# Appendix
# YKY20_Detailed performance commitments

YorkshireWater

# Navigating this document

## This Appendices document is separate to and supports the main business plan document.

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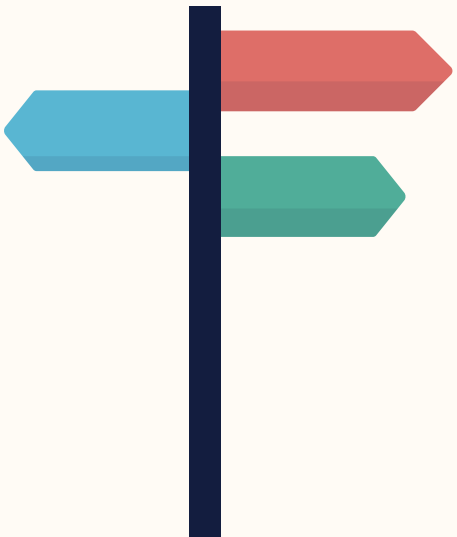
More detail on this subject can be found in **Chapter 7: Performance commitments and outcome delivery incentives**



# Contents

# 1. Introduction

This appendix presents the details of the performance commitments (PC) discussed in Chapter 7 of the main business plan.

# 2. Water supply interruptions

## 2.1 PC Type

Customers receiving an excellent service everyday.

## 2.2 Performance targets

**Table 1:Committed performance levels**

| PC Ref | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | HH:MM:SS per property per year | 00:05:56 | 00:05:47 | 00:05:38 | 00:05:29 | 00:05:20 |

## 2.3 Summary

This Performance Commitment is aimed at incentivising Yorkshire Water to minimise the number and duration of supply interruptions. This improves reliability of the water supply and reduces adverse impacts on customers, especially the more vulnerable customers, of having no water supply.

This PC is currently an AMP7 common PC with common industry targets. For PR24 and AMP8, the reference to the Civil Contingencies Act has been removed since companies are deemed to have a degree of control on reducing risks and impacts to customers, especially in extreme weather events that are not unforeseen.

For PR24, the calculation for this PC in terms of average customer minutes lost is the same as the one used in AMP7:

$$average\ number\ of\ minutes\ lost\ per\ customer = \frac{(properties\ interrupted\ with\ supply\ \geq 180\ minutes)\ \times full\ duration\ of\ interruption}{total\ number\ of\ properties\ supplied\ (year\ end)}$$

Although the main purpose of this PC is to reduce incidents of customers having an interrupted water supply, this PC will also help Yorkshire Water to achieve other benefits. For example, improved ways of responding to water supply interruptions may help to reduce road works that contribute to traffic congestion.

The ODI rate for this PC is based on the values provided to us by Ofwat and are based on a return on regulated equity approach informed by customer preferences. The ODI rate for this performance commitment is £1.42m (22/23 FY average CPIH prices) per minutes lost per customer.

## 2.4 Customer and Stakeholder Engagement

We know, through the customer preferences research as carried out by Ofwat and CCWater, that water supply interruptions are ranked as a high priority service area for customers.

Interestingly, our own Valuing Water customer priorities research found that preventing interruptions to the supply of water (e.g., planned works, burst pipes, leaks and outages) that cause problems ranging from low pressure to no water, was of medium importance to both household and non-household customers. However, as part of the engagement, we analysed contact data, and found that this service attribute generates a higher level of contact from household customers than might be expected given that it was scored as average importance. This suggests that this service area might be more important to household customers than the research analysis initially suggests, particularly if they experience problems with supply interruptions.

Our Water Resources North customer engagement (WReN), while focusing more on the long-term availability of water supply, supported the view that customers place a significant importance on access to a reliable water supply.

> *'The only thing that matters to me is if I turn the tap on and no water comes out.'*

In our affordability and acceptability research conducted following Ofwat guidelines we showcased our planned target for interruptions to supply - 78% of customers found the plan to be acceptable and in our own independent affordability and acceptability testing research, 79% of customers found our overall plan to be acceptable including this target.

More detail on this subject can be found in **Water Resources North customer engagement research**

More detail on this subject can be found in **Valuing water customer priorities research**

Read more about our wider customer and stakeholder engagement in Chapter 6 of our main plan.

## 2.5 Our performance to date

Yorkshire Water has not achieved the targets for this PC in the first two years of AMP7. Our performance in Year 2 of AMP7 (2021/22) of 00:10:38 of customer minutes lost has been significantly affected by ten large impacting events that made up over 00:04:30 of this year's performance. Relative to other companies, Yorkshire Water's performance in 2021/22 is 10th out of 17 companies.

We have an Action Plan to address this PC alongside the related PCs of Leakage and Mains Repairs. These actions are:

1. Additional network pressure monitoring through the installation of 1,200 smart pressure control devices and alert tools to help reduce interruptions and improve response to interruptions.
2. Improved ways of working and response to incidents through water network modernisation.
3. Investing £10m from the Smart Networks and Metering Programme in additional pressure management to reduce network failures and reactive mains repairs.
4. Consolidation of field resources to improve availability and response times.

The 2024/25 (end of AMP7) common industry target for this PC is 00:05:00. Yorkshire Water is forecasting to fail this, and performance is expected to be an average of 00:07:15.

**Arlington Tanks – case study**

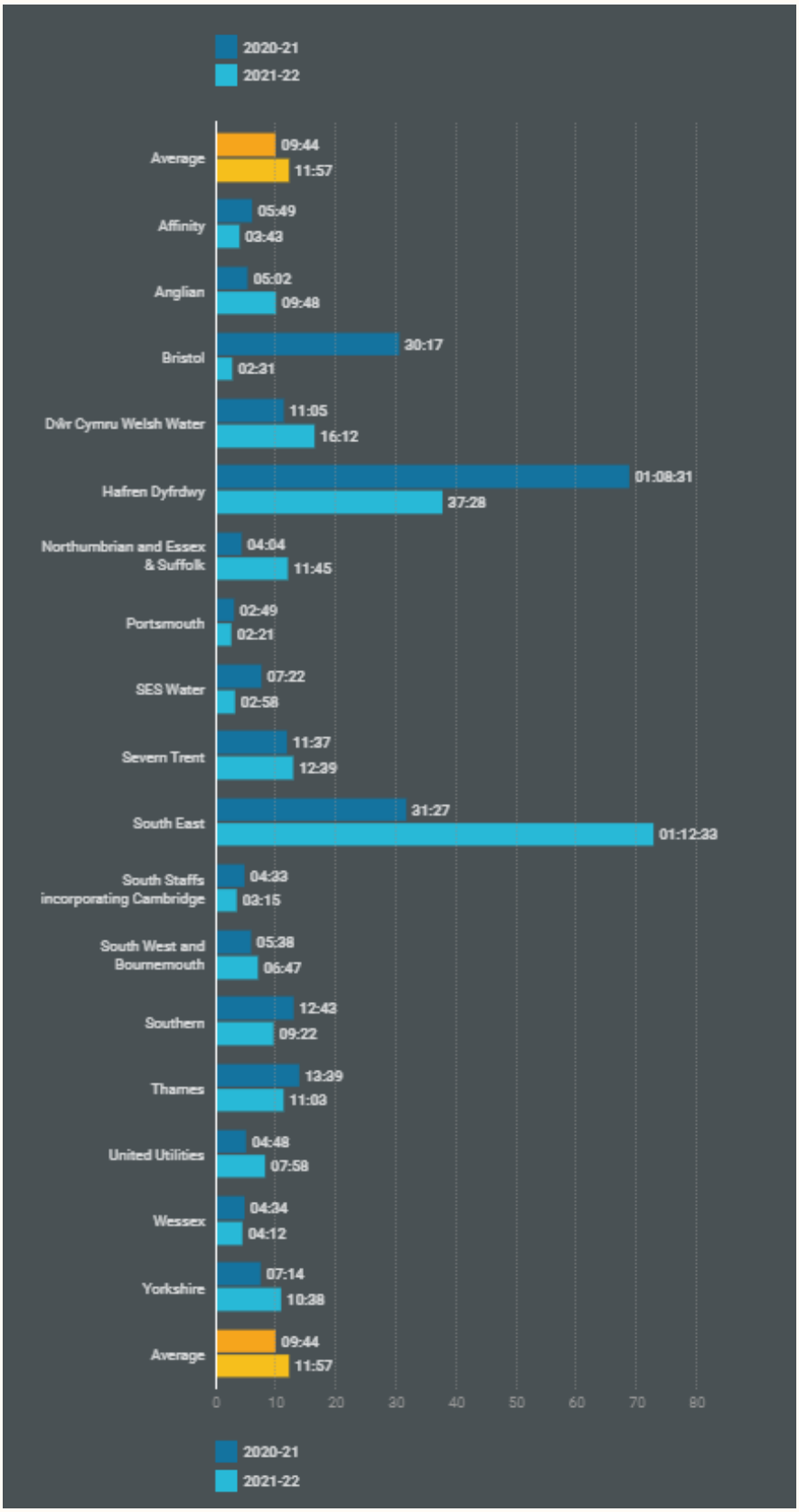
Due to the small tanker fleet size and the legal driving time limits, the network is currently exposed to interruption to supply events as temporary tanker mitigation can often not be available. This is exacerbated by the YW tanker driver having to remain on site with the tanker effectively on stand down and reducing resource utilisation efficiency. The Interruption to Supply performance is affected by the current approach and in AMP8 Arlington tanks would be placed in situ, replacing the tankers on location and enabling greater resilience on the network for the temporary supply restoration.

### Figure 1:Arlington Tank

The Arlington tank consists of a variable speed digitally controlled pumping unit which is both portable and powerful. The system is easy to use, quick and lightweight to deploy.  The ability to maintain supply directly into affected properties means that they effectively have no 'minutes lost' during an event.

This approach would at a minimum result in doubling the available coverage of the supply restoration team throughout YWs operating region and double the current levels of temporary restoration on the network reducing capacity gaps on the network without any FTE impact.

### Figure 2: Minutes lost per customer




Note: values shown in decimals rather than mins:secs

## 2.6 Setting the AMP8 APCL

Based upon the performance observed so far in AMP7 and the initiatives that have become business as usual throughout the last 2 AMPs, such as the Supply Restoration Team and the introduction of the Duty Operations Engineers, these approaches allow us to maintain a stable level of service. Underlying performance has remained stable, but our performance has been

impacted by the low probability but high impacting events in AMP7 e.g., the impact because of Storm Arwen and large diameter mains failures in Ripon and close to Frickley WPS.

We have calculated a modest improvement to CML because of the mains renewal programme that we will implement in AMP8. As we are renewing just over 3% of the network across AMP8, we expect a benefit of 45 seconds to be achieved. Due to the sustainable investment, we expect this benefit to carry on in AMP9 and beyond. We also calculate there will be an improvement of 1 min and 10 seconds as a result of the change in the way we work in AMP8 and the business-as-usual use of the Arlington tanks.

### 2.6.1 Influence of past performance and industry performance on PCLs set

Table 2 below provides both the industry and company actuals and forecasts for water supply interruptions for both AMP7 and AMP8, as well as the PR19 final determination for this performance commitment.

**Table 2 Industry and company actuals and forecasts and PR19 final determination for water supply interruptions**

| Time lost per property (MM:SS) | AMP7 | | | | | AMP8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 20/21 | 21/22 | 22/23 | 23/24 | 24/25 | 25/26 | 26/27 | 27/28 | 28/29 | 29/20 |
| **PR19 final determination** | 06:30 | 06:08 | 05:45 | 05:23 | 05:00 | | | | | |
| **Industry upper quartile actuals and *arithmetic forecast*** | 04:37 | 03:50 | 05:23 | 03:02 | 02:16 | 01:59 | 01:38 | 01:20 | 01:04 | 00:52 |
| **Industry average actuals and *arithmetic forecast*** | 14:34 | 13:26 | 26:25 | 23:57 | 22:16 | 21:09 | 20:27 | 20:08 | 20:10 | 20:31 |
| **Company actuals, *arithmetic forecast and business plan proposed targets*** | 07:15 | 10:38 | 09:27 | 07:26 | 07:15 | 05:56 | 05:47 | 05:38 | 05:29 | 05:20 |

The industry average actuals and forecast figures in Table 2 above illustrate the challenges the industry faces in meeting the targets that were set in PR19. This shows that on average the industry is falling short of the targets set by Ofwat.

While the upper quartile of companies is outperforming the target, it is worth noting that a significant number of companies in this group are clean water only companies (for example, Bristol Water, Portsmouth Water, SES Water and South Staffs Water all exceed the target significantly in the last year of AMP7). Of the combined water and sewerage companies, only Northumbrian, Southwest Water, Severn Trent and Wessex have managed to exceed their AMP7 target in Year 5, and therefore there is an industry-wide issue with combined water and wastewater companies struggling to meet the targets set by the regulator in AMP7.

We have underachieved against the targets set for PR19, with our year 5 performance forecast to be 7 minutes and 15 seconds lost per property against the PR19 target of 5 minutes lost per property. In AMP7 there were several factors which contributed towards our failure to meet the PR19 targets. These include: -

- In year 1 poor performance due to a very long dry spell between April and June and a large impacting event in Sheffield
- In year 2 poor performance due to a failure at Graincliffe water treatment works, an extremely busy summer and the impact of Storm Arwen

- In Year 3 poor performance due to an exceptionally long and dry summer which led to high soil moisture deficit and therefore an exceptionally high number of mains repairs being needed which impacted on performance

We anticipate an improvement on our performance in years 4 and 5 of AMP7 with a year 5 forecast performance of 7 minutes and 15 seconds.

For AMP8, we are proposing a target of 5 minutes and 56 seconds per property in year 1, falling to 5 minutes and 20 seconds per property in year 5.

## 2.7 Our long-term ambitions

We plan to continue to improve this measure throughout AMP8 and beyond. The mains renewal programme provides long term sustainable investment that will benefit this PC over the life of the new assets that we construct. As this programme of work is expected to take place over future AMPs as well, we expect further reductions of interruptions to occur as we renew more of our poorer performing assets.

In addition to this, further refinements to our ways of working to allow us to better respond to asset failure will also benefit CML in the long term. Innovative solutions such as the deployment of the static actuators (done on a small scale in AMP7), which allow the remote operation of valves will further allow us to respond to asset failure quicker, and therefore allow customer supplies to be maintained.

We have also successfully managed to introduce techniques that ensure planned work e.g., mains renewal does not impact CML and we expect this to continue into the long term.

## 2.8 Social and environmental benefits

The social benefits of improving performance within this measure relate directly to what the performance commitment delivers. If customers are interrupted less on average throughout the year, we believe this provides a social benefit to our customers. The environment will benefit from this measure indirectly due to us repairing less burst mains through our mains renewal programme, which results in less unplanned interruptions and less excavations and unplanned traffic management.

## 2.9 Our plans to deliver this commitment

**Activities to deliver proposed service levels across people, process and systems include:**

- Working pattern change in the Water Network field team operation (24/7 ways of working).
- Continuation of the Water Supply System Strategy to reduce impact to customers over long term
- Enhancement of asset deterioration models to inform targeted investment

**Summary of activities include:**

- DMA mains renewal
- Improve Temporary Alternative Water Supplies (TAWS) capacity as per DWI submission through enhancement of the Supply Restoration capability and Arlington tankers
- We will create a highly competent, technically capable team of reactive response technicians to manage reactive network incidents.

**Activities to drive service levels across people, process and systems include:**

- **People –** Water Network Field Team working pattern changes to allow a 24/7 way of working. This will help reduce the number of events occurring on weekends and out of hours.

- **Process –** Continuation of AMP7 Water Supply System Strategy work to identify resilience risks across all clean water assets. We will develop mitigation plans.
- **Systems –** Enhancement of the asset deterioration model and network models to help inform the most beneficial areas to invest to reduce the number of mains failures across the region, as well as to identify mains that are likely to have the biggest CML impact.

**Detailed description of key activities:**

- **Arlington Tankers –** As an unmanned temporary restoration approach, we will ensure trailers are equipped and available to be taken to sire to replace the Arlington Tanks in the event of an incident. Replacing traditional tankers and enabling greater resilience on the network for the temporary supply restoration.
- **DMA mains renewal** approach as describes in the mains repairs performance commitment information.
- **Water Networks Field Team** working pattern changes – we will create a highly competent, technically capable team of reactive response technicians to manage reactive network incidents, with working patterns that meet demand and ensure an optimal response on a 24/7 basis as part of the Water Distribution 2025 change project.
- **Enhancement to the Supply Restoration capability –** enhancement of Restoration Capability to improve incident response and reduce impact on customers of network interruption events
- **Resilience work –** we will continue to work on the Water Supply System (WSS) Strategy that began in AMP7. Further WSS's need to be covered as part of the Stantec study. We will need to indicate short and long-term mitigation options.

**AMP8 Delivery Plan**

**Table 3: AMP8 delivery plan**

| Intervention | Base | Enhancement | Totex £m (AMP8) |
|---|---|---|---|
| **0.2% Mains Replacement** | 100% | 0% | 110 |
| **0.46% Mains Replacement p.a. (Cost Adjustment Claim CW02a – Infra)** | 100% | 0% | 250 |
| **Opex Turnaround plan initiatives** | 100% | 0% | 14 |

## 2.10 Our incentive to deliver

### Table 4: Our incentive to deliver

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Outperformance and underperformance payments |
| **Price control allocation** | 100% water network plus |
| **ODI rate** | £1.42 million per customer minute lost (22/23 FY average CPIH prices) |
| **Outperformance payment- standard** | £1.42 million per customer minute lost (22/23 FY average CPIH prices) |
| **Outperformance payment- enhanced** | £2.84 million per customer minute lost (22/23 FY average CPIH prices) |
| **Underperformance payment - standard** | £1.42 million per customer minute lost (22/23 FY average CPIH prices) |
| **Timing of underperformance and outperformance payments** | In-period |

## 2.11 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 2.12 Deadbands (if relevant)

No deadbands will apply to this performance commitment.

## 2.13 Cap/Collars (if relevant)

The methodology published by Ofwat to inform the development of business plans for PR24 suggests that a collar of at least 0.5% of RoRE will apply to this PC.

# 3. Compliance risk index (CRI)

## 3.1 PC Type:

Customers receiving excellent service everyday.

## 3.2 Performance targets

### Table 5: Committed performance levels

| PR24_CRI | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | CRI score | 3.30 | 3.10 | 2.91 | 2.71 | 2.51 |

## 3.3 Summary

This performance commitment incentivises Yorkshire Water to fully comply with its statutory obligations surrounding drinking water quality and to mitigate issues that affect or could affect performance. This reduces potential risks, including health risks to customers arising from treated water compliance failures. In common with other water quality measures, CRI is a calendar year measure.

A Compliance Risk Index (CRI) value is calculated for each individual compliance water quality sample failure at water supply zones, supply points, water treatment works, and service reservoirs. The full methodology is held on DWI's website·

Read more about this at
https://dwi-content.s3.eu-west-2.amazonaws.com/wp-content/uploads/2020/11/03105604/DWI-Compliance-Risk-Index-CRI.pdf

As shown below, the CRI value for each exceedance is built up from a number of factors including the health risk of the parameter tested, the size of the impacted area, and a subjective assessment of the exceedance by the Drinking Water Inspectorate (DWI). The annual CRI score for a company is the sum of all individual CRI scores for every compliance failure reported within that year.

