and external sewer flooding collars set at 1% of RoRE
Should caps and collars be symmetrical unless it is possible to justify why not	Justification for not having reward caps agreed with sub-group for extreme weather. Not only does extreme weather always fail to have a positive effect on performance, but both interruption duration and internal/external sewer flooding are bounded by zero
Demonstrate that enhanced rewards for super-stretch incentive rates are extremely challenging to achieve	Super stretch rates shown to be asymmetric, in that a larger performance change is needed to achieve enhanced rewards when targeting the UQ than would see enhanced penalty

PART B - TRANSLATING OUR APPROACH INTO ODI RESULTS

6. Structure of ODIs

Our PR19 business plan includes two types of PCs/ODIs:

- those that can be described as base ODIs, which relate to service improvements and reflect funding associated with the botex cost assessment; and
- those which are underpinned by material enhancement expenditure, notably the five measures described in section 2.6 above.

In the table below we have set out our base ODIs. Our focus on delivering financial ODIs means that just eight of PCs will be reputational-only.

Base ODIs

PC	ODI	PC	ODI
Reducing residential void properties	Reward	Sewer blockages	R&P
Reducing residential gap sites	Rep	Public sewer flooding	R&P
Reducing business void and gap site supply points	Reward	Green communities	Reward
Inspiring our customers to use water wisely	R&P	Collaborative flood resilience	R&P
Treatment works compliance	Penalty	Water supply interruptions	R&P
Biodiversity (separately for water and waste)	R&P	Leakage	R&P
Per capita consumption	Rep	Mains bursts	R&P
Satisfactory sludge use and disposal	Penalty	Unplanned outage	Rep
Customer measure of experience (C-Mex)	R&P	Risk of severe restrictions in a drought	Rep
Developer services measure of experience (D-Mex)	R&P	Speed of response to visible leaks	R&P
Help to pay when you need it	Rep	Persistent low pressure	R&P
Supporting our Priority Service customers during an incident	Rep	AIM	R&P
Internal sewer flooding	R&P	Resolution of low pressure complaints	R&P
Pollution incidents (Cat 1-3)	R&P	Water quality compliance (CRI)	Rep
Sewer collapses	R&P	Water quality complaints	R&P
Risk of sewer flooding in a storm	Rep	Farming for Water	R&P
External sewer flooding	R&P	Protecting our schools from lead	R&P

Reward = reward only; Rep = reputational, R&P = reward and penalty; Penalty = penalty only

Alongside our base ODIs we also have ODIs relates to enhancement expenditure and/or real option mechanisms. These are summarised in the table below.

Enhancement expenditure related ODIs

PC	ODI	PC	ODI
Metering	Reward and penalty	Improvements in WFD criteria	Reward and penalty
Increasing water supply capacity	Reward and penalty	Resilient supplies	Reward and penalty
Security (reducing the risks to our sites)	Penalty only	Water trading	Reward only

Three ODIs are set to be penalty-only. Two of these relate to compliance – for treatment works and for sludge use and disposal – where compliance is the expected outcome. So, it is not appropriate to reward such compliance. But, as we have proposed, penalties are appropriate for non-compliance. In the case of security, the expectation is that we will be funded for significant investment in site security over the next AMP. So, this penalty-only ODI is proposed, so that this funding can be returned to customers in the event that we do not deliver the expected investments.

Both penalties and rewards will be available for at least 23 of our ODIs, which will make sure we will be appropriately reward for outperformance and suitably penalised for underperformance. There are two ODIs, CMeX and DMeX, that Ofwat is developing and will set the arrangements for in due course.

We have also created bespoke PCs to manage both residential and business voids for resolving voids. These measures are reward-only to offset the interaction with the WRFIM incentive (revenue cap). This is because void properties have a very high debt rate (around 85% on latest trials) and billing them incurs extra bad debt costs that result in a negative net position. Our reward-only proposal is designed to remove this negative effect and make the net position neutral. Importantly, although they are revenue-only the combination of the ODI and WRFIM means that, even if we earn a reward, bills will fall. We have also proposed a reward-only ODI for green communities, because this incentive is focussed on creating additional environmental amenity. The eight PCs identified for having reputational ODIs, were decided for the following reasons:

- **Reducing residential gap sites** – at present, we do not have clear visibility on the number of gap sites. So, we intend that this is a reputational-only incentive during AMP7, before moving to reward ODI in AMP8. This will provide time to fully understand the new process and set targets that are specific to Severn Trent.
- **Per capita consumption** – if this were set on a financial basis, it would create a set of incentives that would appear counter-intuitive to customers. This is because in return for using less water, which should save the customers money, the companies would earn a reward that it would then pass on to customers in the form of higher prices. A further consideration is that, in the current climate, such an agreement would not be conducive to building trust and confidence in the sector.
- Nevertheless, we see that the incentive to perform on this measure will remain strong. Not only do we want our comparative performance to improve, we also see that lowering PCC will drive other potential benefits, such as reducing the need to develop new resources, lessening the pressure on sensitive sites (including AIM) and limiting the requirement to expand treatment plant capacity.
- **Unplanned outage** – this is a new and emerging resilience measure where there is ongoing uncertainty on reporting. Given this uncertainty, it is appropriate that the ODI is set as reputational, thereby avoiding the risk of windfall, unearned gains or penalties for the company. Consideration will be given to making this a financial incentive going into AMP8.
- **Risk of severe restrictions in a drought** – this common PC is one of two resilience PCs that are at relatively early stages of development and, as identified in Ofwat's methodology, may not be ready for financial incentives. Accordingly, it is appropriate that the incentive should be reputational, at least for the duration of AMP7.
- **Risk of sewer flooding in a storm** – this is the other resilience-focussed common PC that is at a relatively early stage of development, hence it is to be set as reputational.
- **Help to pay when you need it** – supporting vulnerable customers is a critical to maintain trust and confidence in the water sector. We see that there is a significant risk that, should we seek reward from helping those struggling pay bill, it could appear to customers that we are profiting from vulnerable customers. We are also concerned that the presence of penalties could create perverse incentives to ease-off on the qualification criteria in order to meet targets. As result, our view is that this PC should be reputational only.
- **Supporting our Priority Service customers during an incident** – as with 'help to pay when you need it,' we see that financial rewards could give an unfavourable impression to customers and that penalties could act to create perverse incentives. Hence, our plan for the incentive to be reputational-only.

- **Water quality compliance (CRI)** – we are conscious that Ofwat has proposed that companies put forward deadbands to deal with the uncertainties arising from this measure. At present, we see that these uncertainties are significant, not least because the DWI has yet to provide sufficient details to fully understand the implications of this PC. Given this uncertainty, we are concerned that using deadbands to offset the risks would necessitate these deadbands being so large that they would effectively make the incentive reputational-only. Were this to be the case, this could lead customers to further question trust and confidence in the sector, on the basis that the companies are gaming the system to their advantage.

Accordingly, we believe that the appropriate approach is for CRI to be reputational-only for AMP7, with a clear commitment to making it financial from AMP8 onwards – **the fact that the DWI is an effective water quality regulator with enforcement tools that are more than adequate to ensure compliance**. In the absence of financial incentive in AMP7, we will attach no less of a priority to this service element than customers would expect. The combined effects of reputation during AMP7 and the need for performance to be at a level that puts us in a strong position going into AMP8, will give us the incentive, focus and drive to perform and continually improve on this metric during AMP7.

6.1 Our application of caps and collars

We have set only three penalty collars and no reward caps. All three penalty collars have been put forward to address the risks of extreme weather, in line with Ofwat's guidance on this matter.

We were challenged by our Water Forum on whether we should have symmetrical reward caps for extreme weather, but concluded against this for two reasons. Firstly, extreme weather does not favour the company and always poses significant challenges for continuity of service. And, secondly, the best possible performance is bounded by zero in all three cases – it is not possible to have fewer than zero sewer floods or fewer than zero minutes of water supply interruptions.

Our ODI design research, conducted via Tap Chat, found that the majority of our customers supported the use of penalty collars. Those who disagreed were concerned about the water company not preparing for extreme weather events if a collar is in place.