### Figure 3: CRI values for each exceedance

**i. Water supply zones:**

$$CRI = \frac{\text{Parameter Score x Assessment Score x Population affected}}{\text{Total company population served}}$$

**ii. Supply Points and treatment works:**

$$CRI = \frac{\text{Parameter Score x Assessment Score x volume supplied } (m^3/day)}{\text{Total daily volume supplied by the company } (m^3/day)}$$

**iii. Service reservoirs:**

$$CRI = \frac{\text{Parameter Score x Assessment Score x reservoir capacity } (m^3)}{\text{Total service reservoir capacity of the company } (m^3)}$$

Compliance Risk Index is already a common PC in AMP7, aligning with the current risk-based approach to regulation of water supplies used DWI. For PR24, there is no change to the definition or parameters included, and the basis of the definition is as per the DWI's CRI definition.

Read more about this at
https://www.ofwat.gov.uk/wp-content/uploads/2019/12/DWI-Compliance-Risk-Index-CRI_Def.pdf

The ambition for this PC is zero, albeit no water and sewerage company has ever achieved this. This ambition is set at an aspirational level because no level of exceedance of water quality standards can be considered acceptable. Additionally, Ofwat in Appendix 8 of the Final Methodology stated that a deadband will be kept for this PC, although the PC level at which this deadband applies for PR24/AMP8 is currently unknown. For AMP7, the deadband for this PC has been set at a CRI score of 2, but for 4 companies including Yorkshire Water[1], the deadband from Year 3 of AMP7 (2022/23) has been set at a CRI score of 1.5.

In our Valuing Water Research, our household and non-household customers provided the view that Yorkshire Water's top priority is the continuous provision of water that is safe to drink. Even though performance on this measure can be variable year-on-year, Yorkshire Water's overall performance on water quality compliance is a result of long-term investment in its assets to reduce water quality compliance failures.

CRI covers all aspects of delivery of drinking water to customer, and consequently should be considered as a true source-to-tap measure. Maintaining strong relationships with land owners, businesses, regulators, and other stakeholders is vital in ensuring that our raw water sources are not impacted by any contaminant that might cause impact on the eventual consumer. Treatment of raw water to make it safe to drink requires energy and hence operation, maintenance, and upgrade to our facilities in ways that promote efficiency makes a contribution to commitments on greenhouse gases. Operating our treatment facilities to achieve design flows within their respective treatment capability is essential to ensuring a consistent water supply.

Water networks deliver fully treated water from our site to the customer. Operating those networks in careful, planned, and a calm manner reduces the risk of mains burst and interruption to supply for customers. This approach also reduces the likelihood of disturbance in mains which is known to cause discolouration for customers, as measured by the customer contacts regarding water quality PC, and aesthetic metal sample fails which impact on CRI. Clearly, consistently supplying a high quality of drinking water is likely to impact on customer perception of our performance as measured by C-MEX.

The ODI rate for this PC is £1.39m per unit CRI score. These are in 22/23 FY average CPIH prices.

### 3.4 Customer and Stakeholder Engagement

Delivery of performance under CRI does not require direct engagement with customers, as the process which control the quality of water are primarily within Yorkshire Water assets. However, approximately half of the CRI value each is made from samples that were collected from randomly selected customer taps at domestic and commercial premises and the impact of poor performance across CRI can seriously affect our customers. According to the Ofwat/CCWater customer preferences research, this is considered a top priority for customers. When asked to rank 24 different service areas in terms of importance to them, customers ranked taste, smell and appearance, as well as do not drink notices within the top priority grouping. Understandably customers reported that clean, safe water was a core expectation of the service from their water company, and that any threat to their supply in this way would be a significant health concern.

Read more about this in
**Ofwat/CCWater customer preferences research**

We see similar and consistent views through our own research. In our Valuing Water research on customer priorities, our customers ranked 'providing a continuous supply of water that is safe to drink' as the highest priority service area, out of the 20 areas tested, with 75% of our customers ranking it as a priority.

[1] These 4 companies are those that went through the CMA re-determination process: Bristol Water (BRL), Anglian Water (ANH), Northumbrian and Essex and Suffolk Water (NES), and Yorkshire Water (YKY).

Read more about this in
**Valuing water customer priorities research**

More detail on this subject can be found in **Chapter 6: Customer and Stakeholder Engagement**

We tested the acceptability of our PR24 business plan, independently (outside of Ofwat guidelines). In this study we put forward to customers our improvement target for CRI, our plan was supported by the vast majority of customers, 79% of customers found our plan to be acceptable overall including this target.

We engage with more than our customers, our stakeholders have significant involvement in achieving this target. With regards to our stakeholder engagement, the source water for our water treatment works comes from the environment, hence it is important to maintain strong relationships with multiple stakeholders. An example of engagement in this area would be the series of initiatives to return moorland to their natural state. We have engaged with landowners, Natural England, and Environment Agency to take steps to retain more rainwater in upland catchments – this prevents the stripping of organic matter out of soils resulting in raw water which is less coloured and requires less chemicals to make it acceptable to drink. In addition, we work with the farming community to reduce or optimise the use of pesticides, supporting the production of food and reducing health risk to the consumer of drinking water.

Read more about our
**Wider engagement in Chapter 6 of our plan**

## 3.5 Our performance to date

Over the first two years in AMP7 (2020 reported as 2020/21 and 2021 reported as 2021/22), Yorkshire Water has performed over the deadband of 2 CRI score, meaning underperformance in this PC. Our CRI performance of 2.34 units in 2020/21 was impacted by a number of factors including presence of tastes and odours in drinking water and raised levels of aesthetic metals. Performance of 4.76 CRI value in 2021/22 was largely influenced by 6 coliform detections in water treatment works (WTWs) which represented nearly 60% of the total CRI impact for the year. It is noted that a common contribution to the CRI impact is from aesthetic metals failures (aluminum, iron, manganese) despite our improving performance on reducing Drinking Water Quality contacts.

For the final three years of AMP7 the CRI applicable to Yorkshire Water is 1.5 units. In 2022/23 CRI performance was 4.61 units was due to a combination of factors including coliform detections, aesthetic metals, and taste and odour.

Performance in 2023 (2023/24 reporting year) is not expected to meet the deadband, primarily due to three detections of coliform bacteria at a large WTW in the Spring.

We have created a Monte-Carlo based forecast model to support the selection of targeted interventions, and this model is based on historic performance, the impact of interventions, and potential risk from emerging issues. Based on performance to date and the Monte-Carlo model, the forecast median performance for Yorkshire Water for AMP7 Year 4 (2023/24) is 7.60 units. The full year median forecast for Year 5 (2024/25) is 3.50 CRI.

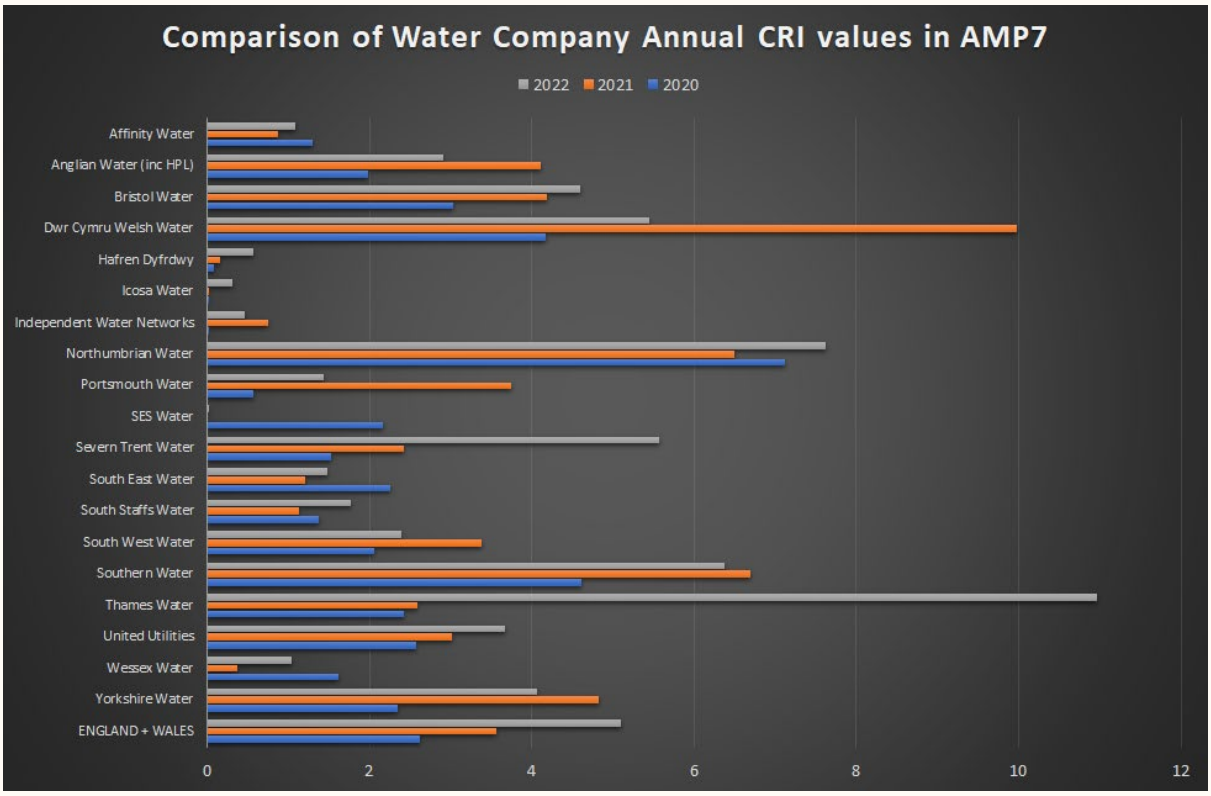
For the remainder of AMP7, we are continuing to implement a targeted programme of interventions including the following:

- The delivery of the current programme of DWI legal instruments targeting 6 WTWs, discolouration, resilience, and network ingress.

- Progress the WQ improvement initiatives highlighted for CRI improvement, include targeted investment at WTW sites and enhanced water quality monitoring on a regional basis.
- Maintain and enhance our programme covering training plans, asset policy updates, communications plans, signage and demarcation, and process and audit.

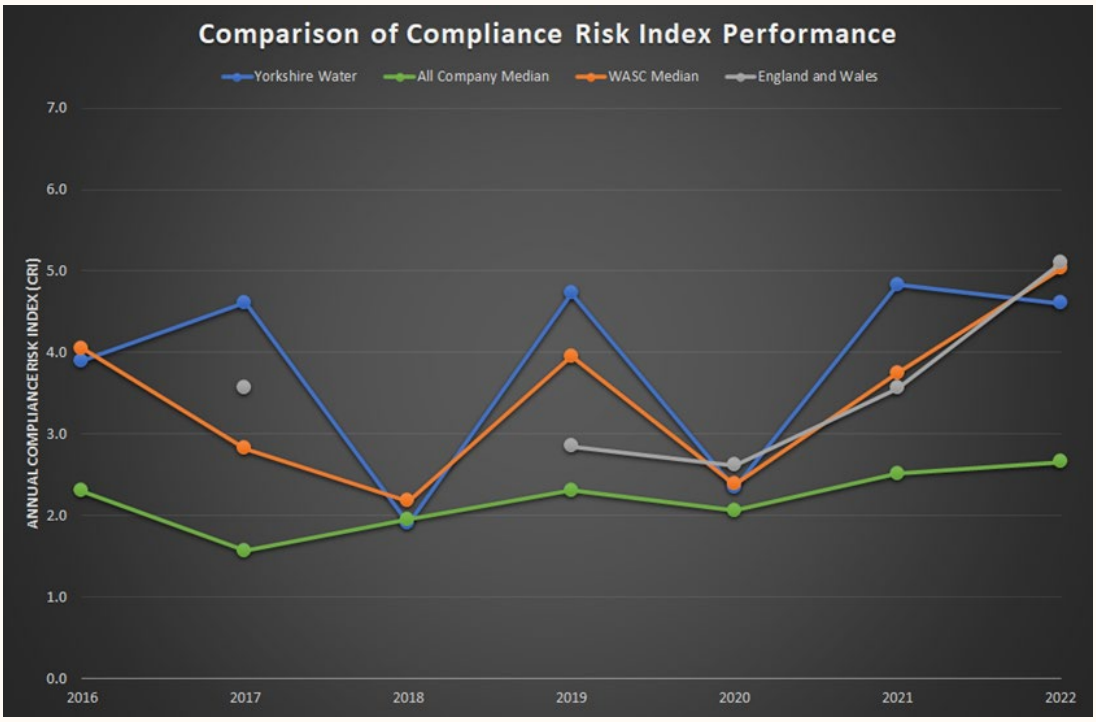
Performance under the CRI measure is reported annually by DWI in the Chief Inspector's Report.

**Figure 4: Comparison of Water Company Annual CRI values in AMP7**




Yorkshire Water has performed relatively poorly in comparison to other companies with respect to CRI. However, based upon the data reported in the DWI Chief Inspector reports it is possible to plot comparative CRI performance against the group of larger water and sewage companies as well as the wider industry. This data indicates that our performance varies around median for this group of similar companies. Further investigation and targeted investment will support future improved performance.

### Figure 5: CRI scores




## 3.6 Setting the AMP8 PCL

Table 6 below provides both the industry and company actuals and forecasts for the compliance risk index (CRI) performance commitment for both AMP7 and AMP8, as well as the PR19 final determination for this performance commitment.

### Table 6: Industry and company actuals and forecasts and PR19 final determination for compliance risk index (CRI)

| CRI score | AMP7 | | | | | AMP8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 20/21 | 21/22 | 22/23 | 23/24 | 24/25 | 25/26 | 26/27 | 27/28 | 28/29 | 29/30 |
| PR19 final determination | 2.00 | 2.00 | 1.50 | 1.50 | 1.50 | | | | | |
| Industry upper quartile actuals and ***arithmetic forecast*** | 0.03 | 0.90 | 1.09 | ***0.17*** | ***0.12*** | ***0.08*** | ***0.06*** | ***0.03*** | ***0.01*** | ***0.01*** |
| Industry average actuals and ***arithmetic forecast*** | 1.90 | 3.24 | 3.57 | ***2.13*** | ***2.02*** | ***2.00*** | ***2.10*** | ***2.32*** | ***2.65*** | ***3.14*** |
| Company actuals, ***arithmetic forecast and business plan proposed targets*** | 2.34 | 4.76 | 4.61 | ***7.60*** | ***3.50*** | ***3.30*** | ***3.10*** | ***2.91*** | ***2.71*** | ***2.51*** |

Table 6 above shows that similar to the industry average, Yorkshire Water are not forecast to meet the targets set out in PR19. Over the AMP7 period, our performance has deteriorated from a score of 2.34 in year 1 to a forecast score of 7.60 in year 4. We are currently underperforming compared to the upper quartile industry performance forecast which shows the industry achieving a target of 0.12 by the end of AMP7. There is no trend of over or underperformance by water and sewerage companies compared with water-only companies which might suggest that Yorkshire Water is less likely to be able to meet the same standard as companies in the upper quartile.

Through AMP7, it has become clear that certain asset types are consistent, major contributors to our CRI score, these primarily being iron fails in the treated water network and coliform failures at WTW's. As a result, both the AMP7 turnaround plan and AMP 8 capital maintenance plans focus significantly on these areas.

Investment in AMP8 is targeted at addressing long term deterioration in our source raw waters, and enhancing the replacement rate of our water mains, whilst providing a resilient supply of drinking water to customers. This approach will provide an impact on CRI performance through sustainably reducing the number of aesthetic service impacts.

It is estimated that Base funding is only sufficient to hold this ODI measure steady and avoid deterioration, but it cannot facilitate sustainable improvement much beyond observed AMP7 improvement rates. Additional funding to address asset health and resilience issues is required to ensure longer term improvement.

Our forecast performance shows an improvement over time which means we are proposing a stretching yet achievable target of a CRI score of 2.51 by the end of AMP8. This will be achieved through a series of fundamental improvements to filtration performance, as well as a scheme to provide enhanced chemical dosing which will provide more a more robust treatment process for customers in the future.

## 3.7 Our long-term ambitions

In January 2023 we developed a long-term water quality strategy which we submitted to the Drinking Water Inspectorate. The purpose of that document was to confirm our approach to identifying current and future risks to water quality, and to ensure that this approach aligns with customer prioritisation of a 'continuous supply of water that is safe to drink'.

The fundamental element of our long-term planning is assessment of the water quality key risks occurring in our system, such as the presence of high levels of organic compounds or microorganisms in raw water, risks of ingress into our fixed assets, and the potential for disturbance of historic sediments in our networks. We also consider new and emerging risks. The timescales of these issues can be variable and so our risk assessments focus on both the risk in the next 12 months, and the risks over the longer term.

In most cases interventions in raw water catchment are likely to address issues at source, and also represent the least environmental impact in terms of embodied carbon emissions. Hence, our preference is to work with stakeholders to take a catchment management approach in reducing water quality risk. However, we acknowledge that these approaches can take time to deliver and so we continue to monitor water quality in order to identify if an adaptive approach to 'end-of-pipe' solutions are required to meet a specific challenge.

Discolouration of supply is a key impact on the acceptability of supply to customers. Primarily this occurs through disturbance of mains sediments. Historic investment at water treatment works has very significantly reduced the levels of sediments entering our network, and our on-going programmes of mains condition by flushing is reducing the number of contacts from customers. Interestingly, this is improvement is not leading to a proportional improvement in exceedance of regulatory standard for aesthetic metals in water samples. We propose to continue our relationship with industry leading university experts to better understand the fundamentals of water chemistry in our mains. Where necessary we propose to increase the rate of replacement of mains to achieve acceptable quality.

Plans for reduction in CRI value are well developed for AMP8 investment period. But beyond that further monitoring will be required as part of the LTDS to confirm the most appropriate path to further improvement. This may include additional intervention to remove taste and odour forming compounds in raw reservoir sources, or further targeted trunk mains conditioning. Following this strategy of identifying and addressing water quality risk will lead to an improved service to customers and will be reflected as a reduction in sample exceedances and a reduction in CRI value. Crucially, whilst Base funding is likely to be sufficient to maintain CRI performance, further improvements beyond Amp 8 are likely to require additional funding in the form of Enhancement or Cost Adjustment Claims.

## 3.8 Social and environmental benefits

Compliance Risk Index covers impacts on water quality as measured in water samples collected as part of the regulatory sampling programme. The wide range of parameter tested under this program results in significant assurance of the quality of water supplied to customer.

The sample programme incorporates direct measurement of parameters such as lead or disinfection by-products that are known to have negative impact of the health of consumers. But it also measures for the presence of indicator bacteria which could also suggest the presence of health impacting pathogenic microorganisms. Fewer samples exceeding the standard, results in lower overall CRI impact. Hence, improving CRI has the additional benefit of demonstrating that consumers are receiving a great product.

But the sample programme also directly measures for key aesthetic parameters such as the concentration of iron, which is linked to discolouration, and taste and odour. Customers report that these factors impact on their confidence in the water supply. Hence, CRI is also linked to overall customer satisfaction in their supply.

## 3.9 Our plans to deliver this commitment

A series of plans are in place in AMP7 and PR24 to influence CRI performance, based on learning from AMP7 and predicting deterioration in raw water quality forecast to impact certain sites in the short-medium term.

**Activities to deliver proposed service levels across people, process and systems include:**

- Implementing changes to the asset management processes to embed a regional view of risk to ensure targeted, efficient solutions are identified and delivered. This is live as of July 2023.
- Improving business process links between Water Quality and Asset Planning, supporting better decision making and efficiency

**A summary of activities includes:**

- Delivery of the AMP8 DWI Enhancement Programme
- Rebuild of two Water Treatment Works contact tanks which are the assets with a high potential impact to CRI (requires additional investment)
- Programme of replacement for cast iron mains which are a key contributor to CRI
- Instrumentation, Control and Automation (ICA) programme to reduce current unplanned shut down or loss of supply risk which has a consequential effect on CRI duel to associated discoloration events.

**Activities to drive service levels across people, process and systems include:**

- **People –** Introduction of Senior Asset Planning Sponsor role and change to asset management process to enable a regional view of risks, and improve outcomes – targeting highest risk assets (implemented in July 23)
- **Process -** CRI 'Turnaround plan for AMP7' - increase in number of Water Supply Zones (WSZ) with prioritisation of those risks/assets with a short payack period)
- **System –** The Drinking Water Safety Plan (DWSP) systems continue to effectively track, and monitor risks associated with WQ failures to enable proactive planning of risk mitigation and resolution

**Detailed description of key activities:**

- **DMA mains renewal** approach as described in the mains repair performance commitment. This will include renewal of unlined cast iron mains to reduce the change of water quality failures from the network.
- **DWI Enhancement Programme –** there are four major non-infra schemes targeting WQ risks that have either impacted Yorkshire Water in AMP7 or are forecast to impact in AMP8. These five major schemes include:
    - East Ness Water Treatment Works – up to 0.17 CRI points per year and adverse impact realised in AMP7

  - Ingbirchworth WTW – up to 0.42 CRI points per year and adverse impact realised in AMP7
  - Haisthorpe WTW – up to 0.43 CRI points per year which is forecast to impact from 2028 (not a reduction against current score, but prevention of the risk impacting in Amp 8)
  - Highfield Lane/ Austerfield WTW – up to 0.13 CRI points per year from the end of AMP8 not a reduction against current score, but prevention of the risk impacting in Amp 8)
- Rebuild of a number of Clear Water Tanks and Service Reservoirs. This is a significant CRI risk, particularly for the tanks that serve large populations. We will deliver this improvement through our targeted allowance Cost Adjustment Claim to address the asset health of these. The high risk tanks include:
  - Chellow Heights
  - Aysgarth
  - Barnoldswick
  - Thornton Moor
  - Bracken Bank
  - Hainworth
- Reduction of **unlined cast iron** in the distribution network
- Instrumentation, Control & Automation (ICA) programme to reduce current unplanned shut down/loss of supply risk which has a consequential effect on CRI due to associated discoloration events.

## 3.10 Our incentive to deliver

### Table 7: Our incentive to deliver

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Underperformance only |
| **Price control allocation** | 100% Water Network Plus |
| **ODI rate** | £1.39m per CRI score unit (in 22/23 FY average CPIH) |
| **Underperformance payment - standard** | £1.39m per CRI score unit (in 22/23 FY average CPIH) |
| **Timing of underperformance and outperformance payments** | In-period |

## 3.11 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 3.12 Deadbands

The PR24 methodology states that a deadband will be applied to the CRI target. We expect that the deadband level will be finalised during the determination process.

### 3.13 Cap/Collars

The methodology published by Ofwat to inform the development of business plans for PR24 suggests that no caps or collars will apply to this PC.

# 4. Customer contacts about water quality

## 4.1 PC Type

Customers receiving excellent service every day.

## 4.2 Performance targets

### Table 8: Committed performance levels

| PR24_WQC | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | Number of drinking water contacts per 1,000 population | 0.90 | 0.84 | 0.77 | 0.71 | 0.64 |

Please note the forecast values on these targets are based upon data collected under the assessment methodology in place in the current five year period. An amended methodology is to be implemented in the next five year. Insufficient data exists for robust forecasts under the new methodology, but it has been calculated to add 0.16 / 1000 population in 2021/22 and 0.12 / 1000 population in 2022/23.

## 4.3 Summary

This Performance Commitment (PC) incentivises Yorkshire Water to reduce the causes of unpleasant aesthetic appearance of drinking water that leads to customer contacts. The categories for customer contacts included in this PC are those about appearance, and taste and odour according to how these are defined as per the Drinking Water Inspectorate's Information Letter 04/2022 Revised2. Additionally, under this letter, customer contacts via social media are included.

Discolouration of water can be caused by different factors such as the disturbance of harmless deposits in water pipes, the change in direction or speed of water flow due to the operation of pumps and valves in the system. There may also be cases where the cause of discolouration is due to the condition of the pipes or plumbing within a customer property. Similarly, tastes or odours can occur due to source water issues or changes supply source, but can equally also be influenced by private fittings. There may be instances where taste and odour issues are caused by a spill or leak of another substance (e.g. petrol or fuel) into the soil around plastic water pipes.

A reduction in the number of customer contacts relating to taste, odour, or appearance indicates an increase in acceptability to customers, implying a reduction in disruption and other negative social impacts. Potential and actual health impacts on customers related to water quality are only very infrequently associated with changes in appearance as covered under this Performance Commitment3. However, it is possible for customers to become concerned about the health impacts of ingesting or using water that has an unpleasant odour, taste and/or appearance.

[2] https://dwi-content.s3.eu-west-2.amazonaws.com/wp-content/uploads/2022/12/01133332/IL-04-2022-Revised-Annual-Consumer-Contacts-1.pdf

[3] This is linked with the Compliance Risk Index (CRI) Performance Commitment instead.

In PR19/AMP7, this is a bespoke PC for Yorkshire Water and all other companies4, albeit with small differences in the measure used. For example, the Yorkshire Water Final Determination measure for its Drinking Water Contacts bespoke PC (PR19YKY_26) is the number of contacts per 10,000 population. On the other hand, the Severn Trent Final Determination measure for its Water Quality Complaints bespoke PC (PR19SVE_H02) is the number of contacts reported in absolute numbers.

For PR24, this PC is measured per contact per 1,000 population, and the annual performance is calculated using the equation below:

$$\frac{Number\ of\ contacts\ for\ all\ appearance, taste\ and\ odour\ contacts * 1{,}000}{Resident\ population\ as\ reported\ to\ the\ DWI}$$

In AMP8 Yorkshire Water intends to continue its long-term approach to reduction in customer contacts. In previous AMPs installation of treatment facilities has led to a much cleaner water entering water mains networks. The flushing of mains in local networks has reduced the presence of sediments which can be mobilised. We propose to continue with this activity, but with an increased focus on the larger trunk mains and their associated downstream network.

A key challenge with working on trunk mains is that due to their size it is frequently not possible to safely discharge flow to waste. Following a protocol developed as part of our relationship with the University of Sheffield we will carry out controlled alterations in flow to incrementally remove historic sediment without impacting on customers. The outcome of this 'conditioning' work will result in a source to tap network that is much more resilient to disturbances or unusual flow activity, resulting in less instances of discolouration and appearance changes received by customers.

Customers often report the presence of air trapped in water, as it causes water to initially appear 'milky' before clearing. There can be many causes of this aeration, including many related to private fittings, but a common cause is due to the ways in which mains must be pressurised following an intervention or repair. We continue to maintain mains repair protocols, as well as the training we provide colleagues, under constant review to avoid this phenomenon. Of course, complementary work to reduce the total number of burst main repairs reduces the likelihood of aeration as well as the disturbance of sediments often related to the burst itself.

The final component of the drinking water contacts performance commitment are contacts relating to tastes and odours. As well as other water quality benefits, completion of an AMP7 scheme to install additional filtration at a water treatment works supplying Kingston-upon-Hull will reduce the presence of compounds that sometimes cause earthy tastes and odours for downstream customers. In addition, we have also entered into agreements with the Drinking Water Inspectorate to improve on-line monitoring of raw water sites supplying Bradford and Sheffield. It is expected that these interventions will provide an enhanced understanding of how our raw water assets operate and allow us to work differently to reduce risk to consumers.

We also have asked for support from the Drinking Water Inspectorate for a project to install additional treatment stages at a site in West Yorkshire in AMP8. This treatment will have benefits to contact rates once implemented. We will investigate expand opportunities for on-line monitoring at an extended series of raw water reservoirs sites. These investigations will help to identify areas in need of future investment which will help to reduce the number of customer contacts about water quality.

The ODI rate for this PC is based on the value provided by Ofwat. The ODI rate is £13.93m per contacts per 1,000 population. This value is in 22/23 FY average CPIH prices.

## 4.4 Customer and Stakeholder Engagement

Any research we undertake tells us that the continuous supply of safe clean drinking water is our customers number one priority for us as a business. When looking at our own Valuing Water priorities study and the customer preferences research undertaken by Ofwat/CCWater it highlights this clearly - drinking water attributes sit in top priority positions when tested amongst other service areas.

[4] Ofwat (2021), Appendix B, PR24 and beyond: Performance Commitments for future price reviews.

Specifically looking at drinking water aesthetics - our own research on customer priorities, found that providing water that is aesthetically pleasing was of average importance, despite the provision of safe clean drinking water sitting in the number one position. Interestingly, Ofwat CCWater customer preferences research found that there may be a strong link between these two service areas when it comes to customer research because they uncovered that customers may remain suspicious about the safety of drinking water after an issue related to taste, smell or appearance.

Another factor which allowed us to conclude this is an important service area for customer is the additional analysis we commissioned alongside our Valuing Water priorities research. This study also analysed household customer contact data between January 2020 and May 2022, and found that provision of a safe supply of water, and providing water that was aesthetically pleasing made up 20% of contacts from our customers. This triangulates the view that these areas are important to customers, as they are compelled to contact us when they perceive there to be an issue.

In any case, we know that customers are extremely sensitive to any changes, even if mild and unharmful, to the taste, colour or smell of their drinking water. While there were some differences in the demographics of the groups who were most sensitive to water quality changes – for example, older customers were reported to be more concerned – any issues related to appearance, taste or smell was considered important by all.

In our affordability and acceptability research conducted following Ofwat guidelines we showcased our planned target for contacts about water quality - 78% of customers found the plan to be acceptable and in our own independent affordability and acceptability testing research, 79% of customers found our overall plan to be acceptable including this target.

Read more about this in **Valuing customer priorities research final report**

More detail on this subject can be found in **Chapter 6: Customer and stakeholder priorities**

**Figure 6: Priority area of HH customer contact (January 2020 to May 22)**

## 4.5 Our performance to date

Yorkshire Water outperformed on this PC in the first year of AMP7 (Calendar year 2020 reported as 2020/21) but missed the target by 0.03 contacts per 1,000 population5 in the second year. Despite an improvement from 1.06 to 1.03 per 1000 population in the third year of AMP7 this resulted in missing the target by 0.05 / 1000 population. However, performance to date in year four of AMP7 is currently suggesting a further significant reduction, but this is unlikely to meet the performance commitment target of 0.89 / 1000 population. We are expecting to underperform on this PC at the end of AMP7 (2024/25) with a performance of 0.97 compared with a target of 0.81.

We have seen a steady decrease in both the number of contacts and the contact rate since 2015 due to our long-term commitment to local area flushing, and performance throughout AMP7 is in line with the long-term trend.

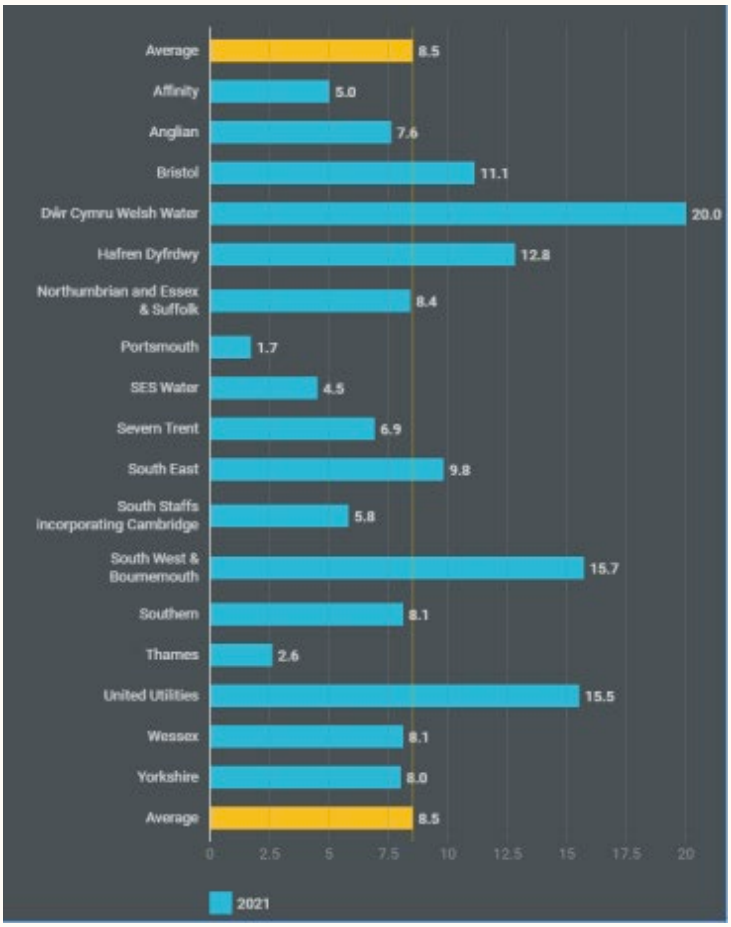
There has also been a reduction in the number of contacts for tastes and odours, as well as reductions for the number of contacts related to appearance of water. Primarily, this has been achieved by maintaining a relatively calm mains network despite challenging weather conditions.

### 4.5.1 Performance comparison

[5] This is expressed in the AMP8 unit of measure rather than the AMP7 unit of measure but under the AMP7 assessment methodology.

The most recently published6 data available for all companies relates to performance in 2021 (reported as 2021/22) Relative to other companies, Yorkshire Water's performance was 8th out of 17 companies for appearance and 12th of 17 companies for Taste and Odour.

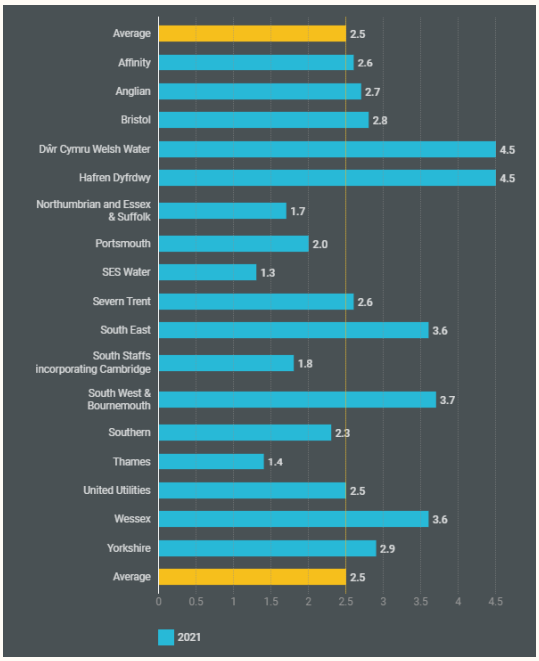
## Figure 7:Appearance




Source: Discover Water

[6] https://www.discoverwater.co.uk

## Figure 8: Taste and Odour




Source: Discover Water

Using the data on DiscoverWater it is possible to plot Yorkshire Water performance against the wider industry. The chart below shows the sum of appearance and taste and odour contacts for the published data since 2017.

Yorkshire Water reported a further reduction in contact rate to 10.2 contacts / 10000 population in 2022 as part of its APR23 submission (not shown)

### 4.5.2 Sector differentiators and how this impacts YW Performance

In AMP8 there is to be a common new definition of the methodology for calculating Drinking Water Contacts. This will lead to development of new performance commitments which will be common for the industry. The new measure will be reported as a number per 1000 population. Average performance over past 3 years has been 1.05 contacts per 1,000 population.

The new methodology will be based upon DWI Information Letter 04/2022. The table below indicates the number of contacts that would have been reported in the groups ‘Appearance’, ‘Taste and Odour’, and ‘Other’ as we as the relevant resident population value for the calendar years 2021 and 2022 when calculated under the existing (DWI IL01/2006) and new (DWI IL04/2022) methodologies.

| | | Relevant DWI Information Letter | |
|---|---|---|---|
| | | IL01 / 2006 | IL04 / 2022 |
| **2021** | Resident Population (no.) | 5355580 | 5355580 |
| | **Customer Contacts (no.)** | | |
| | Appearance | 4329 | 4644 |
| | Taste & Odour | 1535 | 2049 |
| | Other | 3391 | 3391 |

| | | | |
|---|---|---|---|
| | **Total** | **9255** | **10084** |
| **2022** | Resident Population | 5477592 | 5477592 |
| | **Customer Contacts (no.)** | | |
| | Appearance | 4114 | 4354 |
| | Taste & Odour | 1493 | 1909 |
| | Other | 2428 | 2428 |
| | **Total** | **8045** | **8703** |

- Average over past 3 years 1.05 contacts per 1,000 population
- *Note: metric changing from per 10,000 to per 1,000*

### 4.5.3 How is our current performance setting us up for AMP8?

Performance in AMP7 is continuing the long-term trend of reduction in customer contacts, and customer contact rate. Improvements have been due to flushing of local mains. Our focus is increasingly being diverted to a trunk mains conditioning approach using the methodologies developed in conjunction with University of Sheffield. Our expectation is that including this activity will complete the chain between robust raw water treatment, bulk water transport, and local mains activity.

Other initiatives in year four and five of AMP7 will address mains condition in 30km of our poorest performing pipes in our local area networks. This will have multiple benefits for leakage, mains repairs, and discolouration.

### 4.5.4 Innovation to deliver the target

***Uniform Flushing***

Although the principle of flushing is not seen as being particularly innovative (it has probably taken place for about 40-50 years), the ability to be able to calculate sediment depth from a scientific end to end process allows us to model and then predict, based upon risk, which DMAs are likely to cause discolouration in the event of a flow increase. The objective is to base our AMP8 DMA flushing programme (accompanied by a mains renewal programme focussing on cast iron and asbestos cement mains) on risk of discolouration (depth of sediment) rather than waiting for customers to contact us, and then reacting to these complaints. This will help drive our discolouration performance down to lower levels and will be accompanied by a larger scale mains renewal programme where we find the flushing process is not able to reduce the number of discolouration contacts from customers.