The three penalty collars proposed to manage the risks for extreme weather

PC	Unit	2020/21	2021/22	2022/23	2023/24	2024/25	Average	Logic
Water supply interruptions	minutes	27	27	27	27	27	27	Our AMP6 non-extreme-weather worst performance
Internal sewer flooding	10,000 sewer connections	2.17	2.15	2.12	2.09	2.07	2.12	1% of RoRE in AMP7 (equivalent to an incident rate0.54 above target on average)
External sewer flooding	properties flooded	4,566	4,502	4,437	4,373	4,309	4,437	1% of RoRE in AMP7 (equivalent to 613 incidents above target each year)

6.2 Application of deadbands

There will be no reward deadbands. On the penalty-side, there will be just one deadband for a penalty only measure. The deadband will apply to treatment works compliance up to 99%. If performance drops below that level, then penalties will apply on an incremental basis. We have set the deadband to reflect a significant level of stretch based on both our long-standing frontier performance in this area and the Environment Agency's green performance threshold.

We are aware that a similar argument could be made for applying a penalty deadband for 'satisfactory sludge use and disposal.' However, having taken account of the narrowness of the likely deadband and our proposed ODI rate, we have concluded that the potential impact is negligible and would have no meaningful effect. Therefore, we have not proposed a deadband for 'satisfactory sludge use and disposal.'

7. Turning customer valuations into meaningful ODIs

7.1 Triangulating and testing valuations to set meaningful ODIs

Our research has contributed explicitly to our understanding of our customers and the hierarchy of needs. Compared with research undertaken historically, our PR19 research has given us more accurate and contextualised WTP values. Consequently, we have a very strong position and rich picture from which to triangulate valuations.

Our Stated Preference WTP studies yielded four different sets of customer valuation, which we then triangulated using our agreed methodology. The methodology saw us triangulate the data sets by taking a straight-average of the combined-core (A and B) and then averaging with the other results. The logic is that the core and contextualised studies involved the same face-to-face interview, whereas initial non-responders and deliberative involved different approaches.

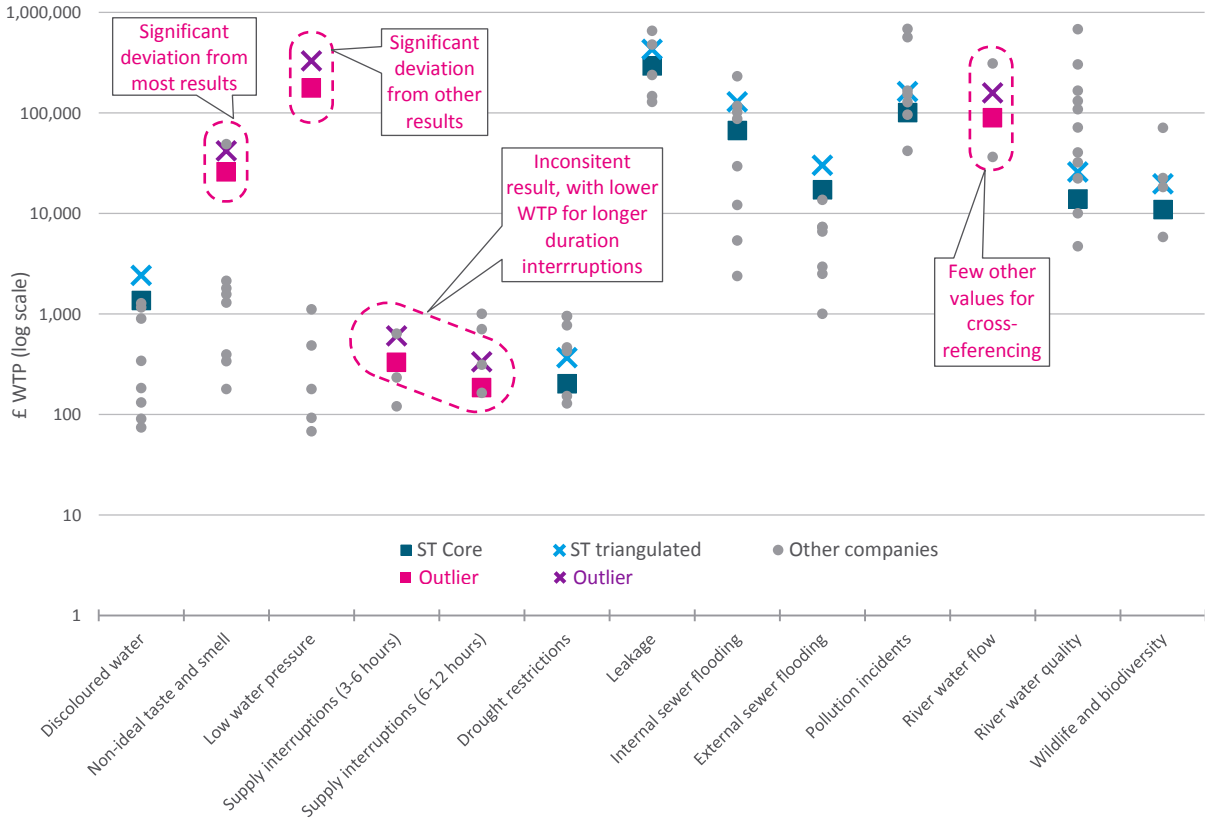
The rich picture of WTP results and the triangulated values

Service attribute		(A) Core	(B) Core with contextualised service failure	(C) Non-responders	(D) Deliberative	Triangulated values
Appearance of tap water	1 complaint	1,390	1,373	3,221	2,811	2,471
Taste and smell of tap water	1 complaint	26,168	26,161	51,569	49,898	42,544
Low water pressure	1 property	181,424	183,942	432,174	400,414	338,424
Use of standpipes	↓ 1% risk	37,410	18,950	83,139	93,169	68,163
Interruption to your water supply 3-6	1 property	227	212	446	590	419
Interruption to your water supply 6-12	1 property	245	213	512	595	445
Alternative water supply	1% of properties	768,422	555,499	1,530,596	2,009,786	1,400,781
Leakage	1 Ml/day	295,553	298,487	607,240	392,883	432,381
River water flow	1 mile	91,350	68,314	153,148	252,608	161,863
River water quality	1 mile	11,274	7,817	30,363	22,858	20,922
Biodiversity	1 hectare	9,208	7,252	18,466	23,075	16,590
Recreation and conservation sites	1 hour	955	772	1,716	3,010	1,863
Internal sewer flooding	1 incident	54,720	76,418	141,820	109,183	105,524
External sewer flooding	1 incident	14,089	23,045	27,792	27,654	24,671
Pollution	1 incident	83,826	74,991	154,368	172,360	135,379

7.2 Testing for outliers

By comparing our WTP results against those of other companies, contained within the Accent report[7], we were able to identify four potential outliers, as set out in the figure below.

A comparison of our 2017 WTP results with those of other companies



Notably, our results that are shown in this figure are those quoted in the Accent report, which are different from the WTP values shown in section 7.1 above. This is because the Accent adjusted the different company results so that, for comparison purposes, they could be reported on the basis of a common metric with company size normalised.

The comparison exercise lead us to identify the following four outliers:

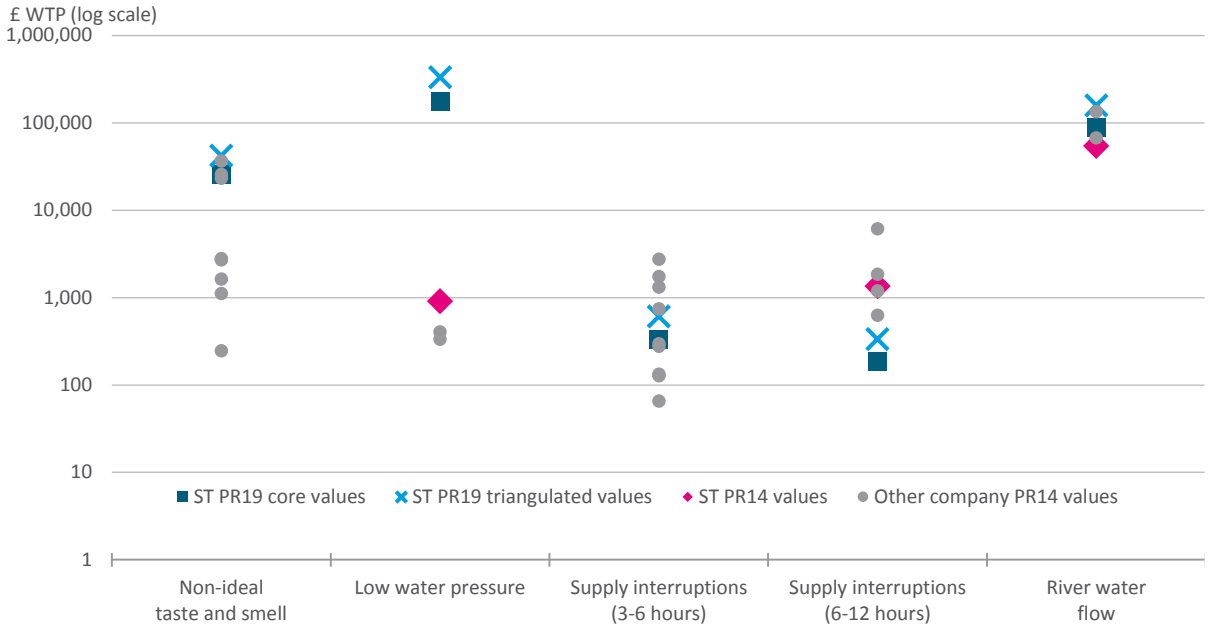
- **taste and smell** – other than one other result, our values were significantly higher than those for other companies. The valuations is also significantly higher than that seen for discoloured water;
- **low pressure** – our results were substantially higher than for any other company;
- **water supply interruptions** – while the cluster of results for 6-12 our interruptions were higher than for 3-6 hour interruptions, our results showed a higher WTP for the shorter duration interruptions; and
- **river water flow** – given that there were only two other non-Severn Trent comparators, it is difficult to rule out that this is an outlier. Consequently, we decided this metric was worth further investigation.

We further compared these outliers, in real terms, with the WTP values from Accent's PR14 report[8]. As shown in the table below, a similar picture emerged. For **taste and smell**, while we had not established a WTP last time round, in comparison with other companies' PR14 WTPs, our PR19 valuations are very much at the upper-end of the range of results. On **low pressure**, our latest valuations are substantially higher than those seen at PR14, including our own result. Even though our **supply interruptions** valuation for PR14 was only focused on the longer duration of 6-12 hours, the inconsistency in our PR19 values remains apparent. And, as with PR19 for **river water flow**, there are relatively few PR14 values for comparison. We also see that our river water flow valuations have increased substantially since PR14 by 64%-191% – this is not immediately apparent in the chart because of the log scaling.

[7] Accent and PJM Economics (June 2018), "*Comparative Review of PR19 WTP Results – Final Report.*"

[8] Accent, (Oct 2013) "*Comparative Review of Willingness to Pay Results – Final Report.*"

Comparing the WTP values for the 2017 outliers with the WTPs from PR14



Throughout the process of developing and deciding on the appropriate interventions, we continually engaged with Water Forum to seek their views and benefit from their challenges, in order to identify a successful set of interventions.

Having identified outliers, we went through a process of developing and deciding on appropriate interventions. During this process, we continually engaged with Water Forum to seek its views and benefit from its challenges, and thereby identify a successful set of interventions.

Below we discuss each of the four outliers and our approach. We also discuss the biodiversity PC-ODI in light of strong challenge from our Water Forum and how we responded to that challenge.

7.3 Outliers - taste and smell

We used qualitative and quantitative insight to help reach an informed decision

Our customer research shows that customers consider high quality drinking water to be important and we know that they expect this as part of their core service. Changes both in taste & smell and in appearance cause customers to be dissatisfied with their service. The evidence on how much of a priority for customers improving taste and smell is presents a mixed picture – some suggest that it is a high priority (WTP and budget game), but other evidence from the customer tracker and choices research suggest it is less important than other measures. The number of customers who complain about poor taste and smell is also much less than those complaining about appearance, even though some of our research implies the numbers experiencing these service issues is similar. This suggests more customers accept taste and smell issues, compared with appearance issues. Even though improving taste and smell is a higher priority than discolouration, we have no evidence, from either the WTP studies or the qualitative work, to suggest that the valuation should be so much more than discolouration.

We successfully intervened by creating a single metric for water quality complaints

Taste and smell are not the only aspects relating to the focus of the PC and ODI, which is **drinking water quality**. The other important consideration is **appearance**. With this in mind the three possible solutions we identified were:

- take the arithmetic average of PR19 results for both the appearance WTP and taste & smell WTP;
- create a weighted-average based on complaint numbers; or
- use just the appearance WTP given that drinking water quality is mainly a perception issue and that this was the aspect that we focused on at PR14.

Following strong support from Water Forum, we have agreed to **use just the appearance WTP to set the ODI for water quality complaints**. As no intervention was made on appearance, its WTP was updated following the Choices research – see below.

7.4 Outliers - persistent low pressure

Customer insight fed into our decision-making process

Our customer research tells us that a relatively large percentage of customers say they have experienced reduced pressure (this is around 13 - 20% of customers, depending on the research source) and that customers complain about low pressure (both to Severn Trent and on social media). Some evidence presents conflicting views about importance of improving low pressure for customers. The qualitative research insight finds that, although water pressure is a consideration for customers, it is less important that other factors such as sewer flooding and much less important than reducing leakage. Notably, the quantum of improvement proposed in the willingness to pay research at PR14 was significantly different from that proposed at PR19 – which might help explain the change in valuation. A further consideration is that the PR14 focus was occasional low pressure, whereas the PR19 research focused on properties affected by low persistent reduced pressure.

The interventions made to successfully resolve outliers

Our **persistent low pressure** PC is focused on days per property, rather than just per property, in order to give focus to persistent issues. Previously, the focus was on any property on the DG2 list – which a property joins after 5 days of low pressure and even if the property's pressure returned to normal on day 7 it remains on the list. Under the existing PC, with an incentive of £888 per property, the focus for improvement has been the easiest-to-fix properties – typically those fixed with operational changes rather than capital investment – and most likely to suffer the fewest days of low pressure in a year.

Creating a per-property per day incentive

Step	Unit	Value
Triangulated WTP value	£ per property	£338,424
Days in year	Days	365
Triangulated WTP value	£ per property per day	£927
In-period ODI	£ per property per day	£464

Our PR19 WTP studies investigate the amount customer where prepared to pay to remedy low pressure for a set number of properties. We discussed with Water Forum the potential that the possible temporal nature of low pressure was not explained to participants in the studies and the Water Forum agreed that it is reasonable to expect that they had assumed that low pressure properties suffered continuously throughout the year. Other options put forward and discussed with Water Forum included using the minimum WTP value and adopting a marginal cost valuations based on the Atkins 2017 study, "PR19 Pressure Management". Both approaches were agreed to be unsuitable because the minimum value (£181,424) still exceeded the PR14 comparators significantly, and the Atkins study provided average cost information, not marginal cost.

Consequently, with Water Forum's support we re-calculated the WTP values a per-property-per-day basis rather than just per-property. So rather than an excessive-looking triangulated WTP of £338,424 per property, **the WTP value becomes £927 per property per day, giving an in-period ODI of £464 per-property per-day**. Going forwards, this measure will specifically be about persistent issues, whereas a separate PC and ODI will cover more general complaints about low pressure. The approach makes sure there is no double-counting between the two measures.

7.5 Outliers - water supply interruptions

We incorporated customer insight into our thinking

Our customer research tells us that a continuous supply of tap water is a basic need for customers, and something that is taken for granted. Our WTP research does not identify reducing interruptions as a high priority, although other sources (such as the budget game and customer tracker) contradict this. We also see that customers tend to value reducing longer-duration interruptions more than shorter ones – our PR14 research on supply resilience confirms this. Given this mixed picture and the counter-intuitive valuations for 3-6 hour and for 6-12 interruptions, we undertook further, revealed preference, research to understand and value the avertive behaviour of customers to such events.

We also incorporated revealed preference research and adopted a single metric

To further investigate **supply interruptions**, we commissioned a joint study by NERA and Dialogue-By-Design to undertake revealed preference valuations by focusing on the avertive behaviour of customers to a supply interruption incident. This research found that the overall average value per property was £19.56 – considerably lower than the stated preference triangulated value of £419-455 per property. The possible implications of this additional research are that:

- revealed preference is undervaluing the service attribute, or
- stated preference is overvaluing these attributes; or
- our response to the incident was very good and therefore limited the effect on our customers.