### Figure 9: Uniform flushing

- **Full zonal uniform flushing**
  - Systematically working from the inlet, valving off individual pipe lengths and flushing every pipe to achieve 2 turnovers at a specific velocity
- **24 full time flushing teams**
  - Up to 70 DMAs per month
  - 1/4 of our network every year
- **Essentially a full DMA service check**
  - Identifying shut valves
  - Capturing valuable flushing information

***Trunk Main Conditioning***

Within AMP7, through a number of Water Supply Zones that have been agreed by the DWI, our approach to addressing discolouration risk in our large diameter mains has been to carry out trunk main conditioning, and where it is appropriate, automate this. We trialled this in AMP6 and rolled this out on a much larger scale throughout AMP7. It will give a benefit to stopping those large scale 'one off' incidents', as well as reducing the amount of sediment transferred from our trunk main system into the DMAs, where any future changes in flow could result in a customer impact. The aim is to use our experience of this process in AMP7 and roll it out further in AMP8, targeting the WSZs that have the highest contact rate.

### Figure 10: Trunk Main Conditioning

- **Automated trunk main conditioning**
  - Identify mobilisation potential when flow increases occur
  - Build single pipe PODDS models for identified high risk pipe lengths
  - Cyclical reconditioning operations are be designed to increase the safe operating flow as part of an asset care plan
- **Manual trunk main conditioning**
  - Field teams to manual condition trunk mains where it is not possible to automate
- **A full water balance calculation** can be applied once sufficient telemetry and instrumentation has been installed

## 4.6 Setting the target

The AMP8 targets for WQ contacts have been set based upon the calculation of benefits from a group of initiatives that we feel will provide impact to this performance commitment. By renewing 0.66% of the mains network and focussing on cast iron and asbestos cement mains, supported by trunk main conditioning and within DMA flushing there will be a benefit in terms of reduced discolouration. We are aware that we cannot fully removed iron pipework from our network in such a short period of time, but we feel a sustainable programme of mains renewal over a number of AMPs balances customer needs.

We have also based our target on the way we interact with customers and feel there is scope for improvement via customer engagement and self-diagnosis of issues, where customers would have previously contacted us regarding the quality of their water.

### 4.6.1 How past company and industry performance have influenced PCLs set

Table 10 below provides the company actuals and forecasts for customer contacts about water quality for both AMP7 and AMP8, as well as the PR19 final determination for this performance commitment. In AMP7, the definition of this performance commitment varied between water companies, meaning that is not possible to assess our performance against the industry average or an upper quartile figure.

**Table 9: Company actuals and forecasts and PR19 final determination for customer contacts about water quality**

| Number of customer contacts per 1,000 population | AMP7 | | | | | AMP8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 20/21 | 21/22 | 22/23 | 23/24 | 24/25 | 25/26 | 26/27 | 27/28 | 28/29 | 29/20 |
| PR19 final determination | 1.14 | 1.06 | 0.97 | 0.89 | 0.81 | | | | | |
| Company actuals, ***arithmetic forecast and business plan proposed targets*** | 1.06 | 1.03 | 1.03 | ***1.02*** | ***0.97*** | ***0.90*** | ***0.84*** | ***0.77*** | ***0.71*** | ***0.64*** |

Although we exceeded our target in the first year of AMP7, in subsequent years we have either underperformed or are forecast to do so. It is however worth noting that we have continued the trend of reduced number across the AMP. We are forecasting a reduction in drinking water contacts by the end of AMP7.

We are proposing an AMP8 target which further reduces the number of customer contacts about drinking water contacts in AMP8. We will do this through a twin track approach of trunk main conditioning and localised DMA flushing. As a result, we anticipate that customers will receive improving service during AMP8, moving our performance from around average under the DiscoverWater definition to the upper quartile.

## 4.7 Our long-term ambitions

Since the beginning of AMP7 we have successfully managed to reduce the number of discolouration contacts by over 50%. We feel we are at a point, moving from AMP7 to AMP8 that the benefits of the flushing programme have been maximised and that other solutions are required to help further reduce the number of water quality contacts. These initiatives are trunk mains conditioning and mains renewal, which we plan to deliver more of in AMP8. We feel we are only at the start of realising the benefits from this programme of work and plan to use our experiences to date, and our future experience in AMP8, to allow further enhancement of these approaches throughout AMP9, AMP10 and beyond.

We are always looking for the most cost-beneficial ways of reducing the number of water quality contacts and plan to continue to work across the industry and within academia (our work with Sheffield University over the last 20 years demonstrates this) in order to meet the long-term ambitions that both our regulators and the customers of Yorkshire expect.

An unintended outcome of our ability to move water around the region in times of high demand or due to operational can results in customers contacting us about a change in the taste to their water water supply. The is an unfortunate consequence of being able to maintain supplies to customers, which is a priority of ours. We will work throughout AMP8 and beyond to reduce customer contacts associated with taste and odour and provide education to customers on this, as well as finding techniques that minimise taste and odour issues when we have to do this.

A multi-AMP mains renewal programme will show a reduction in the number of mains repairs we carry out, will reduce the frequency of sediment mobilisation through unplanned increases in pressure and flow, as well as providing less opportunity to bring air into our water network as a result of repressurising mains after a repair has taken place.

## 4.8 Social and environmental benefits

Customers consistently report that they consider a secure supply of good quality drinking as one of their highest priorities. Although aesthetic deterioration of drinking water is not strongly linked to health impacting issues, customers do report that instances of discolouration or unusual taste and odour do have an impact on their perception of their drinking water. It is not unusual for customers to link perceived illness to drinking water impacts. Hence, acting to prevent deterioration of water supplied to customers will results in overall improved customer satisfaction.

## 4.9 Our plans to deliver this commitment

**Activities to deliver proposed service levels across people, process and systems include:**

- We will ensure accurate reporting to align with the new guidance
- We will ensure a process is implemented to deliver trunk main conditioning
- We will enable improved communication with customers through our website
- We will continue smart network training

**Summary of activities include:**

- The distribution maintenance team will continue the flushing programme
- We will increase the trunk main conditioning programme, included in the DWI submission, to 16 water supply zones
- We will continue with the programme of work to improve ICA resilience

**Activities to drive service levels across people, process and systems include:**

- **People –** Accurate reporting in relation to water quality contacts to align to the new guidance set by the DWI. We will ensure sufficient engineering support to allow effective trunk main conditioning across the Water Supply Zones identified
- **Process –** We will follow the same process for the trunk main conditioning work that has been completed in AMP7, but with Network Engineers from a different part of the region.
- **Systems –** We will improve self-diagnosis from customers via a more effective level of communication through the website.

**Detailed description of key activities:**

- **Distribution Maintenance Team –** will continue flushing between a quarter and a third of the network per year. We will optimise this process to ensure we are targeting the right DMAs to get the biggest benefit
- We will continue to rollout the **Trunk Main Conditioning Programme** that has had success in AMP7. With support from the DWI, we will target 16 Water Supply Zones (WSZs) and embed engineering solutions, where possible, to automate the conditioning of the mains to allow this to be done on a cyclical bases, in an efficient way. We will build on the work carried out with Sheffield University to optimise flushing activity.
- We will continue with **calm network** training to avoid self-inflicted failures on the network
- We will continue our programme of work to implement Instrumentation, Control and Automation (ICA) resilience.

**AMP8 Delivery Plan**

**Table 10: AMP8 Delivery Plan**

| Intervention | Base | Enhancement | Totex £m (AMP8) |
|---|---|---|---|
| **WQ contacts initiatives** | 100% | 0% | 10 |
| **DWI Programme (Trunk Main Conditioning)** | 0% | 100% | 9 |
| **0.2% Mains Replacement p.a. (base maintenance)** | 100% | 0% | 110 |

| | | | |
|---|---|---|---|
| **0.46% Mains Replacement p.a. (CW02a cost adjustment claim allowance)** | 100% | 0% | 251 |

## 4.10 Our incentive to deliver

### Table 11: Our incentive to deliver

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Outperformance and underperformance payments |
| **Price control allocation** | 100% water network plus |
| **ODI rate** | £13.93 million per contact per 1,000 population (in 22/23 FY average CPIH prices) |
| **Outperformance payment- standard** | £13.93 million per contact per 1,000 population (in 22/23 FY average CPIH prices) |
| **Underperformance payment - standard** | £13.93 million per contact per 1,000 population (in 22/23 FY average CPIH prices) |
| **Timing of underperformance and outperformance payments** | In-period |

## 4.11 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 4.12 Deadbands

Deadbands do not apply to this PC.

## 4.13 Cap/Collars

The guidance set out by Ofwat for the PR24 business plan submission suggests that neither caps nor collars will apply to this PC.

# 5. Per Capita Consumption

## 5.1 PC Type

Environmental outcomes

## 5.2 Performance targets

**Table 12: Committed performance levels**

| PR24_PCC | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | Percentage reduction against 2019/20 baseline | -2.6% | -3.3% | -4.0% | -4.5% | -5.0% |

## 5.3 Summary

Please note this plan has been developed with the best information available at the point of submission for the PR24 plan. This data was aligned with the iteration of WRMP available at the time of submission, however the PR24 PCC plan may evolve as part of the development and submission of the revised draft WRMP.

Per Capita Consumption (PCC) is defined as the percentage reduction of three-year average PCC in litres per head per day (l/head/d) from the 2019-20 baseline. Three-year average values are calculated from annual average values for the reporting year and two preceding years expressed in l/head/d. It is calculated using:

$$\frac{(Measured\ household\ consumption + Unmeasured\ household\ consumption)}{Total\ household\ population}$$

This is the first AMP of a 5 AMP delivery plan to achieve our long-term target for PCC of 110l/h/d by 2050, which aligns with the

## 5.4 Customer and Stakeholder Engagement

Through the customer preferences research carried out on behalf of Ofwat and CCWater, we understand that, when considering several service areas across the board, customers ranked using less water in the lowest importance group. The report found that customers struggled to understand why using less water would be of importance to water companies and while they acknowledged that using water more responsibly should be an area of focus, in the rounds it was not considered a priority when rain seemed to be in abundance across the country.

Read more about this in
**Ofwat/CCWater customer priority research**

This view is perhaps not unsurprising when considering that research consistently finds that understanding of the water industry in general is limited, particularly in those groups who are not yet responsible for paying a water bill. We can triangulate this priority view with our own Valuing Water customer priorities research, which also found that supporting customers to reduce their water use, was considered of below average importance, with only 26% of customers choosing this service attribute as a priority.

However, we know that customers understanding of their own water usage can be very mixed – as indicated in the Ofwat/CCW customer preferences research, as well as our own Water Resources North customer engagement research and smart meter trial research, so customers' understanding per capita consumption as a priority may also be impacted by this. Indeed, our

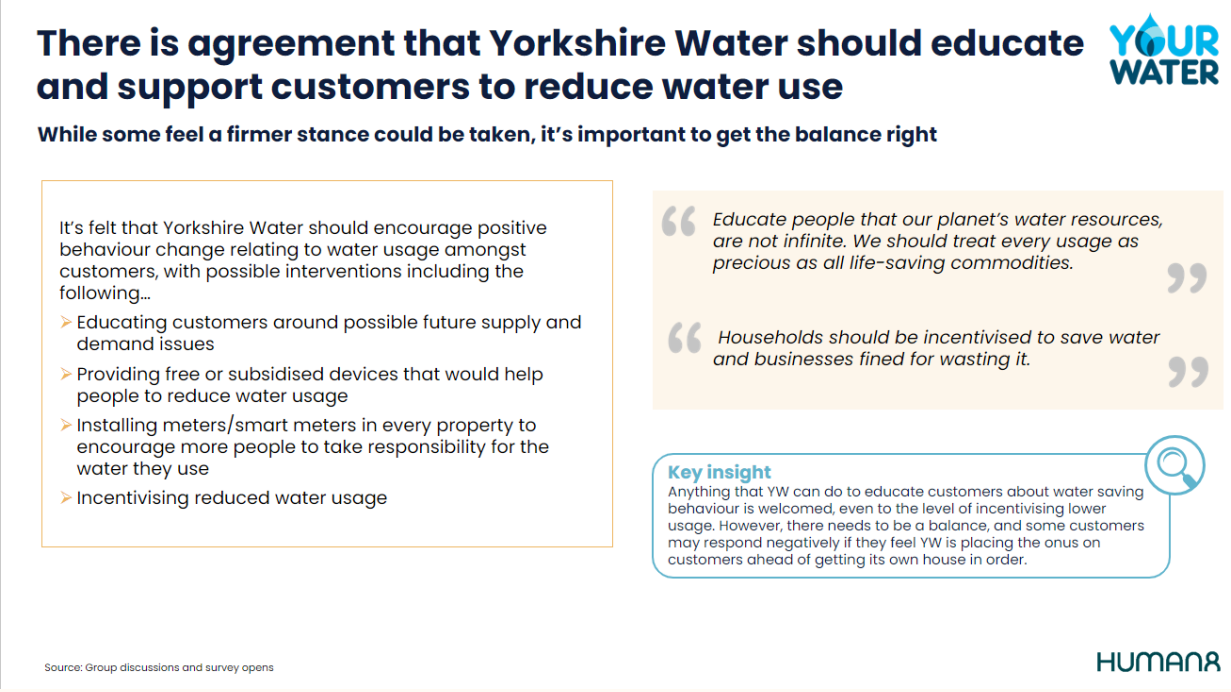
research to support the development of our WRMP found that customers were shocked by the average PCC values presented to them and did feel that reduction in usage should be addressed.

However, customers also shared views that water companies 'should get their house in order' before attempting to reduce the water consumption of their customers. Nevertheless, customers do see benefit in reducing their water use when it came to reducing household costs – specifically for customers on a meter. In this instance, customers welcomed ideas on how to save money in the home.

In March 2023, we asked our customers their thoughts on our draft WRMP, in this research customers were shocked to learn that a potential water deficit was looking likely should we take no action to address the challenges we face (population growth and less forecasted annual rainfall). In this study customers were supportive of Yorkshire Water encouraging households to reduce their usage.

> *"I am shocked there is less water available than demand" Household Customer, Your Water Online Community, Draft WRMP research, March 2023*
>
> *We should be reducing water usage with stricter controls on households using water unnecessarily, for example people using hosepipes/pressure washers every week to wash their car. I know several neighbours on my street do this every week, particularly in the spring and summer. Household Customer, Your Water Online Community, Draft WRMP research, March 2023*

Below is a snippet of customers thoughts on reducing household water use from our report Water Resources Management Plan review.




Finally, in our own independent affordability and acceptability testing research study (outside of Ofwat guidelines) we included our PCC target to inform customers of the progress we plan to make to reduce PCC – 79% of customers found our plan to be acceptable overall including this target.

More can be read about all of our engagement in Chapter 6.

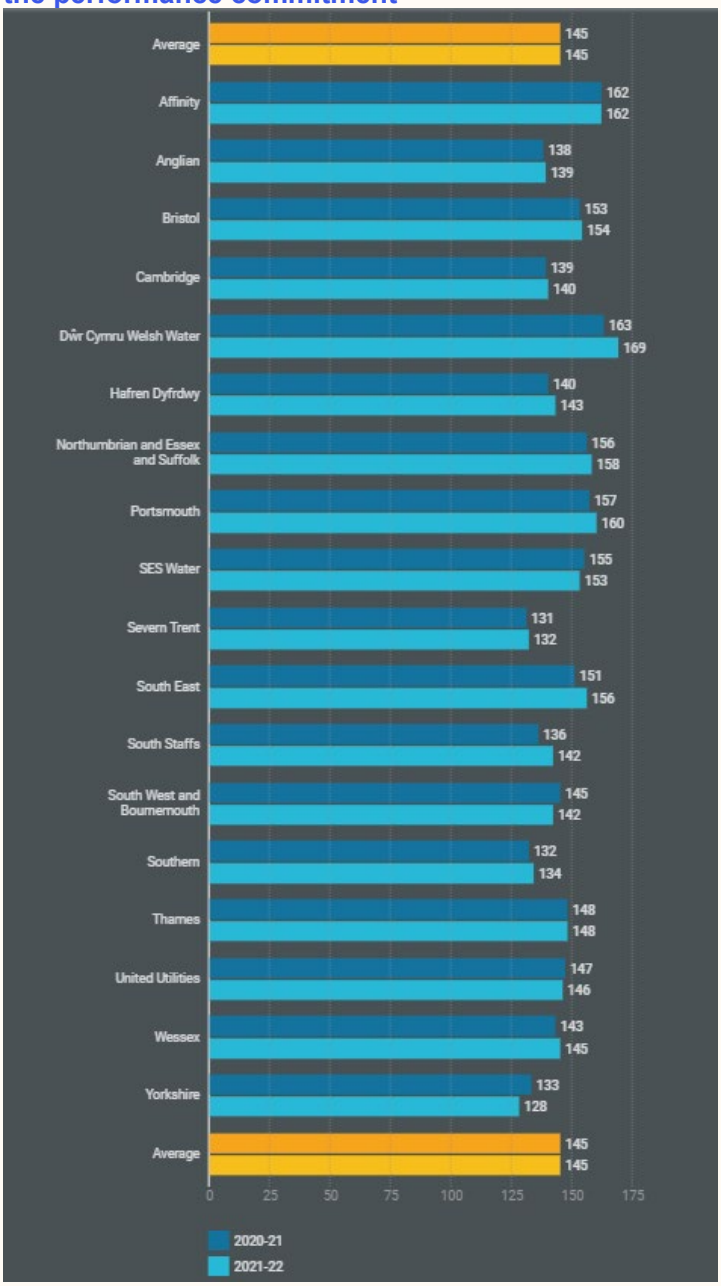
## 5.5 Our performance to date

PCC is a common performance commitment and Yorkshire Water have a company specific PCL target.

Yorkshire Water's PCC performance was industry leading across AMP6 and our performance has remained upper quartile in AMP7. We out-turned year 3 with the lowest PCC in the industry for both our in-year and 3-year rolling average performance.

PCC industry average is 145 l/h/d and the long-term industry target for PCC is 105 l/p/d by 2050. Yorkshire Water is on track to deliver this long-term target based on the enhancement requested in AMP8.

**Figure 11: Comparison of Yorkshire Water performance with its industry peers against the performance commitment**




Source: Discover Water

## 5.6 Setting the target

### 5.6.1 How past company performance and industry performance have influenced PCLs set

Table 14 below provides both the industry and company actuals and forecasts for the per capita consumption performance commitment for both AMP7 and AMP8, as well as the PR19 final determination for this performance commitment.

### Table 13: Industry and company actuals and forecasts and PR19 final determination for per capita consumption

| Litres per person per day | AMP7 | | | | | AMP8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 20/21 | 21/22 | 22/23 | 23/24 | 24/25 | 25/26 | 26/27 | 27/28 | 28/29 | 29/30 |
| **PR19 final determination** | 125.1 | 121.9 | 118.7 | 117.6 | 116.8 | | | | | |
| **Industry upper quartile actuals and *arithmetic forecast*** | 142.2 | 141.7 | 144.9 | 145.4 | 146.0 | 146.6 | 147.2 | 147.8 | 148.4 | 149.0 |
| **Industry average actuals and *arithmetic forecast*** | 149.3 | 150.2 | 150.5 | 151.4 | 152.4 | 153.4 | 154.4 | 155.4 | 156.5 | 157.6 |
| **Company actuals, *arithmetic forecast and business plan proposed targets*** | 132.5 | 133.5 | 132.2 | 127.1 | 124.9 | 124.9 | 123.9 | 123.1 | 122.4 | 121.7 |
| ***Proposed reduction in consumption against 2019/20 baseline*** | | | | | | -2.6% | -3.3% | -4.0% | -4.5% | -5.0% |

Table 14 above shows that Yorkshire Water has not met its PR19 targets in the first three years of AMP7, and it is not forecast to meet its targets in years 4 and 5. Our inability to meet the PR19 targets has been driven in part by a long-term increase in water demand resulting from behaviour changes arising from the Covid-19 pandemic. However, it is worth noting that we are currently outperforming against both the industry average and the industry upper quartile.

Across AMP7 and as forecast across AMP8, we are on track to reduce per capita consumption on an ongoing basis, compared with forecast increases with for both the industry average and upper quartile.

We are proposing challenging targets of a reduction in consumption to 121.7 litres per person per day by the end of AMP8. This represents a target reduction of 5.0% against the 2019/20 baseline. This will be achieved through the implementation of a water efficiency strategy (focused on communication, education, collaboration, and innovation), the installation of smart meters, and measures such as trialling household flow regulators.

## 5.7 Our long-term ambitions

Yorkshire Water plans to achieve our long-term PCC reduction target of 110l/h/d by 2050 which is a national target for all water companies. The Water Resource Management Plan has considered stretch targets however further PCC reduction was not required to achieve the supply demand resilience required by 2050.

### Table 14: Long-term performance trajectory for PCC

| | AMP8 end (2025-30) | AMP9 end (2030-35) | AMP10 end (2035-2040) | AMP11 end (2040-45) | AMP12 end (2045-50) |
|---|---|---|---|---|---|
| **PCC performance (3-year rolling average) l/h/d** | 121.7 | 118.5 | 112.2 | Achieved national target of 110 l/h/d | Achieved national target of 110 l/h/d |

The figures outlined in Table 15 for PCC is our current best knowledge of outturn for PCC between now and 2050 but subject to change dependent on the outturn of the revised draft WRMP.

## 5.8 Social and environmental benefits

In delivery of this performance commitment Yorkshire Water will subsequently support improved socioeconomic outcomes throughout the region, such as reducing Yorkshire Water's carbon impact on the environment through the need to process less water and reducing our impact on the water environment from source to sea, minimising CSO impacts and enabling reduced abstraction from rivers and reservoirs. Furthermore, driving down customer demand will support customers by helping keep their bills as low as possible and driving resilience of water supply for all Yorkshire Water's customers.

## 5.9 Our plans to deliver this commitment

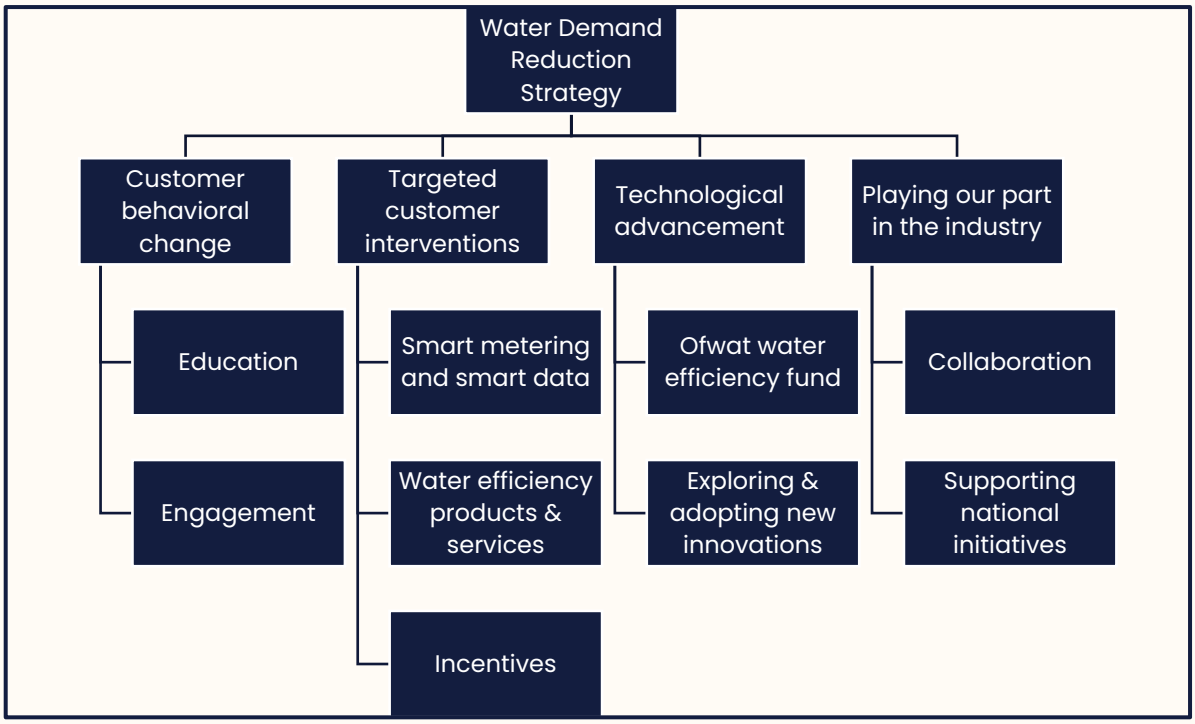
For PR24 we have created a new long-term Water Demand Reduction Strategy which is overarching across all customers including household, non-household, and developers. In preparing this new strategy we have:

- designed our proposals to meet the requirements of UK Government Policy including as set out by Defra and Ofwat
- carefully considered feedback from all stakeholders from the draft WRMP
- completed an extensive review of external evidence and literature
- benchmarked with other water companies
- created an internal Water demand reduction forum bringing together a variety of skills and expertise from across the business which includes household, non-household, smart metering, developer services and regulatory change
- worked with a specialist consultant exploring a variety of initiative options which have then been prioritised based on costs and benefits
- ensured alignment with Waterwise's UK Water Efficiency Strategy[2]

**Figure 12: Waterwise UK Water Efficiency Strategy to 2030 10 strategic objectives**


Our new long-term Water Demand Reduction Strategy is set out in Figure 13.

**Figure 13: New Water Demand Reduction Strategy**




Yorkshire Water's PCC performance was industry leading across AMP6 and our performance has remained strong in AMP7. We out-turned year 3 with the lowest PCC in the industry for both our in-year and 3-year rolling average performance.

However, due to COVID-19, which started in March 2020, the change in lifestyle of our customers resulted in a higher than forecast PCC outturn in 2020/21 and 2021/22 which impacted our ability to achieve our PCC target in those years.

This higher PCC in Y1 and Y2 of AMP7 resulted in an increased 3-year rolling average across AMP7 to date. We have seen reduced consumption in Y3 which puts us back on track to return PCC to the baseline by the end of AMP7 although this means that we will not meet the targets set in WRMP19.

Therefore, understanding how our household water customers use water and their overall consumption is key to help us help our customers to reduce their demand. We currently promote water saving to household customers through our current water efficiency initiatives.

When aligning to our long-term demand management strategy, to achieve our 2050 target for PCC of 110l/h/d per day, we need to include other initiatives which provide demand reduction benefits. Yorkshire Water engaged RPS to conduct a thorough review of all available household options which could be applied between 2025-2050 to help deliver our long-term PCC target by 2050.

In addition to the household RPS options, we had existing options for PCC reduction, which were identified through knowledge gained in previous AMPs and trials that have been conducted. We have explored 36 household demand reduction options throughout our WRMP optimisation process.

We narrowed down the household options by ensuring they aligned to our long-term demand management strategy and are in alignment with the Waterwise strategic objectives and the Ofwat water efficiency collaborative fund framework.

### 5.9.1 Customer behavioural change

Customer behavioural change starts with and is sustained by communication and education. We need to communicate water efficiency messages to household customers and provide them with advice on how they can reduce their water consumption. Effective communication is supplemented with customer education, which starts with providing customers with water saving

tips, stretching to engagement and education of children on the importance of reducing our water use.

Understanding household water consumption and promoting our water saving message to customers is evidenced in our current water efficiency initiatives summarised below:

**Behavioural change**

We have several channels in place for promoting water efficiency behavioural changes through:

- A water efficiency section on our website which includes information on water efficiency, tips to reduce water use and our water use calculator.
- Our ‘Use Less. Save More’ campaign providing water saving tips for home and garden including a 4-minute shower playlist and self-audit leaflets.
- My water use pilot, which measures customer’s water consumption and evaluates their usage in comparison with their neighbours with similar house sizes and occupancy.
- Green Classroom school pack and visits to our four education centres across Yorkshire.

**Education**

We continue to offer visits to our four education centres across Yorkshire. During these visits, attendees are taught about the water cycle, shown where they use water in the home and provided opportunities to reduce water consumption.

We provide a Green Classroom school pack with details and activities on understanding the water cycle, where our drinking water comes from and calculating how much water they use and provide tips for saving water.

Providing water efficiency education directly in schools as part of the curriculum would ensure a greater coverage across Yorkshire. We are exploring the option to work with schools by providing a visit to their school where a water efficiency workshop session is conducted during the day.

Conducting face-to-face training sessions would help to reinforce the understanding of the principles of water efficiency and the message to sustainably reduce water use.

**Engagement Strategy**

Our approach to communicating water saving to people in Yorkshire has evolved over the years and using that learning, insight, and research we have a robust campaign approach.

Research conducted in 2018 told us that customers were more likely to get on board with messaging and change their behaviours around water usage when the advice feels achievable, and they can understand why there is a need for change. It also highlighted the need to tailor messages to certain segments of customers, for example a financial benefit is more likely to prompt some people to make changes, versus other segments where the environmental benefits can cause a greater change.

Alongside insight into how we should deliver our campaign, we use data on reservoir levels, rainfall, and demand to set triggers on message escalation. At each escalation point we have a suite of red, amber, and green messages that we are able to target at different areas of the region across multiple channels that we choose based on demographic information. This approach allows us to increase and decrease the message severity to have the most impact, at the right times and across the right channels.

The campaign which we call ‘Use Less. Save More’, uses messaging and creative that speaks to customers in the right tone of voice, feels relatable and includes enough of the ‘why’ (explaining why we need to save water) as well as practical, achievable tips that most people can apply in their everyday lives.

**Figure 14: Examples of our customer water saving leaflet as part of our lives**


We have a comprehensive media plan that we can activate that includes digital channels, social media, out of home advertising, broadcast advertising and experiential events.

Some of the more dynamic channels in our media plan, such as social and digital advertising allow the flexibility to be able to switch the messaging on ads depending on the weather, for instance: we have referred to 'There's not been much rain lately' or 'No need to water the lawn, there's been a bit of rain.'

This helps customers understand the link between rainfall, the impact on our reservoir levels and how they can help. Whereas our more traditional less dynamic channels help us to reach large numbers of customers with more generic messaging.

Supplementing our paid-for marketing activity, we develop content plans that help us create news 'hooks' for regional and national media titles and organic content across our social channels that all aim to drive great engagement with the topic of water saving.

## 5.10 Targeted customer interventions

The key to reducing water demand is ensuring we have accurate data that evidenced where our water is being used so we can work with those customers with higher consumption levels to encourage them to reduce water use by providing products and services which facilitate this reduction.

### 5.10.1 Smart Metering & Smart Data

We have commenced our smart meter deployment on all new developments and domestic meter optants since Summer 2023. Of the existing circa 1.5 million metered properties in Yorkshire Waters operational area ~1.39 million will be end of life in AMP8, as the AMR battery will fail in AMP8 (10-15 year expected asset life).

As such a significant asset replacement programme is required to maintain service so we are planning on exchanging 1.39 million AMIs across AMP8 and installing 0.19 million new meters through DMO & new developments. 1.28 Million of the 1.39 million meters will be on households, with the remaining 106K meter being non household properties.

The introduction of smart AMI meters from 2023 will unlock data of an improved granularity to the existing data offerings from our AMR meter stock. This enriched data is an enabler to ensure that we identify the most suitable household customers when implementing water efficiency initiatives in AMP8.

If we effectively utilise the data and identify customers with high consumption, there is potential to increase our total benefit realisation from each initiative which could enable us to achieve our long-term targets sooner than forecasted.

In addition to utilising the AMI data to inform areas or household customers who would benefit from a water efficiency initiative. Metered customers will have access to their consumption data to connect them to their water use and help communicate which of their habits are water demanding and which are water efficient.

Throughout AMP8, we will continue to work closely with the Metering and Smart Metering teams across AMP8 to ensure any opportunities to incorporate demand reduction in their strategies are realised and ensure that demand reduction is included in any adaptive planning.

More detail on this subject can be found in
**Enhancement Case – Smart Metering**

## 5.11 Water Efficiency Products & Services

We have previously offered customers free water saving devices which they can request via our website. The water saving products available are a shower regulator, 4-minue shower timer, buffalo cistern bag and LeakyLoo detection strips with install instructions. Customers can select which products they would like to receive, and these products are then self-installed.

Uptake of free water saving packs and products is evident across our region, with over 30,000 units being requested and sent each year to our customers, who self-fit the products in their homes.

In July 2023, we have extended the existing offering by commencing a trial of the Save Water Save Money's 'Get Water Fit' platform which allows customers to register on the platform and complete a questionnaire to gain an understanding of water use in their home, providing them tips to reduce their usage and request free water saving devices.

However, we won't achieve our PCC target for household customers solely through the implementation of water saving devices, as the measured savings from these products isn't as much as previously thought. The saving per property from water saving products is circa five litres per property per day (l/p/d), compared to around 50 l/p/d previously assumed. This can, in part, be attributed to the fact that customers ordering the free packs do not necessarily fit the products.

Therefore, in 2023 we are restarting our water efficiency audit and product retrofit service pilot. Between 2018 and 2020 we delivered a pilot project where we offered customers a home water audit and installation of waver saving products applicable to their property. This pilot was stalled in 2020 due to Covid-19 and the inability to enter customers' properties.

Once the pilot is complete, if it is successful, we will include household Smart Water visits and virtual visits as part of the wider water efficiency strategy to reduce demand for water. During the visit a technician will either visit properties face to face or conduct this virtually, fit the appropriate water saving devices for that property and discuss ideas with the customer on ways to reduce their consumption.

### Incentives – Housing Developers

The population of the UK is rising, and we are forecasting the development of around 20,000 new build properties per year from 2025, falling to around 10,000 properties per year further into the planning period. This increase in households in Yorkshire will increase future water demand and put pressure on our wastewater network and treatment processes if we do not invest in new assets and infrastructure.

To reduce the requirement for investment in new assets and infrastructure, we work with developers and provide an environmental incentive which reduces the infrastructure charges on each home they build if they can evidence that it was built to water consumption level of less than 110l/h/d.

If a developer can evidence that they have built a home to 110l/h/d or lower they receive a 20% discount of their water and foul water infrastructure charge. We are hoping to develop this further by increasing the discount but reduce the consumption levels further to align with our long-term targets for PCC.

This increased incentive to reduce infrastructure charges could encourage more developers to operate to the Integrated Water Management (IWM) principles and reduce usage through step changes in water supply to homes.

To increase incentives we would need additional funds to offset the reduction in revenue from infrastructure changes and the costs of implementing a metric to check that the new developments achieved the target when they apply for the grant.

In further support of this target, Yorkshire Water have adopted a Smart as standard approach to New Development metering, meaning from 2023 all new developments will be fitted with a Smart meter. The inclusion of Smart Meters will help to identify continuous flows and help communicate to customers which of their habits are water demanding and which are water efficient.

### 5.11.1 Technological advancement

Whilst the interventions discussed above are useful and help to reduce demand, they are soft measures to reduce water use based on behavioural change or from installing water saving devices in customers' homes. To meet our long-term target for PCC reduction the need to introduce SMART technologies and install more water efficient devices is imperative.

### 5.11.2 Ofwat Water Efficiency Fund

Ofwat are introducing a water efficiency fund of £100M in AMP8 and the framework of that fund has been used to share the new strategy for demand reduction. Yorkshire Water will work collaboratively with other water companies and partners to explore innovative ideas for water efficiency and demand reduction, so we are able to submit suitable bids to obtain funding to reduce water use.

We have previously submitted bids as both the lead water company or as a supporting partner on bid submitted by other water companies for the Ofwat innovation fund. However, the introduction of the water efficiency focused fund will enable collaboration across the industry in tackling demand and the need for customer to reduce consumption.

### 5.11.3 Exploring & Adopting New Innovations

We conducted a 'my water use pilot' in 2022/23 which measured customer water consumption and evaluated their usage in comparison with their neighbours with similar house sizes and occupancy. The data used in this pilot was smart meter data from meters which had been installed in an area in Sheffield.

In September 2023, we are commencing a trial in Leeds of flow regulator installations on 1000 household customer properties to reduce their flow and capitalise on the reduction in water use. This measure means that customers don't need to change their behaviour as this product is installed on the supply pipe at the customer boundary, so they continue to use water in the same way.

The potential saving of the flow restrictor has been estimated to be at circa 22l/h/d so the realised benefits from installing 1000 in the trial could reduce water use significantly with no change on customers water usage behaviour. If the trial is successful and we realise the expected benefits, we have plans to install these devices on new build homes and offer these to a proportion of meter optants and existing metered properties.

### 5.11.4 Playing our part in the industry

Yorkshire Water already have employees who attend, and chair water efficiency groups and forums attended by representatives from across the industry. We are an affiliated partner with Waterwise who organise the Water Efficiency Strategic Steering Group (WESSG) and is chaired by MOSL.

Within this strategic group we work together in task and finish groups in alignment with Waterwise's strategic objectives so we can share learnings cross industry to ensure we are able to achieve out long-term target for PCC of 110l/h/d by 2050.

In addition to attendance at task and finish groups we also share learning from water efficiency initiatives which have been trialled by us or other water companies so we can ensure that any innovation or technologies that we plan on trialling have consumption reduction benefits.

## 5.12 AMP8 Delivery Plan

### Table 15: AMP8 Delivery Plan

| Intervention | Base | Enhancement | Totex £m (AMP8) |
|---|---|---|---|
| **WRMP incl. water efficiency visits & devices, customer engagement and education initiatives** | 13% | 87% | 15.39 |
| **WRMP incl. Smart metering and DMO plus customer smart multi-channel engagement platform** | 54% | 46% | 292.29 |

## 5.13 Our incentive to deliver

### Table 16: PCC Incentive Summary

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Underperformance and outperformance |
| **Price control allocation** | 50% water resources, 50% water network plus |
| **ODI rate** | £1.94m per litre per person per day |
| **Benefit sharing factor** | 70%. |
| **Outperformance payment- standard** | £1.94m per litre per person per day |
| **Outperformance payment- enhanced** | £2.88m per litre per person per day |
| **Underperformance payment - standard** | £1.94m per litre per person per day. |
| **Timing of underperformance and outperformance payments** | In-period |

## 5.14 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 5.15 Deadbands

Deadbands do not apply to this PC.