Therefore, to make sure we give due weight to the revealed preference research and our other studies we are re-triangulated this value with contextualised and deliberative WTPs. This approach was adopted following review, discussion and agreement with Water Forum members. The latter two valuations were used to achieve a triangulated value that was grounded in understanding and appreciation of relevant issues. The resulting triangulated values were £274 for 3-6 hour interruptions and £276 for 6-12 hour interruptions.

Because revealed preference has a potential weaknesses, in that it is likely to exclude factors such as customer inconvenience, we chose, with support from the Water Forum, not to rely solely on revealed preference and decided to incorporate stated preference evidence as well.

To combine these values into a single metric we averaged the two WTP values (£275) and divided them by the number of minutes in a 3-12 hour duration interruption (7½ hours or 450 minutes) to give a WTP per-minute per-property of £0.61. With the performance measure calculated on the basis of all properties, we arrived at an aggregate WTP per-minute of £2,162,090 by multiplying the WTP per-minute per-property by the number of properties.

Creating a single metric for supply interruptions

Average WTP (£)	Mid-point minutes for 3-12 hour	WTP per minute per property (£)	Number of properties	WTP per minute (£)	In-period ODI per minute
275	450	0.61	3,538,540	2,162,090	£1,081,045

The overall value of the in-period ODI becomes £1,081,045 compared with the current ODI of £1,237,107. Although this reflects a real-terms reduction, this needs to be seen in the context of increases in our GSS payments for interruptions greater than 24 hours. A further point to note is that, if the ODI had been based solely on the revealed preference evidence, then the ODI would have been a small fraction of the PR14 incentive.

7.6 Outliers - river water flow

Harnessing our customer insight

The qualitative insight confirms that customer value the environment, and want us to protect it for future generations. However, we have no evidence to suggest that river flow valuations have increased significantly since PR14.

The details of the practical solution

Although the PR19 valuation for **river water flow** significantly exceeds our PR14 final value, it is only 17% above the highest rate seen at PR14. A further consideration is that a single metric is needed for improvements in WFD criteria in terms of the PC and ODI, which takes of both river water flow and quality measure takes flow into account.

Following consultation with Water Forum members, we agreed with them that a sensible solution – both to overcome possibility that the WTP is an outlier and to create the single metric – is to create a weighted WTP:

- based on the number of points arising from schemes expected to benefit flow (29) and the points that will arise from quality impact (182); giving
- flow an 14% weight in the final valuation worth £22,247, combined with quality having an 89% weight worth £21,525; giving
- an weighted average WTP of £43,771.

Combining river water flow into a single metric for river water quality

Flow		Quality		Weighted average WTP per mile#
WTP	Improvement points	WTP	Improvement points	
£161,683	29	£24,954*	182	£43,771

*this is the WTP uprated for the results of the Choices research
the WTP values were derived on a per mile basis to ensure cognitive understanding for participant, while our CBA was based on published river lengths from EA, which are in kilometres.

Converting this per mile WTP into and end-of-AMP ODI involves:

- establishing the total number of miles of river (1,572 miles) expected to see improvements over the AMP;
- combine with the expected WFD points (211) to create an average number of miles improved per point (7.45);
- establish the per-point WTP values from the average number of miles improved per point and the WTP per mile (7.45 x £43,771 = £326,094 per year) which is on an in-period basis; and
- the equivalent WTP on an end-of-AMP basis is £1,630,468, giving **an end-of-AMP ODI of £815,234**.

Converting the per-mile WTP into end-of-AMP ODIs per-point

Miles to be improved	Improvement points	Miles per point	WTP per point per year	End-of-AMP WTP per point	End-of-AMP ODI per point
1,572	211	7.45	326,094	1,630,468	£815,234

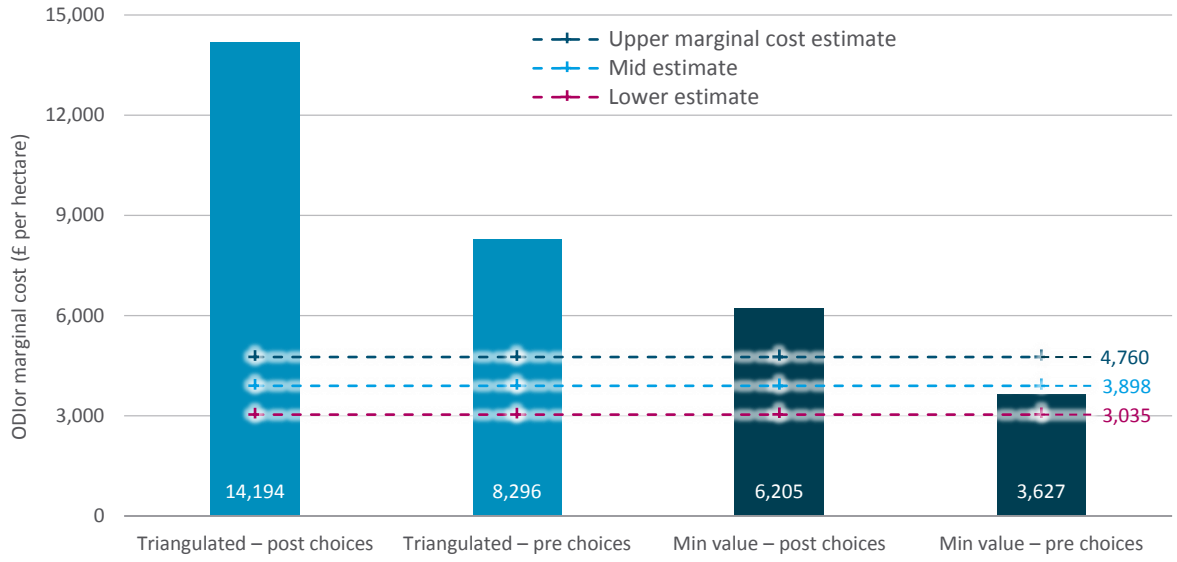
7.7 Water Forum challenge on biodiversity (water & waste)

Separate to our benchmarking and comparison analysis of our WTP values, we also identified biodiversity as an additional outlier. Although the comparator results had not suggest this to be the case, when we compared the potential ODI rates with the cost of farm land. We found that overly-large ODI rates for biodiversity (water & waste) would create the very real risk of highly perverse incentives, whereby it could encourage the purchasing of farmland simply to outperform on biodiversity (water & waste).

At the close of 2017, Savills GB Farmland Value Survey[9] showed that average prime arable commanded close to £22,200 per hectare, with average grade 3 farmland trading at around £18,500 per hectare. Grazing land was trading at between £13,600 and £10,900 per hectare, reflecting the variation in quality and geography across the holdings marketed. If the ODI were based on the triangulated WTP of £16,590, the incentive rate would be £8,296 per hectare, which would certainly be sufficient to create a perverse incentive. If the Choices research is taken into account, then the perverse incentive would be even more pronounced given the WTP and ODI rates would increase to £28,387 and £14,194 respectively.

[9] Savills (12 Feb 2018), online report – https://www.savills.co.uk/research_articles/229130/228020-0

Comparing biodiversity marginal cost estimates with ODI valuations



In terms of the ODI rates derived from our WTP options, following the marginal cost comparison we can conclude:

- option 1 – the triangulated, post-choices ODI rate is too high – it is almost three-times higher than our upper marginal cost estimate;
- option 2 – the triangulated, pre-choices ODI rate is also too high – although not as high as the post choices valuation, it remains 75% greater than our upper marginal cost estimate;
- option 3 – the minimum WTP value, post-choices ODI rate is probably too high as well – it is 30% greater than our upper marginal cost estimate, and perhaps only looks more reasonable by virtue of being less-excessive than the two triangulated options above; and
- option 4 – the minimum WTP value, pre-choices ODI rate looks to be the most suitable value. It lies within the range of our marginal cost estimates – only 7% below the mid-point in this range.

The case against using options 1-3 goes beyond the mathematical logic given above – there is a strong qualitative case against their use. The presence of such rates requires either a revised PC target or a significant reduction in the ODI rate. In fact, the physical limitations of identifying additional practical schemes to include in a higher target suggest that the intervention would focus on the ODI rate.

By contrast, the case for adopting ODI option 4 is compelling:

- it remains founded, in part, on our WTP research;
- it gives a value the compares very well against our marginal cost estimates;
- it will give a strong incentive to deliver the PC; and
- it will create a suitable incentive to outperform the PC, where it is efficient to do so, but without creating obvious perverse incentives.