## 5.16 Cap/Collars

The PR24 methodology currently states that the cap for this performance commitment will be set at 1% of water equity.

# 6. Leakage

## 6.1 PC Type:

Environmental outcomes

## 6.2 Performance targets

### Table 17: Committed performance levels

| PR24_LEA | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | Reduction (%) against 2019/20 basline (three-year average) | 16.6% | 19.1% | 22.0% | 24.9% | 27.4% |
| | In 3 year rolling average MLD | 263.0 | 255.2 | 245.9 | 236.7 | 229.0 |

## 6.3 Summary

Please note this plan has been developed with the best information available at the point of submission for the PR24 plan. This data was aligned with the WRMP iterations, however the PR24 leakage plan will evolve as part of the development and submission of the revised draft WRMP.

This PC incentivises Yorkshire Water to reduce leakage in our water supply network. This reduces pressures on raw water supplies and the aquatic environment due to reduced water demand, and this reduction in demand has an equivalent carbon saving. By undertaking a range of network interventions to reduce the water lost from our network, we are increasing our water supply network resilience to maintain supply in the long term. Additionally, by reducing leakage, we are also demonstrating to customers that we are contributing to a reduction in overall water demand.

Leakage is already a common PC in AMP7 with company specific targets related to a percentage (%) reduction in 3-year average leakage from a 2019/20 baseline. For PR24, the AMP7 measure for this PC is retained. The measure is based on a % reduction of 3-year average (or arithmetic mean) leakage in Ml/d from the 2019/20 baseline. The 3-year average values are calculated from annual average values of the reporting year and the two preceding years and expressed in Ml/d.

**Smart Metering**

Yorkshire Water has included within its WRMP an extensive smart metering programme. This is to ensure all future customer meters installed are smart and that end-of-life Automated Meter Reading (AMR) meters are replaced with Smart Meters. The enhancement case being made is for the cost difference between AMR and Smart and the enabling people, process and technology upgrades to support the improved business capabilities. Yorkshire Water acknowledges that with such an ambitious plan to deliver ~1.4 million customer meter exchanges that bill payers must be protected from under delivery. Yorkshire Water will maximise the benefits from Smart Metering and has significant exposure to under delivery of this programme, through service improvements baked into our Leakage, PCC and Non Household Demand Reduction Performance Commitments and the associated reward & penalty.
Given the existing exposure through PCs Yorkshire Water proposes a PCD related to the delivery of Smart Meters.

The enhancement PCD protects customers to a value of £82.6m for the delivery of an exchange and install programme totalling 1,389,314 meters, with a further £45.1m for a PCD related to DMO installation. These numbers are to be assessed at the end of the AMP, with an ambition to deliver in the profile detailed in Table 19 below. Further the timeliness of the delivery will be

incentivised through inclusion of the service improvements within the PCL incentive regime with the financial impact of non-delivery of the metering programme detailed below.

**Table 18: Total number of smart meters to be installed (with associated installation costs) under the smart metering PCD, by year**

| | 2025/26 | 2026/27 | 2027/28 | 2028/29 | 2029/30 |
|---|---|---|---|---|---|
| **Number of meters in plan** | 139,281 | 347,154 | 347,154 | 347,154 | 208,572 |
| **PCL impact (£m)** | 0.47 | 1.88 | 3.93 | 6.24 | 8.27 |

### Mains Renewal

Yorkshire Water is planning a significant mains renewal programme in AMP8 in line with its 10-year strategy to improve asset health. Yorkshire Water is planning an annual asset renewal rate of 0.66% over AMP8 which will improve our performance against the leakage and mains repair PCs amongst others. Yorkshire Water will be submitting a Cost Adjustment Claim (CAC) to fund 0.46% of the 0.66% per Annum. Given the investment has been optimised within the WRMP24 and PR24 plans, this investment is core to achieving multiple Performance Commitments which there is significant financial exposure, through the existing incentive regime if Yorkshire Water does not deliver via leakage, mains repairs, interruptions to supply and water quality contacts. Yorkshire Water therefore propose a PCD related to the length of mains renewals delivered each year. The total PCF value is £250 Million, for the delivery of 746km of mains renewal. Table 20 below provides a summary of the mains renewals programme including its delivery cost

**Table 19: Summary of mains renewals programme including delivery cost**

| | Total AMP8 | Total PCD |
|---|---|---|
| **Length of mains renewal (km)** | 1,082 | 746 |
| **Cost (£m)** | 364 | 250.9 |

## 6.4 Customer and Stakeholder Engagement

We carry out extensive engagement with our customers, communities and stakeholders. Information on our engagement approach can be found in Chapter 6, but specific customer engagement related to leakage can be found below.

Through the Ofwat / CCWater collaborative research on customer preferences, we understand that customers generally rate reducing leaks as somewhat important. We can triangulate this ranking of prioritisation with our own Valuing Water customer priorities research, which found that preventing leaks from Yorkshire Water's pipe network was of average importance, with 53% of customers tested ranking it as a priority area when ranked amongst other service areas.

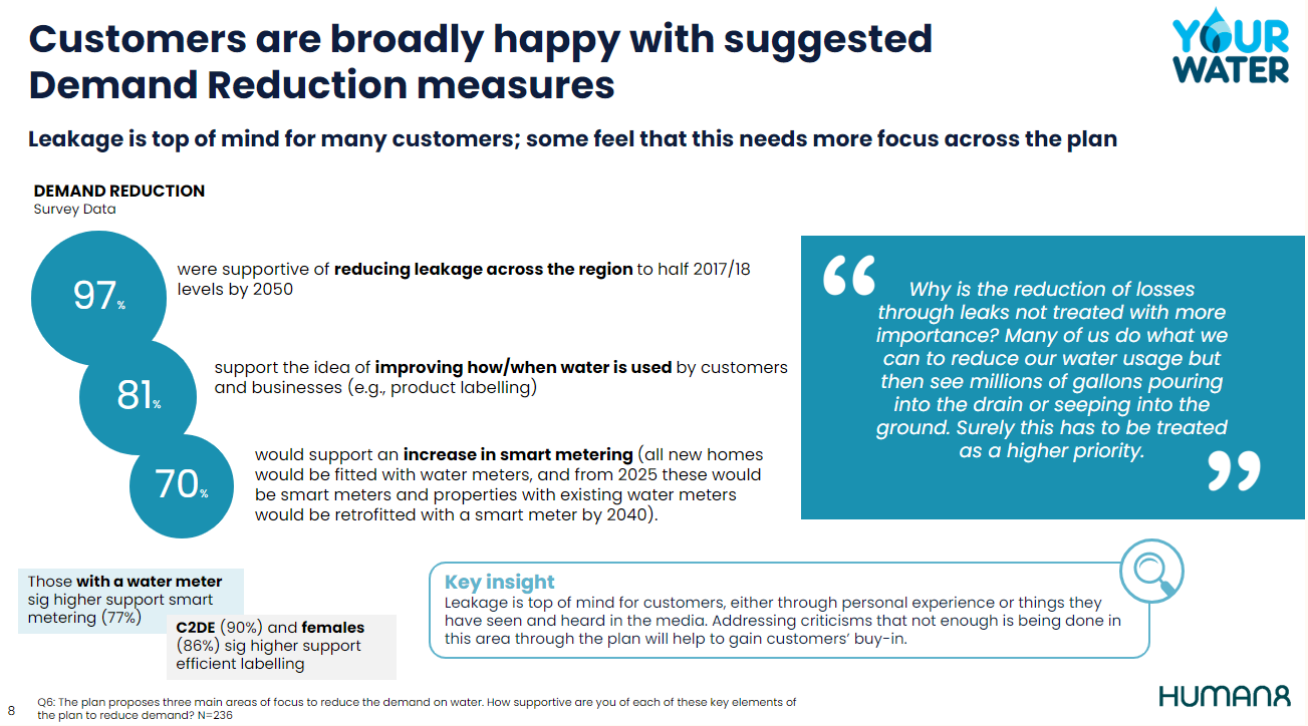
However, in many focus groups when asked about their water company, many customers instantly cite leakage as an issue and immediately call to have this wastage rectified and that it shouldn't be happening.

> *"Why is the reduction of losses through leaks not treated with more importance? Many of us do what we can to reduce our water usage but then see millions of gallons pouring into the drain or seeping into the ground. Surely this has to be treated as a higher priority." Household customers, Your Water Online Community, Draft WRMP Research, March 2023.*

In fact, in our draft WRMP research, customers spontaneously mentioned leakage as a main contributor to the water supply deficit facing Yorkshire Water and called for action to address this, specifically when we were asking customers to reduce their own water use. Outlined in the

snippet from this report below are what customers believe are the biggest risks to water supply, including the spontaneously mentioned 'leaks' in orange.


And in terms of addressing demand, the below outlines customer support for options – 97% of customers surveys support the reduction in leakage as an option to do this.




Our more recent engagement, through our affordability and acceptability testing research, found that customers expect Yorkshire Water to do much more in the space of leakage. Their view of leakage performance was that the amount was 'shocking' and that the current target is set high.

In testing our plan in affordability and acceptability quantitative research conducted following Ofwat guidelines we showcased our planned target for leakage - 78% of customers found the plan to be acceptable and our own independent affordability and acceptability testing research

also showcased this target and 79% of customers found our overall plan to be acceptable including this target.

Read more about this in **Ofwat/CCWater customer preferences research**

More detail on this subject can be found in our main business plan: **Chapter 6: Customer and Stakeholder research**

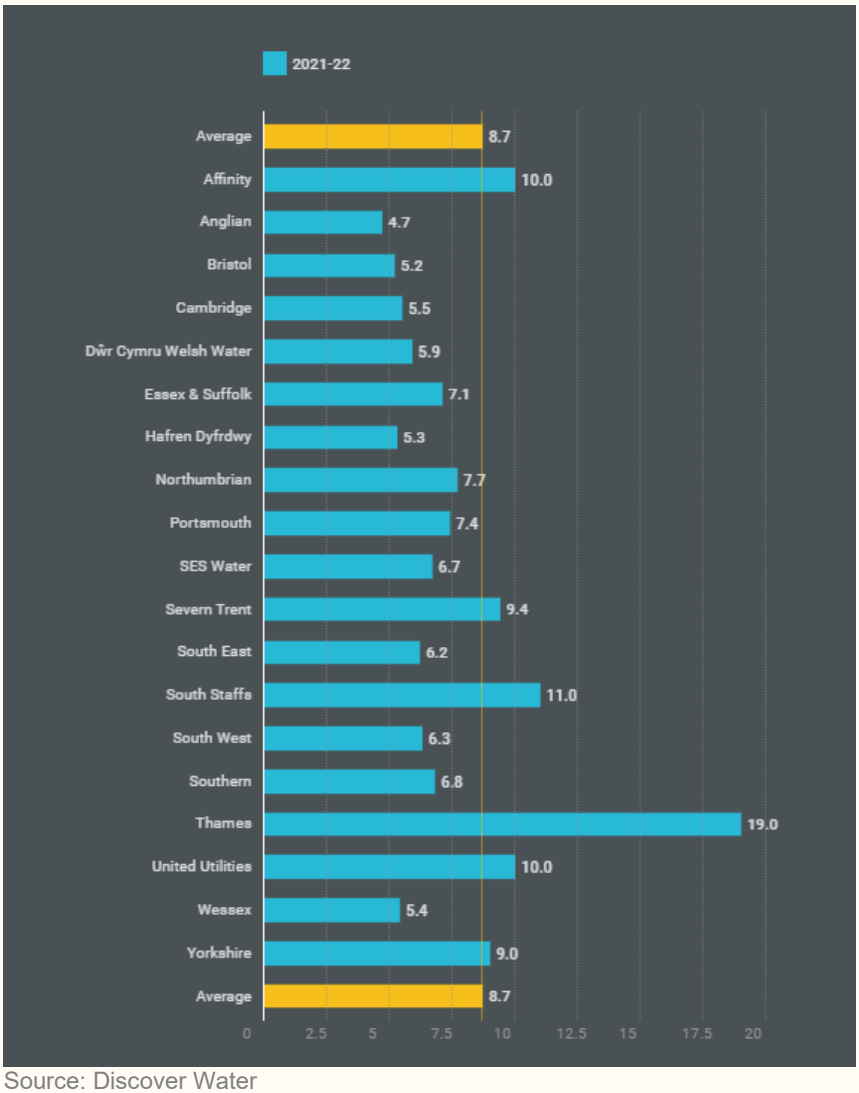
## 6.5 Our performance to date

Yorkshire Water has achieved the leakage target in the first three years of AMP7 delivering a 9.6% reduction in 3 year rolling average leakage from the 2020 baseline.

Only 9 of the 17 Water companies have achieved their year 3 performance commitment target, demonstrating Yorkshire Water's commitment and technical expertise to innovate and deliver continuous improvement.

Yorkshire Water's leakage performance in comparison to the rest of the industry is shown below. This performance has been normalised as "leakage per KM of network length" from the Discover Water website. Yorkshire Water performance is slightly behind the mean industry performance, but we have ambitious targets to deliver 50% leakage reduction by 2050, the first 15% of which are targeted before 2025.

**Figure 15: Yorkshire Water leakage performance compared to the industry**




Source: Discover Water

## 6.6 Setting the target

Yorkshire Water has undertaken significant levels of modelling and optioneering to produce its AMP8 and beyond Performance Commitment Level (PCL) for leakage. This has been driven by three main factors.

1. Our dedication to achieving at least a 50% leakage reduction by 2050, baselined as a 3-year rolling average from 2019/20
2. The contribution from leakage, within the WRMP in achieving resilience in our Water Supply Demand balance within a best value plan for our customers
3. Optimisation of the leakage reduction trajectory and investment plan, using industry recognised best practice analytics solutions, to deliver the lowest cost leakage programme accommodating policy constrains.

The PCL proposed in AMP8 is part of the wider plan to achieve 50% leakage reduction by 2050 and has been deduced following a multi factorial optimisation process, considering over 15 intervention types.

### 6.6.1 How past company and industry performance have influenced PCLs set

Table 21 below provides both the industry and company actuals and forecasts for the leakage performance commitment for both AMP7 and AMP8, as well as the PR19 final determination for this performance commitment.

### Table 20: Industry and company actuals and forecasts and PR19 final determination for leakage

| Megalitres per day | AMP7 | | | | | AMP8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 20/21 | 21/22 | 22/23 | 23/24 | 24/25 | 25/26 | 26/27 | 27/28 | 28/29 | 29/30 |
| PR19 final determination | 304.6 | 292.0 | 285.7 | 278.4 | 268.0 | | | | | |
| Industry upper quartile actuals **and *arithmetic forecast*** | 65.1 | 63.3 | 60.3 | ***57.5*** | ***54.8*** | ***52.2*** | ***49.8*** | ***47.4*** | ***45.2*** | ***43.1*** |
| Industry average actuals **and *arithmetic forecast*** | 179.3 | 172.0 | 166.8 | ***161.9*** | ***157.1*** | ***152.5*** | ***148.0*** | ***143.7*** | ***139.6*** | ***135.6*** |
| Company actuals, ***arithmetic forecast and business plan proposed targets*** | 304.2 | 290.5 | 285.2 | ***278.4*** | ***272.1*** | ***263.0*** | ***255.2*** | ***245.9*** | ***236.7*** | ***229.0*** |
| ***Proposed reduction in consumption against 2019/20 baseline (%)*** | | | | | | ***16.6*** | ***19.1*** | ***22.0*** | ***24.9*** | ***27.4*** |

We exceeded or are forecast to exceed our target in the first four years of AMP7 and the WRMP DEFRA target for year 5. Only 9 of the 17 water companies are currently meeting their targets for this performance commitment. We are forecast to further improve our performance in both year 4 and 5 of AMP7.

We are proposing targets of a 16.6% reduction against the 2019/20 baseline in year 1 of AMP8, rising to a 27.4% reduction against the 2019/20 baseline in year 5 of AMP8. This will be delivered through a blend of long-term sustainable investments such as Smart Metering, advanced analytics which will enable “Point of Interest Active Leakage Control”, and mains renewal. Medium term solutions such as pressure management will reduce leakage, while reducing mains bursts in the short terms (~5 years), and efficiencies in traditional ALC through investing further in acoustic logging.

This blended solution has been optimised utilising third party systems to achieve the best value set of interventions to achieve leakage targets and improve underlying asset health.

## 6.7 Social and Environmental Benefits

The leakage plan proposed is aligned to the latest knowledge as we progress the creation of the revised draft Water Resources Management Plan, ensuring long term security of supply. By reducing leakage in line with the PCL trajectory through to 2050, we underpin our water supply system’s ability to provide wholesome clean water to a resilience of a 1 in 500 dry weather event by 2039.

From an environmental perspective the PCL will offset growth in demand due to population growth, climate change and restriction to supply through abstraction reform. Through lowering levels of leakage, Yorkshire Water will reduce the chemical and energy requirements otherwise necessitated to treat and distribute water which isn’t utilised by customers, underpinning a reduction in operational carbon. The reduction in leakage will also reduce the need for immediate Water Supply options, such as additional water treatment works and abstraction sources, offsetting the environmental impact of abstracting more water resources from our catchments and rivers, whilst also avoiding the embedded carbon required to build new water treatment and distribution assets.

## 6.8 Our long-term ambitions

Yorkshire Water plans to achieve 50% leakage reduction by 2050. The Water Resource Management Plan has considered stretch targets beyond 50% however further leakage reduction was not required to achieve the supply demand resilience required by 2050.

The trajectory proposed from our optimisation work has produced the glidepath below, with a more aggressive leakage reduction in the earlier AMPs of the plan to 2050. The WRMP process

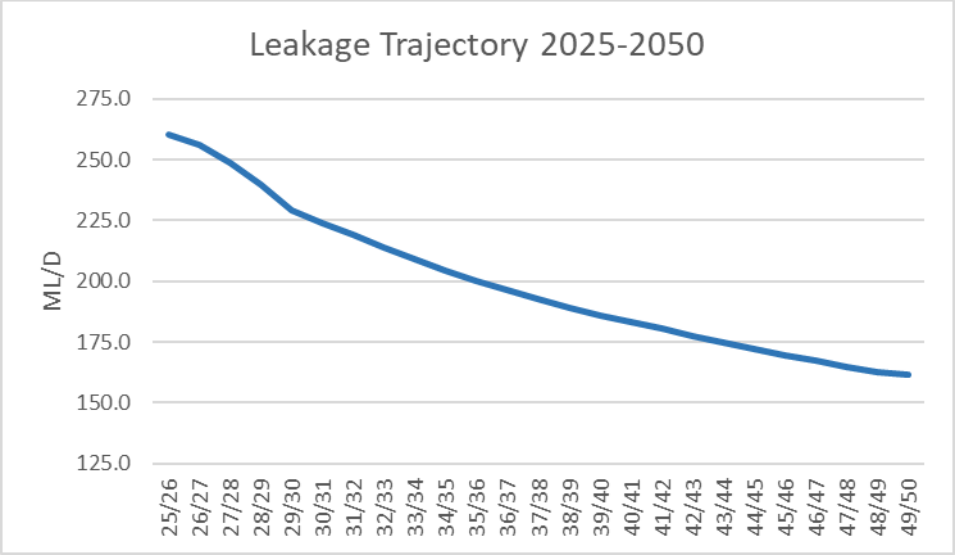
will cyclically review the delivery plan and progress vs plan. Adaptive pathways will be used if progress along this target trajectory are not achieved. Iterative optimisation along the pathway will occur in each subsequent WRMP process as new and innovative solutions arise.

### Table 21: Long-term performance trajectory for leakage

| | AMP8 end (2025-30) | AMP9 end (2030-35) | AMP10 end (2035-2040) | AMP11 end (2040-45) | AMP12 end (2045-50) |
|---|---|---|---|---|---|
| **Leakage performance (3 year average rolling Ml/d)** | 229.0 | 204.2 | 185.9 | 172.1 | 161.3 |

Figure 16 below sets out the long-term performance trajectory for leakage.

### Figure 16: Long-term performance trajectory for leakage




## 6.9 Our plans to deliver this commitment

The Yorkshire Water leakage strategy centres around developing its asset management and operational capabilities to deliver a Smart, Resilient and Calm water network. Key outcomes from this strategy are:

- The implementation of a Point of Interest Active Leakage Control (ALC) strategy driving higher levels of resource output. Using technology to precisely locate the likely location of bursts will help to reduce the time to find leaks and the run time of leaks before repair.
- Building resilient networks, using advanced pressure management and valve actuation to optimise network pressures thereby reducing bursts and leakage. This will also allow for the remote operation of strategic network controls to mitigate operational events.
- The roll-out of Calm Networks, which will help us to identify the root causes of network failures and mitigating the impact of short-term pressure transients, which can cause accelerated network deterioration.
- Transforming our systems to support Smart Metering capability thereby reducing customer-side leakage and improve DMA leakage targeting.
- Advancing our analytics capability to target and prioritise leaks optimally, including improving the accuracy of leakage reporting through adopting dynamic night use modelling.

Summary of activities include:

Multiple intervention types have been considered to create the Leakage PCL, with optimisation of the plan selecting the following interventions as significant strands of investment.

- Pressure Management- reducing pressure to less than 40 Average Zone Night Pressure (AZNP) in AMP8
- Calm Networks- Yorkshire Water assets have calm control mechanisms installed & 3rd party proactive engagement to reduce the impact of pressure related failures
- Smart Metering- target customer side leakage & help prioritise Yorkshire Water network leakage
- Mains renewal- reduction in background leakage & burst rate
- Point of interest tools- sensors & analytics to locate leaks to small area of network (50-meter radius) to enable resource efficiency.
- Operations 2.0- a transformation programme to align and optimise decision making, planning scheduling, technician availability, work deployment, activity processes and job feedback
- Innovation- Active participation in industry innovation arena to adopt emerging solutions

Activities to drive service levels across people, process and systems include:

**People:**

- Productivity improvement across Find & Fix, resulting in a lower £/MLD
- Changes to delivery model for leakage ALC activity

**Process:**

- Identification & resolution of pressure related leakage
- Improved network health and resilience through renewal activity

**Systems:**

- Significant investment in systems to realise benefits from Smart metering
- Continued innovation in Analytics and Smart Systems

Detailed description of key activities:

**People efficiency**

- **Integrated Planning & Scheduling**- leakage prioritisation standardisation & optimisation
- **Smart Analytics**- Point of Interest Leakage strategy maturation
- **Next Generation Acoustic Logging**- Enhanced capability underpinning POI leakage strategy

**Process**

- **Mains Renewal Programme** – Prioritisation of beneficial mains to reduce background levels of leakage & burst rates
- **Pressure Management**- Prioritisation of schemes and reduction in overall network pressure, reducing water lost & burst rate
- **Network Calming**- Identification of sources of network health impacting pressure changes and implement mitigation through VSD Pumps, Advanced pressure control and large user engagement

**Systems**

- **Smart Metering** - Identification & resolution of customer side leakage from current contribution of 30% of DMA leakage, supported by the creation of systems providing analytics and insight
- **Smart Networks platforms**- Advanced techniques to identify non-acoustic leakage, unmapped mains/demand points and sub optimal DMA design.

## 6.10 Our incentive to deliver

### Table 22: Leakage PC Incentives

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Underperformance and outperformance |
| **Price control allocation** | 100% water network plus |
| **ODI rate** | £0.36m per megalitre per day |
| **Outperformance payment- standard** | £0.36m per megalitre per day |
| **Outperformance payment- enhanced** | £0.72m per megalitre per day |
| **Underperformance payment - standard** | £0.36m per megalitre per day |
| **Timing of underperformance and outperformance payments** | In-period |

## 6.11 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 6.12 Deadbands

Deadbands do not apply to this PC.

## 6.13 Cap/Collars

The current methodology published by Ofwat to inform the development of PR24 business plans suggests that a cap of 1% of water equity will apply to this PC.

# 7. Business Demand

## 7.1 PC Type

Environmental outcomes

## 7.2 Performance targets

**Table 23: Committed performance levels**

| PR24_NHH | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | Percentage reduction against 2019/20 baseline | -0.9% | -1.1% | -1.5% | -2.0% | -2.5% |

## 7.3 Summary

Please note this plan has been developed with the best information available at the point of submission for the PR24 plan. This data was aligned with the iteration of WRMP available at the time of submission, however the PR24 non-household (NHH) demand reduction plan may evolve as part of the development and submission of the revised draft WRMP.

Business demand is measured by the percentage reduction of three-year average business demand in Ml/d from the 2019-20 baseline. Three-year average values are calculated from annual average values for the reporting year and two preceding years expressed in Ml/d.

This is the first AMP of a 5 AMP delivery plan to achieve a 15% business demand reduction by 31 March 2050, which aligns with the Defra statutory water demand target set out in the HM Government Environmental Plan 2023.

## 7.4 Customer and Stakeholder Engagement

We carry out extensive engagement with our customers, communities and stakeholders. Information on our engagement approach can be found in Chapter 6, but specific customer engagement related to NHH demand can be found below.

More detail on this subject can be found in **Chapter 6: Customer and Stakeholder priorities**

In February 2023, we carried out a BR-MeX replica survey, which in part, gave us the opportunity to understand NHH customers' interest in reducing water use, the appeal of smart meters and appeal for future services such as water use audits. Interestingly, the engagement results found that 65% of participants did not believe a smart water meter would help reduce unnecessary water usage. This is despite calls from retailers to improve availability, quality and consistency of consumption data to help customers with their usage and subsequent bills, through smart meter implementation (UKWRC response to Ofwat consultation on methodology for PR24). However, many of the participants in the study were low users of water or felt they had already taken action to reduce their water use.

We do however know, that in businesses where water is essential, these customers are likely more conscious of water usage and more open to options on reducing their consumption; however research still suggests that it was far from a top priority when considering it within the wider list of service areas.

In our own independent affordability and acceptability testing research study (outside of Ofwat guidelines) we included our business demand target to inform customers of the progress we plan to make from 2025-2030 – 79% of household customers and equally, 79% of our non-household customers found our plan to be acceptable overall including this target.

Read more about this in
**Ofwat/CCWater customer priorities research**

## 7.5 Setting the target

Defra have set a target of 9% by 31 March 2038 and 15% by 31 March 2050. Split evenly across each year this means a 3.46% reduction should be achieved by 31 March 2030. This represents a reduction of 0.9% to 2.5% against the 2019/20 three year average baseline across AMP8. The 2019/20 three-year average baseline is 277.3 megalitres per day. We believe the target, dependant on the final WRMP, we are proposing to be stretching yet achievable and will be delivered through several measures including promoting behaviour change through targeted media campaigns, through supporting retailers and businesses to identify and reduce wasted water resource, and through providing incentives to businesses and retailers to reduce their consumption. We will reassess our target for AMP9 subject to WRMP29, in the eventuality there is a shortfall against national standards.

## 7.6 Social and Environmental Benefits

In delivery of this performance commitment Yorkshire Water will subsequently support improved socioeconomic outcomes throughout the region, such as reducing Yorkshire Water's carbon impact on the environment through the need to process less water and reducing our impact on the water environment from source to sea, minimising CSO impacts and enabling reduced abstraction from rivers and reservoirs. Furthermore, driving down customer demand will support customers by helping keep their bills as low as possible and driving resilience of water supply for all Yorkshire Water's customers.

## 7.7 Our long-term ambitions

The plan set out by Defra is a reduction in business customer consumption from the 2019/20 baseline of 9% by 31 March 2038 and 15% by 31 March 2050. Our delivery against this aim is is subject to finalising the revised draft WRMP and dependent on the supply demand enhancement business case. We commit to working collaboratively with regulators and stakeholders to close this gap including ensuring an appropriate starting baseline. Key in bridging the gap will be technological advancement and wider industry changes such as water efficiency labelling and we will continue to monitor this during AMP8, and will reassess our long-term plans as this develops as part of WRMP29.

## 7.8 Our plans to deliver this commitment

For PR24 we have created a new long-term Water Demand Reduction Strategy which is overarching across all customers including household, non-households, and developers. In preparing this new strategy we have:

- designed our proposals to meet the requirements of UK Government Policy including as set out by Defra and Ofwat
- carefully considered feedback from all stakeholders from the draft WRMP
- completed an extensive review of external evidence and literature
- benchmarked against other water companies
- created an internal water demand reduction forum bringing together a variety of skills and expertise from across the business which includes household, NHH, smart metering, developer services and regulatory change
- worked with a specialist consultant exploring a variety of initiative options which have then been prioritised based on costs and benefits
- ensured alignment with Waterwise's UK Water Efficiency Strategy[2]

Risks in delivering our plans are:

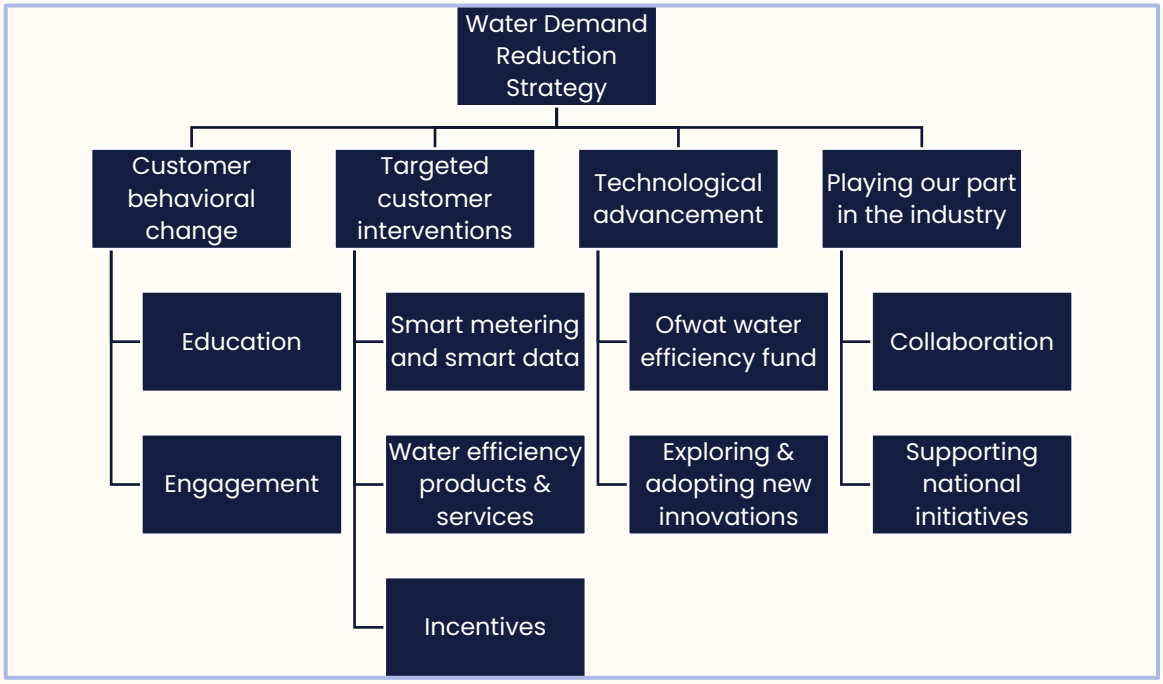
- Dependent on Water Supply Demand Enhancement business case.
- Benefits from government policy changes, e.g. water efficiency labelling, are built into our assumptions and outside of our control.

- As this is a new measure and new capability, Yorkshire Water is untested in this area, evidence of benefits are limited and there is therefore uncertainty on the benefits that will be delivered
- Final WRMP is not yet completed, resulting in a potential difference of AMP8 target and investment requirement.
- Achievement of PC requires sustainable behavioural change from NHHs and support from Retailers.
- There is risk that the Performance Commitment does not allow for growth of demand required for wider economic reasons
- We will closely monitor progress against the Performance Commitment and will adapt our approach accordingly in conjunction with other stakeholders

### Figure 17: Waterwise UK Water Efficiency Strategy to 2030 10 strategic objectives


Our new long-term Water Demand Reduction Strategy is set out in the chart below:

### Figure 18: New Water Demand Reduction Strategy




Since retail competition was introduced for NHH customers, the relationship with the customer has changed from being direct with Yorkshire Water to more indirect as the retailer is now responsible for most customer interactions.

Despite this during AMP7 we have delivered the following initiatives:

- promoting water efficiency to NHH customers and working in collaboration with retailers
- developed a new dedicated web page for NHH customers which has business tailored water efficiency advice
- offered free 'save a flush' cistern bags which are available to all businesses
- ran a Water Saving Promise Campaign where we incentivised businesses to ensure they were efficient with their water use
- offered an industry leading value-added meter reading service to retailers
- provided granular consumption data services to NHH customers and retailers
- were represented on the RWG Water Efficiency Group
- sponsored or co-sponsored several water efficiency Market Improvement Fund Projects (LIDA Project and Project Discovery)

Whilst these initiatives are useful, insight from the NHH market through the Retailer Wholesaler Group Water Efficiency Subgroup has noted that customer willingness to pay is below the efficient cost to supply these services. Market participants require £22m of funding to achieve the 9% NHH demand reduction targeted by 2038 by Defra[7]. Therefore, driving real improvements in water efficiency remains a challenge.

The introduction of this performance commitment helps to define roles and responsibilities within the market structure and provides the much-needed opportunity to secure funding to support Yorkshire Water in meeting its targets and ultimately promote resilience of supply for the whole customer base.

In order to work towards the targets set out for 2038 (9% reduction) and 2050 (15% reduction), Yorkshire Water has worked collaboratively with stakeholders from across the business, enlisted the expertise of a specialist water efficiency consultant and taken into account feedback shared through multiple PR24 and WRMP forums and mechanisms. We are seeking to deliver a suite of new initiatives within AMP8 which will allow us to supplement our existing activity and make significant headway against these targets whilst also optioneering initiatives for future AMPs. In AMP8 these are proposed to be funded through £17.2m of enhancement which has been included in the Water Supply Demand Enhancement business case.

Given the relationship between NHH customers and water companies is less direct since market opening, as we referenced above, the approach we will take will aim to be collaborative and supportive to the needs and requirements of all stakeholders across the market.

Yorkshire Water will seek to introduce initiatives which support the four pillars of our Demand Reduction Strategy referenced at the beginning of this section.

### 7.8.1 Customer behavioural change

**Non-Household Targeted Media Campaign**

As we move into AMP8 and beyond, we will work to build on and enhance our media campaigns to support the raising of awareness around the needs to adopt water efficient practices and mentalities. We will continue to provide advice, guidance and learning tools to all NHH customers but will go one step further by targeting NHH customers and customer groups through a significant and sustained media campaign (for example, see Figure 19 below of our 'Use Less, Save More' campaign). We feel by tailoring and targeting this campaign will can make a significant difference by ensuring our campaigns drive maximum impact. Given the varying needs of NHH customers, many using water for similar purposes as a domestic customer but others using water for business specific processes, it is key to ensure we tailor our content so we can provide relevant advice and information to all NHH customers, from micro business to our largest users.

[7] https://www.economic-insight.com/2022/06/14/increasing-water-efficiency-in-the-nhh-water-retail-market/

**Figure 19: Examples of previous communications shared with customers as part of our 'Use Less, Save More' campaign**


### 7.8.2 Targeted customer interventions

**Non-Household Smart Metering**

A key enabler of several initiatives listed in this document is smart metering. Smart meters will support a cultural change to the way in which water usage is viewed by NHH customers through increased granularity and availability of consumption data. Yorkshire Water intend to continue to provide meter reading services and additional services related to the provision of granular consumption data to support customers understand their usage, quantify the impact any water efficiency interventions may have and identify leakage. The increased availability of the granular consumption data captured by our smart meters will give Yorkshire Water the opportunity to accurately baseline and monitor consumption which will support a targeted approach to water efficiency initiatives and proactively notifying customers when something doesn't look right e.g., constant flow notifications etc.

The AMP8 plan includes the ambition to deliver 105,155 meters to NHH properties, which is equivalent to 85% of NHH properties (excluding voids) operating with a smart meter. This coverage is further bolstered by the ~1250 NHH properties which are continuously logged, which are Yorkshire Waters largest water consumers, contributing to ~28% of the business demand across the region. Together this data will provide the ability influence water efficiency, help target specific interventions more effectively and bolster the insight and evidence in the evolution of our business demand strategy into future AMPs.

**Business Smart Water Visits**

Business Smart Water visits will be offered to customers, whereby water efficiency experts will provide tailored audits and advice to businesses on changes they could make, both physical and cultural, to reduce their usage. These audits will also include where applicable fixing of items such as leaking toilets and retrofitting water saving devices tailored to that property. These visits will primarily be targeted at sectors where evidence suggests there's the greatest opportunity to reduce usage, e.g., sport and leisure facilities, education establishments and the hospitality sector.

**Subsidised Retrofits of Rainwater Harvesting for Large Users**

Specific to our customers who have the largest usage, we propose to offer subsidies for the introduction of retrofitted rainwater harvesting solutions. Many of our largest users will have processes which don't require potable water. Providing alternative and more sustainable supplies to NHH customers will help support the resilience of supply for all customers and contribute towards Yorkshire Water's performance against the targets set out by Defra & Ofwat.

### Water Retailer & Non-Household Customer Incentives

We recognise that retailers have a huge part to play in supporting NHH customers and Yorkshire Water in achieving the targets set out. Retailers are the key to the relationship with the customer and a collaborative effort between all parties will likely see improved take up and action. In recognition of this we propose to offer incentives to retailers to support us on our journey of sustainably reducing their customer's usage in AMP8 and beyond.

In addition to retailer incentives, we will explore options to incentivise NHH customers to make changes to deliver significant and sustained reduction in their water usage. Furthermore, we recognise from an NHH customer and retailer perspective, consistency of approach towards incentives will be key. In view of this we will seek to collaborate with the industry to drive a national approach to incentive schemes and in doing so hope to remove unnecessary complexity from this key deliverable.

### 7.8.3 Technological advancement

We will actively seek to explore new and emerging technologies to help support deliver our commitments around Business Demand Reduction. We are keen to trial new and innovative ways of driving water efficiency to make sure they are, first and foremost right for our customers and their needs but also to ensure they deliver a return on investment to give n customers in Yorkshire the confidence we're investing wisely.