Having tested our approach and logic with Water Forum members and obtained their agreement, we have used the minimum pre-choices WTP valuation to **set the biodiversity (water & waste) in-period ODI at £3,627 per hectare**.

7.8 Updating valuations for additional insight – choices research

Using the Choices research to understand relative importance of different service aspects and their underlying valuations

In line with our planned approach, our choices research on investment priorities, performance commitments and ODIs provided us with two sources of information, in that it allowed us to refine certain triangulated WTP values and it provided us with valuations for metrics that we had not been able to cover in our original WTP research. The updated WTP values are set out in the next table, with

the subsequent table providing the additional valuations. Note that, as discussed in the section on interventions on outliers regarding taste and smell, the water quality complaints metric is set with reference to the appearance of tap water WTP valuation.

WTPs updated for the Choices research findings and the resulting in-period ODIs

Service attribute	Units	Triangulated WTP	Choices % change	WTP post Choices	In-period ODI
Pollution incidents (Cat 1-3)	1 incident	135,379	-7%	125,584	£62,792
Internal sewer flooding	1 incident	105,524	2%	107,402	£53,702
Leakage	1 Ml/day	432,381	50%	649,705	£324,853
External sewer flooding	1 incident	24,671	96%	48,442	£24,222
Public sewer flooding	1 incident	24,671	99%	49,054	£24,528
Water quality complaints*	1 complaint	2,471	121%	5,462	£2,731

* based on the WTP for drinking water appearance

In our discussions with Water Forum, we concluded that it is reasonable to attach material weight to this latest research, particularly since it provided more context on bills. Furthermore, since the research was calibrated around the triangulated valuation, we can conclude that it also captures the other evidence. Therefore, it was appropriate to rely on the fully adjusted values, rather than the alternative under consideration which would have been to average the Triangulated WTP and the Post Choices WTP (for which no appropriate rationale could be identified).

Valuations identified directly through the Choices research

Service attribute	Units	WTP from Choices	In period ODI
Sewer collapses	1 collapse	20,689	£10,345
Inspiring our customers to use water wisely	1% expansion	18,668	£9,335
Sewer blockages	1 blockage	22,330	£11,166
Mains bursts	1 burst	23,838	£11,920

Four of the ODIs identified in the above table require further adjustment to align with the Ofwat common metrics that allow comparison across companies. These ODIs are pollution incidents, internal sewer floods, sewer collapses and mains burst. These are all converted into frequency of incidents measures, as set out in the table below.

Aligning ODIs with Ofwat metrics

Service attribute	Initial ODI value	Unit of measure used in initial ODI calculation	Required unit of measure	Total connections/ network length	Revised in-period ODI
Pollution incidents (Cat 1-3)	62,792	1 incident	per 10,000 km of waste network	95,001 km	£596,530
Internal sewer flooding	53,702	1 incident	per 10,000 sewer connections	4,208,872	£22,602,484
Sewer collapses	10,345	1 collapse	per 1,000 km of waste network	95,001 km	£982,785
Mains bursts	11,920	1 burst	per 1,000 km of sewers	47,136 km	£561,861

The ODI for inspiring our customers to use water wisely (our education programme) needed to be converted from an inputs to an outputs focussed valuation. The 1% expansion equates to expanding our education programme by an additional 7,000 students. The move to an output measure, means the focus is on successfully educated and engaged students where UKWIR[10] has established that current take-up is 18%, so on this measure the 1% increase would yield 1,260 students. Allocating the £18,668 WTP for 1% expansion across these student, gives a WTP of £14.82 and an **in-period ODI of £7.41 per customer**.

Creating an outputs-focussed ODI for inspiring our customers to use water wisely

WTP for 1% expansion	Increase in students from1% expansion	Conversion rate to successfully educated and engaged customer	Increase in educated and engaged students from1% expansion	WTP per educated and engaged customer	In-period ODI per educated and engaged customer
£18,668	7,000	18%	£1,260	£14.82	£7.41

Using triangulated WTPs values to set ODI rates

Not all triangulated WTP values were tested through the Choices research, largely because it was important to manage the cognitive load for participants. As a result, there was one PC, were we set the ODI on the basis of the triangulated WTP value, and that was resilient supplies. The triangulated WTP was £1,400,781 for a 1% change in properties with resilient supplies. As this is on an in-period basis, the end-of-AMP WTP would be £7,003,903, giving **an end-of-AMP ODI of £3,501,952**.

Deriving the ODI for resilient supplies

Triangulated WTP	WTP metric in period	WTP end-of-AMP	ODI end-of-AMP
£1,400,781	1% of properties	£7,003,903	£3,501,952

[10] UKWIR (Report no. 09/WR/25/4), "*Estimating the water savings for baseline water efficiency activities.*" https://www.ukwir.org/reports/09-WR-25-4/67232/Estimating-the-Water-Savings-for-Baseline-Water-Efficiency-Activities

7.9 Setting ODIs where customer valuations could not be established

There are service attributes were identifying customer valuations is not straightforward. This is because some attributes do not have a direct interface with the customer, or the service area is difficult to express to customers in a sufficiently meaningful and tangible manner for drawing out coherent valuations.

Two ODIs were set with reference to the established values for other ODIs

For the PC relating to **resolution of low pressure complaints**, we were able to derive its ODI from the £464 per-property per-day ODI we have proposed for persistent low pressure complaints. This logical approach takes into account that low pressure complaints will arise on a per-property basis and are likely to be short-term in nature (otherwise they would be registered as persistent). Hence, we have used its value (£464 per-property per-day) as the per-complaint value. The ODI also requires further refinement to align with the unit of measure used in the PC, where progress is measured on the basis of the percentage-change in complaints.

Converting the measure for low pressure complaints involved assessing the how many fewer complaints there would be following a one-percent reduction in their total, based on the average number of complaints per year (16,190) over AMP7. **The in-period ODI for a one-percent change in complaints was then calculated to be £75,122**.

By way of clarity, this measure will specifically be about low pressure complaints, whereas a separate PC and ODI will cover persistent low pressure issues. The approach makes sure there is no double-counting between the two measures.

We refined the resolution of low pressure complaints ODI to apply by percentage-change

ODI per complaint	Average number of complaints per year AMP7	1% of complaints	In-period ODI per 1% change in complaints
£464	16,190	162	£75,122

For **speed of response to visible leaks**, we also needed to identify an appropriate proxy for setting the incentive rate. Ultimately this measure is about responding to customers' expectations about service quality. We therefore set the ODI by reference to the ODI for a 1% improvement in low pressure complaints – which delivers a value of £1m per day reduction in speed of response to visible leaks. This is expected to be four times more powerful than our current incentive.

We considered whether there might be better options for this valuation, such as supply interruptions. But, as the focus here is more about reactions to water service, rather absence of service, we settled on low pressure complaints as a pragmatic and logical solution. This conclusion was reached with Water Forum's support, following discussion on, and deliberation of, the issue.

The speed of response ODI also requires alignment with the unit of measure used in the PC – the number of days taken to fix the leak. As set out in the table below, we this by:

- taking the value of a 1% reduction in low pressure complaints as the value for a 1% reduction in complaints about visible leaks;
- taking the expected improvement in speed of response to be 50%, based on the end-of-AMP7 target of 3.5 days, compared with the expected average of 7 days at the end of this AMP;
- valued the 50% reduction at £3,756,000 (in other words 50-times the value of a 1% reduction); and
- derived a per day valuation of £1,073,171 by dividing the valuation of the 50% reduction (£3,756,000) by the expected improvement in days (3.5).

The resulting in-period ODI is of £1,073,171 per one-day reduction in speed-of-response to visible leaks.

We honed the ODI for speed of response to visible leaks to accrue according to time taken

ODI per 1% reduction in low pressure complaints	Expected improvement in average speed of response time		ODI valuation of total improvement	ODI per day improvement
	Days	%		
£75,122	7 days to 3.5 days	50%	£3,756,100	£1,073,171

As a sense check for our approach, we have reviewed our existing PC and ODI arrangement that was set at PR14. This review has taken account of the fact that the definition of the PC is changing – in the next AMP it will focus on the average response time across all recorded visible leaks, rather than just those completed within a certain timeframe.

The current PC has an ODI of £28,085 (in 2017/18 prices) per 1% of visible leaks responded to within 24 hours. In 2017/18, performance was 58 percentage points short of the target (net of the 10 percentage point deadband) such that a penalty of £1,628,594 applied. The average response time for leaks in this year was 7 days – 6 days above target. This implies a penalty rate of £271,492 per day above target (ie, £1,628,594 divided by 6 days. This leads to the conclusion that, in real terms, the ODI proposed for our AMP7 PC is going to be four times more powerful than the existing arrangement, and will therefore provide a substantially sharper incentive to improve performance.

We have calculated four ODIs using marginal cost valuations

Where we have used short-run marginal cost values, we have derived these from the incremental cost of improving the service area by one increment. We have applied this approach to four PCs – reducing residential void properties; abstraction incentive mechanism (AIM); protecting our schools from lead; and metering.

Reducing residential void properties – under the (WRFIM) revenue cap, the adjustments for additional revenue recovery that take place in the subsequent period would be expected to leave companies indifferent to collecting voids. However, because void properties also have a very high incidence of debt (around 85% in our latest trials) billing void properties actually results in extra bad debt costs that disincentivises the pursuit of voids. Nevertheless, even with the potential for bad debt, customers stand to benefit from reducing residential voids. This is because bringing a void into charge means that, at least, some revenue will be generated where there was none before, thereby reducing the need for other customers to bear the costs associated with residential void sites.

The aim of the ODI is to incentivise the company to resolve voids, so we have set it using the combination of the average 2017/18 residential annual bill of £330 and, to incentivise improved performance, a slightly reduced bad debt rate of 80%. This implies an average bad-debt of £264 for each residential void brought into charge. Taking 50% of this value, then applying the 20% uplift gives an **in-period ODI of £159 per void property brought into charge over the annual target**. The ODI will be reward only, because applying a penalty for increases in voids would disincentivise their identification – voids are unknown until the point of discovery.

Abstraction Incentive Mechanism (AIM) – the marginal cost values were determined separately for each AIM site, according to the marginal change in modelled despatch costs from constraining these sites off the system. This resulted in area-specific marginal costs, such that sites within the same despatch area have common marginal cost valuations. The corresponding **in-period ODIs are £1,204 and £136 per megalitre**.

Deriving the AIM ODI rates

AIM site	Area	Marginal cost per megalitre per year	In-period ODI per megalitre per year*
REDACT	North Staffs	£2,007	£1,204
REDACT	Strategic Grid	£226	£136

* ODI equals 50% of marginal cost, uplifted by 20% to provide an incentive to avoid under-deliver

Protecting our schools from lead – to establish whether a school requires protecting from lead, sites will first need investigating. Our expectation is that 30% of schools will require additional work following the initial investigation. So, we have calculated the ODI, which will apply per school, to reflect the full marginal cost of the trial hole and 30% of the expected cost of additional work – all schools will require a trial hole, but only 30% will need further work. This gives a marginal cost of £1,497 per school over the AMP that, following multiplication by 50% and the 20% uplift, gives an in-period valuation of £898 and **an end-of-AMP ODI of £4,491 per school**.

Certain ODIs required us to update PR14 ODI rates

For certain measures, where marginal cost information is not readily available we have adopted the PR14 valuations, updated for inflation, given that these are already successfully driving desired performance outcomes. The two measures where we have taken this approach, in a straightforward manner, are set out in the following table, along with their existing ODI rate in 2012/13 prices and the revised rate in 2017/18 prices.

Farming for water – set with reference to the PR14 value for catchment management schemes, as both metrics concern the number of catchment schemes where we will improve control of raw water. Uprated for inflation, **the end-of-AMP ODI will be £1,157,119 per scheme over the AMP**.

Treatment works compliance – as this was a PC at PR14 that is already providing and effective incentive, it is uprated for inflation to give **an in-period ODI of £1,572,783 per 1% non-compliance**.

The ODIs where we have update PR14 ODI rates

Site type	Units	ODI		
		2012/13 prices	2017/18 prices	Timing
Farming for Water	Number of schemes	1,030,000	£1,157,119	End-of-AMP
Treatment works compliance	per 1% non-compliance	1,400,000	£1,572,783	In-period

In addition, the ODI for one measure – **collaborative flood resilience** – has been recalibrated as well as being based on the PR14 ODI. Previously, this measure was input focussed, in that it concentrated on the number of schemes delivered. This time around, the measure will be outcomes based, in the form of the number of properties benefitting from the schemes on an end-of-AMP basis.

We have refocused the collaborative flood resilience ODI from inputs at PR14 to outcomes

PR14 annual ODI per scheme (2012/13 prices)	Annual ODI per scheme (2017/18 prices)	Average number of properties per scheme	Annual ODI per property (2017/18 prices)	PR19 end-of-AMP ODI per property (2017/18 prices)
61,172	68,722	10	6,872	£34,361

One further measure is set with reference to the PR14 ODIs and that is **satisfactory sludge use and disposal**. As this ODI is a compliance-focused metric, we calculated it as a ratio of the treatment works compliance ODI, with the ratio reflecting the relationship between PR19 RCVs for sludge and waste. The reason for this approach is that both are a compliance measures with environmental consequences from non-compliance. And, to make sure the incentive is proportionate across the two businesses, it is appropriate to scale for the relative values of the two businesses. With the sludge RCV at 10% of the waste RCV, the resulting **in period ODI for satisfactory sludge use and disposal is £157,279 per 1% non-compliance**.

Linking the sludge compliance ODI to the treatment works compliance ODI

PC	ODI for treatment work compliance	Sludge RCV as % of waste RCV	In period ODI
Treatment works compliance	£1,572,783	10%	£157,279

For each of these four measures, we have tested the proposed ODI rates for possible performance outcomes In the case of farming for water we have assessed the individual P10/P90 scenarios. For the three compliance-based measures, the assessment is for just the P10 scenario, because these are penalty only ODIs.

Potential performance outcomes for ODIs based on uprated PR14 valuations

PC	ODI	Performance outcomes			Deadband	Revenue effect		
		P10	P50	P90		P10	P50	P90
Farming for Water	£1,157,119	12	16	21	n/a	£4,628,476	0	£5,785,595
Treatment works compliance	£1,572,783	98.50%	100%	n/a	99%	£786,392	0	n/a
Collaborative food resilience	£34,361	154	420	430	n/a	£9,140,026	0	£343,610
Satisfactory sludge use and disposal	£157,279	98%	100%	n/a	n/a	£314,558	0	n/a

The outcomes, shown in the above table, gives us confidence that the penalty rates create a strong incentive to avoid under-performance across all four PCs. While the P90 reward for farming for water is greater than the P10 penalty, this is largely the result of there being a small number of increments in the PC, such that the P90 performance involves delivering 5 schemes above target and the P10 performance concerns falling short of the target by 4 schemes. Overall, the incentives will be robust for this metric. And, with collaborative flood resilience shows the potential P90/P10 outcomes provide a good balance between providing appropriate rewards for outperforming the stretch PC, while creating a robust incentive to avoid under-delivery against this challenging target.

We were able to use alternative valuation sources for two ODIs

Green communities – to assess the additional amenity created by green community investments we use the B£ST[11] evaluation tool, which assesses the amount of natural and social capital value (the benefit) created for the local community. So, **for every £1m of benefit created, the in-period ODI is £0.5m**.

Reducing business void and gap site supply points – the basis of the ODI is to incentivise retailers to resolve business and gaps sites. We will pay NHH Retailers an amount equal to the ODI for each site brought into charge. The ODI will be reward only – penalties are not considered, for the same logical reasons as for residential gap sites. We will earn the ODI against each of the business gap and void sites brought into charge, over and above the average annual number seen in the first three years of AMP6.

We see that wider customers will benefit from this action, as it should it will bring greater clarity on both the volume of wholesale water attributed to the NHH market and cost allocations across customers. Ultimately, it should reduce the proportion of costs that need to be recovered from other customers.

In setting the ODI, we looked to establish the incremental cost of debt arising from resolving business gaps and voids. However, with the changes to the NHH Retail market, including the rollout of competition and our exit from this retail market, obtaining the required data proved challenging, and in the end was found not to be sufficiently robust. Consequently, we sought to set the rate on the basis of benchmarks from other companies making gap site incentive payments. Our research found that only Anglian currently has such an arrangement, so we have tested it for reasonableness for the Severn Trent area.

We have tested this value, with reference to the two worked example set out in the next table, based on 2018/19 bills:

- at average consumption[12] (227 m^3/year) – the combined annual bill would be £602, which would lead to a bad debt figure of £350 if the incremental incidence of bad debt was around 58% for business gaps and voids; and
- for smaller consumption (165 m^3/year) – the combined bill would be £452, where an incremental bad-debt rate of 77% would give a figure of £350.

[11] B£ST is the Benefits of SuDs Tool. SuDS refers to Sustainable Drainage Systems. The B£ST tool was developed and is provided free by the Construction Industry Research and Information Association (CIRIA).
[12] the average of Ofwat's non-household volumes for water consumption

We tested the suitability of the benchmarked valuation for business gaps and voids

Size of NHH customer	Annual Volume	Annual bill	Incremental rate of bad-debt	Amount of bad debt
Average	227m^3	£602	58%	£350
Small	162 m^3	£452	77%	£350

Given that gap and voids site are less likely occur with higher volume businesses, because of District Metering Areas monitoring, it is reasonable to expect these to be clustered amongst below-average consumption business. A further consideration is that NHH customers should have a lower incidence of bad debt because supply can be disconnected for non-payment. However, the extent of the reduction is tempered by the fact that the greater economic flexibility associated with SMEs (small and medium enterprises) and the potential for some of these smaller enterprises to represent less formal parts of the economy. Therefore, we find the £350 valuation to be reasonable for Severn Trent.

As the valuation is a cost based measure, it is appropriate to apply our approach to setting ODIs based on marginal cost valuations. Accordingly, this sees us take 50% of the £350 and apply the 20% uplift, giving an **in-period ODI at £210 per site brought into charge**.

7.10 ODIs with enhanced incentive rates

Our framework and method for setting accelerated ODI rates to further motivate performance is based on a higher benefit-sharing rate of 75%, compared with the 50% used for standard rate ODIs. We will apply this to both penalty and reward for the two common PCs where we are UQ, which are internal sewer flooding and pollutions. We have reserved this approach for two ODIs, given our ambitious approach for setting the level at which penalties are triggered. Rather than setting it at the lower quartile (LQ) rate, we have set the trigger-point at a point which is significantly in excess of LQ.

These higher rates will apply, incrementally, for super-stretch performance as summarised in the figure below.

We will have accelerated ODIs for the common PCs where we are UQ

PC	Unit	Standard ODI	Accelerated ODI
Pollution incidents (Cat 1-3)	per 10,000 km of waste network	£596,530	£894,795
Internal sewer flooding	per 10,000 sewer connections	£22,869,716	£33,903,727

The trigger points for the enhanced penalty rates will be set at the point where performance falls below our expected end-of-AMP6 performance by an amount that is equal to the expected improvement that would be delivered from meeting the PC target at the end of AMP7, as set out in the table below.

Pollution incidents			Internal sewer flooding		
Average AMP7 target	End AMP6 performance	Enhanced penalty threshold	Average AMP7 target	End AMP6 performance	Enhanced penalty threshold
24.46	27.41	32.33	1.58	1.70	1.89

By contrast, the reward trigger-points will be set at the point that is double the improvement between expected end-of-AMP6 performance and the applicable PC target for each year of AMP7.

	Pollution incidents			Internal sewer flooding		
	End AMP6 performance	PC target	Enhanced reward threshold	End AMP6 performance	PC target	Enhanced reward threshold
2020/21	27.41	26.43	25.45	1.70	1.66	1.62
2021/22	27.41	25.45	23.49	1.70	1.62	1.54
2022/23	27.41	24.47	21.53	1.70	1.58	1.46
2023/24	27.41	23.48	19.55	1.70	1.54	1.38
2024/25	27.41	22.49	17.57	1.70	1.51	1.32

7.11 Enhancement related ODIs

We have six enhancement related ODIs that have a number of different roles:

- the ODI penalties protect customers against levels of enhancement that fall short of our PCs, and so provide a logging mechanism;
- for four of the enhancement related ODIs (Improvements in WFD criteria, Supply Capacity, Metering and Water trading) the reward forms part of a real option mechanism, and so provides a means of managing uncertainty that avoids pushing up customer bills unduly. The potential to earn these rewards is subject to defined trigger mechanisms which allows the case for the enhancements to be tracked as new information becomes available; and
- for the resilient supplies ODI, the reward and penalty rates have been set to provide incentives that support our ambitious plans and consistent with customer valuations.

These are summarised in the table below.

Enhancement expenditure related ODIs

PC	ODI	PC	ODI
Metering	Reward and penalty	Improvements in WFD criteria	Reward and penalty
Increasing water supply capacity	Reward and penalty	Resilient supplies	Reward and penalty
Security (reducing the risks to our sites)	Penalty only	Water trading	Reward only

Improvements in WFD criteria

Our business plan includes enhancement expenditure for all of our green and some of our amber schemes associated with wastewater environmental quality improvements. The penalties for our 'Improvements in WFD criteria' ODI protect customers in circumstances where we did not deliver the improvements that these schemes are intended to (i.e. they provide a form of logging mechanism).

We excluded some amber schemes from the enhancement expenditure in our plan because they delivered fewer wider benefits, and we would not want to proceed with these schemes ahead of receiving formal Ministerial approval. The rewards under this ODI form part of a real option mechanism which provides a means of funding further improvements, should approval be received, but does not required current customers to face higher bills now, in a context where there is uncertainty over whether those improvements will be required. We have explained this real option mechanism further in Appendix A8.

Our approach to outcome measurement uses the points measurement system that we developed at PR14, and have been applying throughout AMP6. This system was developed in order to provide a more sophisticated means of defining outcome improvements than, for example, km of rivers improved. Importantly, the points system captures the fact that 'improvements' can differ both in terms of extent of improvement, and the parameters to which that improvement applies.

Our PC target is for an improvement of 164 points, and the enhancement expenditure in our plan of £270m provides for the achievement of this level of improvement. Our real option mechanism provides a means of funding a further improvement of 132 points (and to the extent that) the additional improvements are required (as a result of Ministerial approval), and those improvements are delivered.

As discussed in the earlier section regarding resolving the river water flow outlier, **the applicable end-of-AMP ODI rate will be £795,015 per point**. Given the long term nature of the investment we are categorising this as an RCV adjustment.

Resilient supplies

For our resilient supplies measure we have calculated the incentive rate using customer valuations, as per Section 7.6 above. This supports the use of symmetrical incentives to deliver greater performance where customers' value it and the improvement is cost-effective.

Our PC target is to improve resilience by 9%, and we have included [£m] of enhancement expenditure in our plan to enable the delivery of this. **The symmetrical end-of AMP ODI penalty and reward rate is £3,501,952 per one-percent change**.

We have also categorised this as an RCV adjustment. This reflects the long term nature of the investments.

Metering

To balance future supply-demand we have identified the need for more demand side solutions. A key feature of our WRMP and enhancement business case is an increase in our **metering** programme. This programme is subject to some uncertainty given that we have proposed a increasing our rate of meter installation to 300% of our current level to support water efficiency programmes – this would result in 500,000 meters being installed over the AMP.

The uncertainty with metering relates to the extent to which this increase to 300% of our current installation rate in metering is deliverable. On one hand we could respond to this by assuming a smaller increase in metering, however this would reduce our ability to deliver demand side reductions. We could also include a true-up mechanism that returns money to customers if we don’t deliver meter installations at 3 times the current rate.

We have taken on board feedback from our customer engagement on real option mechanisms and are proposing a middle ground solution. This would involve:

- only including an enhancement business case that includes installing 65,000 meters per year;
- using the ODI to fund additional metering activity up to a cumulative cap of 497,878 meters over the AMP; and
- using the ODI to return money to customers if we do not install an average of 65k of meters each year, unless the aggregate cap for the period has been achieved.

This approach ensures that customers are protected through an appropriate logging mechanism. This ODI is based on an average marginal cost of £205 per meter, where we take 50% of this value giving an **in-period ODI of £103 per meter**.

Security – reducing the risks to our sites

Our business plan includes an enhancement business case for investment needed to meet the increased statutory requirements associated with security at 247 sites. Although this activity is underpinned by a legal requirement, we consider that due to the materiality of the enhancement case additional customer protection is required. We have therefore established a new ODI that returns the money to customers in the event that we fail to deliver the improvements.

In developing the ODI we have sought to create a single metric, even though the improvements relate to different types of sites – boreholes, distribution reservoirs, surface water treatment works and sewage treatment works. We have done this by normalising each improvement by reference to the cost of delivering an improvement at a surface water treatment works. For example one Borehole is worth 4.5% of a Surface Water Treatment Works and a Distribution Reservoir is worth 5.3%. This is illustrated in the table below.

Creating a single, simple ODI metric for site security

Site type	Sites	Total Cost	Unit cost	Surface water treatment works equivalents		
				Proportion of 1 SWTW	Investment cost	End-of-AMP ODI
Boreholes	132	9,500,000	71,970	3.6%		
Distribution reservoirs	105	11,266,962	107,304	5.3%	2,026,350	£1,013,175
Surface water treatment works	10	20,263,500	2,026,350	100.0%		

* ODI equals 50% of investment cost

The investment cost of one surface water treatment works equivalent is £2,250,000. As with our marginal cost valuations, we have created the ODI by taking 50% of marginal cost.. The result is **an end-of AMP ODI of £1,013,175**. As this ODI is focussed on returning money to customers in the event schemes are not delivered, it will be penalty only.

We have also categorised this ODI as an RCV adjustment. This reflects the long term nature of the investments.

Increasing water supply capacity

Our business plan includes three schemes to increase supply capacity that, via our Water Resources Management Plan (WRMP), we have confirmed are required. Specifically each schemes is required in AMP7 irrespective of any assumption made on climate change uncertainty.

These schemes are included in our PR19 plan (see our supply-demand enhancement expenditure) and described in the table below.

Scheme	Benefit (Ml/d)	Time to deliver benefits (years)
REDACT pipeline capacity increase	7.5	2
REDACT transfer solution	25	4
REDACT asset and water treatment enhancements	36	5

The cost of delivering the additional supply capacity is equal to £90m or £1.3 per Ml/d. To ensure customers are protected in the event of non-delivery we have proposed **a penalty rate equal to £659,855 per Ml/d**. This is based on the cost of delivery multiplied by the totex sharing rate (50%). This incentive effectively logs us down if we do not deliver the schemes.

We also recognise that due to uncertainty about climate change, there could be a need for additional investment. As we describe in Appendix A8 there are 18 potential schemes that could be required across three water resource zones. These are described in the table below:

Water Resource Zone	Schemes	Unit rate (m/Ml/d)	Ml/d	Incentive £m / Ml/d
Strategic Grid	16	£2.8	189.7	1,400,000
North Staffs	1	£1.5	7	750,000
Nottinghamshire	2	£2.0	55	1,000,000

We are therefore proposing that this ODI would also have three potential reward rates, to reflect the different water resource zones. These **reward rates would range from £750,000 to £1,400,000 per Ml/d as per the table above**. Delivery of the additional capacity would only be initiated if the defined triggers were met as explained in Appendix A8.

These would be end of AMP ODIs with an RCV adjustment, to reflect the long term nature of the investment.

Water trading - interconnector

In Appendix A8 we discuss the rationale and design of the water trading – interconnector real option mechanism. The key feature is that we have not included activities associated with developing the interconnector and water trade in our PR19 totex submission. Our Customer Challenge Group (the Water Forum) strongly supports this option – having challenged us that in light of the current position from Thames, there is a risk that our customers may not benefit from any expenditure. Instead we have been challenged to reduce the uncertainty before undertaking more extensive feasibility and design work. This led to the development of the real option mechanism.

In terms of the incentive rate for the real option mechanism, given the nature of the work involved (planning, feasibility) and the challenges this poses for assessment (in a context where the ultimate consequences of decisions may not arise for many years, and even then may remain unclear), there look to be significant risks associated with an approach that seeks to apply some kind of incentive rate or unit rate. That is, such an approach may have unwanted adverse consequences that only apparent (potentially) many years in the future.

In recognition of this, we propose that a maximum cost of £40m, REDACT. This estimate is considerably more than typical unit cost for new water sources given the wholly different nature of the work being undertaken. It aligns with the early pipeline only cost of REDACT developed with a third party and is in line with feasibility for the Birmingham Resilience Scheme. We would provide assurance about the efficiency of the costs through the following checks:

- our initial schedule of expected costs would provide a benchmark against which identified costs could be compared;
- relevant identified costs would be subject to appropriate third party assurance which could then be reviewed by our Water Forum; and
- our identified cost levels and contracting processes would prove a basis for Ofwat to review the appropriateness of the arrangements at PR24.

We have also categorised this as an RCV adjustment. This reflects the long term nature of the investments.

8. Summary of ODIs

In the table below we have presented our resulting package of ODIs. A key feature of this package is that by embracing the philosophy of ODIs (linking more revenue to service, limited use of caps, collars and deadbands), we have significantly increased the level of risk (and reward) relative to PR14. Our resulting RORE penalty range is just below 3%, with very strong alignment to performance on asset health. Further information about the balance of risk and return is set out in Appendix A11 Aligning Risk and Return.

PC	Unit	ODI	Timing	Type
ODIs were we intervened to resolve outliers				
Persistent low pressure	per property per day	£464	In period	Revenue
Water supply interruptions	per minute	£1,081,045	In period	Revenue
Improvements in WFD criteria	ODI per point	£815,234	End of AMP	Revenue
Biodiversity (water & waste)	Hectare	£3,627	In period	Revenue
ODIs incorporating the triangulate WTP results and findings of the Choices research				
Pollution incidents (Cat 1-3)	per 10,000 km of waste network	£596,530	In period	Revenue
Internal sewer flooding	per 10,000 sewer connections	£22,602,484	In period	Revenue
Leakage	1 Ml/day	£324,853	In period	Revenue
External sewer flooding	1 incident	£24,222	In period	Revenue
Public sewer flooding	1 incident	£24,528	In period	Revenue
Water quality complaints	1 complaint	£2,731	In period	Revenue
ODI valuations identified directly through the Choices research				
Sewer collapses	per 1,000 km of sewers	£982,785	In period	Revenue
Inspiring our customers to use water wisely	per customer	£7.41	In period	Revenue

PC	Unit	ODI	Timing	Type
Sewer blockages	1 blockage	£11,166	In period	Revenue
Mains bursts	per 1000 km of mains	£561,861	In period	Revenue
ODIs set directly from triangulated WTPs				
Resilient supplies	% customers whose service can be restored in 24 hrs	£3,501,952	End of AMP	RCV
ODIs set with reference to established ODI valuations				
Resolution of low pressure complaints	per 1%	£75,122	In period	Revenue
Speed of response to visible leaks	per 1 day	£1,073,171	In period	Revenue
ODIs based on marginal cost valuations				
Reducing residential void properties	per void property brought into charge	£159	In period	Revenue
AIM – North Staffs sites	per megalitre	£1,204	In period	Revenue
AIM – Strategic Grid sites	per megalitre	£136	In period	Revenue
Protecting our schools from lead	per school	£4,491	End of AMP	Revenue
ODIs utilising uprated PR14 values				
Farming for Water	Number of schemes	£1,157,119	End of AMP	Revenue
Treatment works compliance	per 1% non-compliance	£1,572,783	In period	Revenue
Collaborative flood resilience	per property or area	£34,361	End of AMP	Revenue
Satisfactory sludge use and disposal	per 1% non-compliance	£157,279	In period	Revenue
ODIs with alternative valuation sources				
Green communities	per £1m increase calculated in BEST evaluation tool	£500,000	In period	Revenue
Reducing business void and gap site supply points	per gap/void property brought into charge	£210	In period	Revenue
Enhanced ODIs rates that will apply for incremental super-stretch performance for PCs where we are UQ				
Pollution incidents (Cat 1-3)	per 10,000 km of waste network	£894,795	In period	Revenue
Internal sewer flooding	per 10,000 sewer connections	£33,903,727	In period	Revenue
ODIs for enhancement expenditure and/or uncertain expenditure requirements				
Metering	per meter	£103	In period	Revenue
Security – reducing the risks to our sites	per surface water treatment works equivalent	£1,013,175	End of AMP	RCV
Increasing water supply capacity – penalty	per Ml/day	£659,854	End of AMP	RCV
Increasing water supply capacity – reward 1	per Ml/day	£1,400,000	End of AMP	RCV
Increasing water supply capacity – reward 2	per Ml/day	£750,000	End of AMP	RCV
Increasing water supply capacity – reward 3	per Ml/day	£1,000,000	End of AMP	RCV
Water trading – interconnector	Input	£40,000,000	End of AMP	RCV