In addition to technological solutions, we will carefully consider other areas such as tariff-based changes which may help support cultural change and awareness around water usage. This isn't an option we will implement in AMP8, but we are conscious that the existing tariff structures are not aligned with environmental needs and therefore changes should be carefully considered. As with many of the initiatives we've detailed above, another reason why we're keen to consider our approach to tariffs is due to the differing needs of business customers. Changes to tariff structures will impact micro businesses differently to the largest consumers and therefore we must carefully consider the potential impact to NHH customers of all sizes and come up different approaches that treat all customers fairly based on their needs and circumstances.

Furthermore, we welcome the news of Ofwat's new Water Efficiency Fund which is being set up to support measurable reduction in business and residential demand. Yorkshire Water will seek to prepare and submit innovative bids with the hopes of being able to supplement the good work we've already set out to do over the forthcoming AMPs. We will also consider other funding opportunities such as MOSL's Market Improvement Fund and the Ofwat Innovation Fund to help with the development of new and exciting initiatives and sharing best practice with the wider industry to support optimised customer outcomes.

### 7.8.4 Playing our part in the industry

Yorkshire Water will commit to working with stakeholders across the industry to explore new and innovative approaches to business demand reduction. We will continue to support the good work which is happening collaboratively in industry forums to drive consistency of approach and importantly the ease of application and adaptation for NHH customers. Yorkshire Water will ensure we continue to maintain and build on our current representation and leadership of national industry groups. Yorkshire Water currently chair the Retailer Wholesaler Group (RWG) drought subgroup, we also sit on the Waterwise Water Efficiency Strategy Steering Group and are represented on several water efficiency specific working groups.

## 7.9 Our incentive to deliver

### Table 24: NHH Business Demand Incentives

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Underperformance and outperformance |
| **Price control allocation** | 50% water resources and 50% water network plus |
| **ODI rate** | £0.36m per megalitre per day |
| **Outperformance payment- standard** | £0.36m per megalitre per day |
| **Underperformance payment - standard** | £0.36m per megalitre per day |
| **Timing of underperformance and outperformance payments** | In-period |

## 7.10 Performance Possibilities

Please see the risk and return chapter and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 7.11 Deadbands

Deadbands do not apply to this PC.

## 7.12 Cap/Collars

The guidance published by Ofwat to inform the development of PR24 business plans suggests that the caps and collars for this PC will be +/- 0.5% of RoRE.

# 8. C-MeX

## 8.1 PC Type

Customers receiving excellent service every day.

## 8.2 Performance targets

### Table 25: Performance targets

| PC Ref | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | C-MeX Score | TBD | TBD | TBD | TBD | TBD |

Ofwat are currently proposing changes to the design of each of the measures of experience performance commitments. A consultation is due to close on 26 September which sets out Ofwat's initial views on future C-MeX methodology.

Initial proposals include changing the relative weights within the sample so that there is a greater focus on customers that have experienced operational incidents, making greater use of cross-sector benchmarks to determine relative performance payments, and removing the higher performance gateways for enhanced payments.

In line with our approach in AMP7, we are not proposing a target for C-MeX in AMP8 given that performance will be measured in terms of our ranking against other companies.

## 8.3 Summary

C-MeX is designed to incentivise water companies to provide an excellent customer experience for residential customers, across both the retail and wholesale parts of the value chain.

C-MeX comprises two surveys – the customer service survey (CSS) of residential customers who have recently contacted their company and the customer experience survey (CES) of random members of the public in relation to their general experience of their water company. In both cases customers are asked how satisfied they are with the service provided using a score out of 10. This score is then used to rank all 17 water companies in a league table, with penalty and reward determined as the relative difference between the top, median and bottom companies.

Yorkshire Water is currently performing around the industry average in C-MeX, but we want to be much better than this and move towards being one of the best companies on this measure by the end of AMP8.

## 8.4 Customer and Stakeholder Engagement

We are dedicated to engaging with our customers and stakeholders, not just as part of the business planning process, but also on an ongoing basis. Following the introduction of C-MeX in AMP7, we take on board the feedback from customers through this mechanism on a regular basis. C-MeX results are examined by teams across the business to identify trends in the data and collectively ensure we have the right improvement plans in place. For more information on how we use this insight.

More detail on this subject can be found in **Chapter 6: Customer and Stakeholder Engagement**

More specifically related to this performance commitment, we know through the customer preferences research conducted on behalf of Ofwat and CCWater, customer satisfaction was considered in the lower importance category in terms of priority and impact. However, through this research, all performance commitment area were seen as important, and rather they were placed on a scale of importance, instead of there being a perception that customer satisfaction was not important. Through the research, we understand that customers felt this performance area felt distinct from others, and that it was unlikely to cause significant disruption on a day-to-day basis due to the fact that engaging with your water company was relatively infrequent. Customers felt that customer satisfaction as a performance commitment was important, but that it was a hygiene factor, and did not necessarily link other performance areas with customer satisfaction.

Read more about this in
**Ofwat & CCWater Customer Preferences Research**

While our own customer priority research did not specifically measure customer satisfaction or C-MeX as a performance commitment area, it did capture that customers found good customer service to be an essential service provision.

Read more about this in
**Valuing Water Customer Priorities Research**

We have carried out several other customer research studies to provide insight into how to support performance improvement in C-MeX going forwards. One example of this is the research we carried out in August 2022 on our Channel Strategy. We understand that providing a tailored service is very important to our customers and want to ensure that the options we provide to our customers about how they contact us meet their expectations. Customers tend to flex their expectations on channel preference depending on the reason for contact and whether it is a transactional contact (e.g., requesting a meter fit) or of high importance (e.g., to query a high bill). Customers that need to make transactional contact were found to prefer digital channels, particularly at the outset, whereas for high importance queries, a personal touch via more traditional methods, i.e. phone, is preferred. The research found that customers are satisfied with the existing range and standard of channels provided to them, and that contact experience with us was largely positive, with 75% stating that they were satisfied.

Read more about this in
**Channel Strategy Research**

A further example of how we engage our customers in relation to their satisfaction on our performance can be seen through the online community study carried out in January 2023, on our customer's trust levels with us. Using an innovative implicit reaction tool to measure trust levels, the research showed that 50% of customers involved in the online study, trust Yorkshire Water. While initially this may seem low, this is an impressive performance when compared to other organisations, such as Telecoms (22% trust level), Energy Providers (12% trust level) & Banks (28% trust level).The water sector overall reported a 35% level of trust, therefore the 50% trust in Yorkshire Water is higher than the wider industry and indicates a more positive trust relationship between the company and its customers than in other water companies.

Read more about this in
**Trust Research**

Finally, in our own independent affordability and acceptability testing research study (outside of Ofwat guidelines) we included our C-MeX ambition to inform customers of the progress we plan to make in customer service – 79% of customers found our plan to be acceptable overall.

For further information on the wide variety of customer and stakeholder engagement carried out as part of the business planning process, see Chapter 6.

## 8.5 Our performance to date

C-MeX was introduced for the first time in AMP7. Our overall C-MeX score and ranking has been around the industry average each year of the AMP, but has been dropping.
In the **Customer Service Survey (CSS),** the factors that customers cite as having influenced their score broadly fall into two categories: resolution of issues and communication.
For our billing service, we have had a good record of providing timely and accurate bills, and in resolving around 90% of queries on the first contact made by the customers. Therefore, our billing service score has been consistent through the AMP and ranking has gradually improved as the industry average score has declined.

For operational customer service, our clean water service has been inconsistent relative to other companies – sometimes ranking as high as second, but in other quarters dropping to near the bottom of the table. For wastewater, our C-MeX score has been towards the bottom end of the rankings. A weaker operational service performance is linked to inconsistency when it comes to resolution and communication for operational issues. We know that some of this is due to a proportionately high length of combined sewers in Yorkshire, which leads to a greater number of issues occurring on the network. However, it's also due to having systems and processes that don't consistently enable a fast, effective response. Therefore, much of our focus is on improvement in these areas.

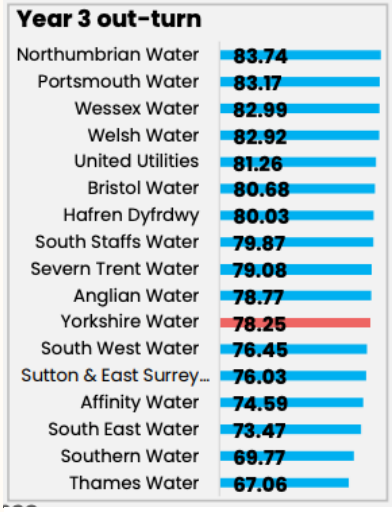


Figure 20: Year 3 out-turn

In the **Customer Experience Survey (CES),** we have seen a drop in the ranking, from being in the top half of companies to being around the industry median. This appears to be driven by a weakening in the positive responses rather than an increase in negative responses. Reasons cited include bill cost and company performance in areas such as leakage and pollution – as well as experiences from a recent service interaction.

## 8.6 Setting the AMP8 PCL

In AMP7, there was no absolute target for C-MeX. Instead, companies' performance in the industry was compared against each other and overperformance and underperformance payments were made based on how each company performed relative to the rest of the industry. Therefore, it is not possible to provide a comparison of whether Yorkshire Water has underperformed or overperformed against the AMP7 target.

Following the closure of the consultation on the definition of this performance commitment on 26 September, it is likely that this performance measure will remain a relative one, measuring our performance against other water companies and potentially introducing cross-sector benchmarking (via the UKCSI) and therefore we are not proposing a target for this measure.

## 8.7 Our long-term ambitions

We are aiming to progress towards being one of the leading companies on C-MeX by the end of AMP8 and then sustain this as a long-term position.

## 8.8 Social and environmental benefits of this PC

C-MeX reflects the extent to which we are meeting the needs of the customers and communities we serve. Those needs may be specific to the resolution of a particular issue, but also include broader needs and expectations around the societal and environmental value we provide. Doing the right thing for our customers and the environment should contribute to higher C-MeX scores.

## 8.9 Our plans to deliver this commitment

C-MeX is an output of everything that we do for customers across the retail and wholesale functions and as such it is dependent on effective customer contact experiences, excellent communication, accurate billing, and the delivery of fast and effective resolution of network issues – as well as positively engaging with customers on issues affecting them and the water industry.

In the main business plan, our chapter on the retail price control (8.11) covers much of the improvement activity that will impact the front-end customer experience – which will see us become more proactive in our service and communication, deliver simple, easy and reliable customer journeys, and provide a more multi-channel, digitally enabled service.

Our chapters on wholesale water (8.8) and wholesale wastewater (8.9) include plans around how we will reduce the incidence of issues impacting customers, become better at identifying issues through more network monitoring and alerts, as well as improving our approach to resolution when problems do occur.

To drive higher C-MeX scores, it's important to focus on the lead measures of customer experience, to help monitor progress and target activity in the right areas. Some of our key indicators of progress in AMP8 are identified in the table below:

### Table 26: Key indicators of progress

| Customer measure | Current (2023) | Future (by 2030) |
|---|---|---|
| **Follow-on calls – reducing the volume of calls into our operational contact centre that are regarding an existing issue** | 30% | 10% |
| **Reducing jobs raised that are found to be private issues upon visit- which delays issue resolution and diverts resource from Yorkshire Water issues.** | 35% | 20% |
| **Self-serve operational contacts – increasing the proportion of contacts regarding operational issues that are reported through automated channels –in line with customer channel preferences.** | <10% | >50% |
| **Increasing the ratio of proactive to reactive wastewater work – more of our work will be about preventing issues occurring rather than fixing them.** | 30:70 | 60:40 |
| **Reducing the average response time for internal sewer flooding incidents** | 6-8 hours | 2 hours |

Achieving C-MeX improvement is linked to many initiatives and activities across the retail and wholesale business. Those activities with the highest impact include:

- Continuation of the retail base IT programme (see Ch 8.11) to enhance customer journeys by developing our system capabilities, including:
    - Online account functionality with a single portal for all needs. All billing and operational requests will be easy to manage in one place, whilst preference management and consumption data will provide more personalised experiences for customers.
    - Channel optimisation to enable simple, easy contact experiences – offering greater choice of channels, harnessing the best technologies and capabilities to respond to changing customer expectations, and gather feedback about their experiences. Guided by customer preferences, new technologies may include mobile apps and greater webchat capabilities, as well as the development of social media and asynchronous chat as service channels.

    - Increased proactive communication using insight and greater channel offering to contact customers about issues impacting them and to keep them updated.
- Enhanced model for operational customer contacts – full roll out of the operational customer experience operating model including our new consolidated system for field scheduling and customer communications, delivering more accurate appointment scheduling with better feedback mechanisms and issue triage.
- Wastewater people and process improvements to increase productivity through smarter workforce planning and intelligent escalation triggers, plus increasing proactive issue detection through alarms.
- Clean water people and process improvements to improve resolution timescales and productivity, and better manage customer communication, including more proactive information around issues such as water quality.
- Smart metering programme roll out, which will deliver improved billing accuracy and richer data for customer engagement.
- Continuous programme of proactive positive customer engagement campaigns to drive positive sentiment and explain to customers how we have invested in improvements to the network, and how this represents good value for money.

There are some key risks to C-MeX delivery. The measure is driven by multiple factors across service delivery and therefore is dependent on sustained improvement in many key programmes and areas of the business. It is also influenced by external factors such as the economic and political environment, weather events and media coverage. Therefore, it is difficult to commit to a target performance level with high degree of confidence.

It is also important to note that given C-MeX is a relativised performance measure, improvements in scores do not necessarily result in an increase in ranking as this is dependent on the customer service scores across the wider industry.

### 8.10 Our incentive to deliver

C-MeX ODI methodology is current subject to an Ofwat consultation. Proposals include moving the ODI to be based on regulatory equity rather than the current base of residential retail revenue. There is also a proposal to change the calculation to be based on relative performance against the UKCSI (UK Customer Satisfaction Index) benchmark rather than the industry median C-MeX score.

**Table 27: Our incentive to deliver**

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Penalty and reward based on relative position against other companies |
| **Price control allocation** | Retail |
| **ODI rate** | Residential retail revenue adjustment, with % based on relative performance against other companies |
| **Outperformance payment- standard** | Residential retail revenue adjustment, with % based on relative performance against other companies |
| **Underperformance payment - standard** | Residential retail revenue adjustment, with % based on relative performance against other companies |
| **Timing of underperformance and outperformance payments** | In-period |

### 8.11 Performance Possibilities

Our ambition is to see an improvement over the course of the AMP to an upper quartile position.

However, this will be a challenging target given that all C-MeX improvement is relative to the other companies in the industry, whose performance we cannot forecast. We anticipate that with our improvement activities planned, we would as a minimum remain in the top half of the league table.

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 8.12 Deadbands

The current consultation on the performance commitment definition for C-MeX does not include proposals for deadbands.

## 8.13 Cap/Collars

The current definition for C-MeX includes caps and collars set at + / - 12% of retail revenue, although this is subject to change as part of the current consultation.

# 9. D-MeX

## 9.1 PC Type

Customers receiving excellent service every day.

## 9.2 Performance targets

### Table 28 D-Mex Performance Targets

| PC Ref | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| Proposed AMP8 PCL | Ranking | TBC | TBC | TBC | TBC | TBC |

In line with our approach in AMP7, we are not proposing a target for D-MeX in AMP8 given that performance will be measured in terms of our ranking against other companies in the sector, additionally Ofwat have initiated consultation on this performance commitment.

## 9.3 Summary

We aim to provide an effective and efficient service for all our customers that require water and wastewater new connection services including domestic customers, property developers, Self-Lay Providers and New Appointees (SLPs & NAVs) Our delivery of high quality and regulatory compliant domestic and commercial solutions for new water and wastewater services will be measured through the developer measure of experience (D-MeX).

Yorkshire Water Developer Services has made **significant improvements** over the last year. We have been continually closing the gap on other water companies and Median performance which we are targeting for the remainder of AMP7. As of July 2023, we have had 6 successive quarters of improvement in our D-Mex quality scores and greater than 60% improvement in our D-MeX quantitative performance moving from circa 61% to over 99.5% of work within service level.

**Strong foundations** have been laid to support this improvement including tactical digital investment, multiple process improvements and additional resources deployed in relevant areas. However, the improvements have **not been enough to move up the D-MeX table** and the gap between Yorkshire Water and Median performance remains, and is driven by Quality scores specifically:

- Ease of contact
- Time to respond to queries.
- Progress updates
- Perceived value for money

Based on our analysis of the data, customer feedback and engagement along with team interviews, we have created a plan which builds on the foundations to take DS on the longer-term journey towards upper quartile with ambition to achieve Median performance in AMP 8.

## 9.4 Customer and Stakeholder Engagement

Developer Services enable economic growth throughout Yorkshire, it is essential to developers including domestic, industrial, Self-Lay providers, New Appointees and Variants, along with local authorities and our communities that we deliver effective and efficient service at a high quality to support that growth. In AMP8 we estimate we will support the development of circa 88k new properties each generating employment and economic growth.

A critical element of Developer Services is ensuring development is environmentally sustainable and we offer incentives to developers to promote this along with our requirements to ensure development is completed to relevant regulatory requirements, we generate infrastructure revenue which provides funding to reinforce our Water and Sewerage Networks. We continually gather feedback from developers both proactively and through D-MeX surveys to provide insight into improvement areas and shape future thinking.

Through continuous customer engagement via dedicated relationship managers, and case management of applications we recognise that our customers have distinct needs and service requirements – for example, domestic customer vs small builder vs a large home developer vs a self-lay provider or NAV (New Appointment and Variation).

Our customer feedback is that:

- Our processes could be clearer and more user friendly.
- They would like more regular updates on the status of applications/and progress.
- Speed to communicate change could be improved.

Our goal is to provide seamless end-to-end digital service, offering our 'self-service' approach for customers whilst retaining traditional contact channels for those who need them. Whilst we accept that not all will fully embrace digital technology, many tell us they expect it. We will meet those expectations and enable the benefits of lower cost digital services, providing cost reflective, effective, and efficient services for all our customers.

Our digital first approach for all processes will minimise customer effort, enhancing the customer experience through multiple initiatives including:

- Providing an easily accessible platform to allow customers to contact us for support or to self-serve whichever is the customer preference.
- Ensuring all required information is captured right first-time minimising touchpoints for customers and reducing time to serve.
- Giving customers real time status updates via the medium of their choice.
- Providing digital / application-based support allowing customers to provide live stream video footage to drive speed of resolution and improve quality of information transfer.
- Continuous collaboration with our customers to understand and adapt to their needs and concerns to update our digital platforms to meet their needs.

Our service will provide personalisation based on persona and real-time use of customer data which will mean we are able develop helpful, friendly customer journeys, making sure we get it right first time. Many of our processes will become automated, giving customers the opportunity to self-serve and typical customer journeys will be faster and easier, giving the customer choice and control.

Finally, in our own independent affordability and acceptability testing research study (outside of Ofwat guidelines) we included our D-MeX target to inform customers of the progress we plan to make in this area – 79% of customers found our plan to be acceptable overall including this target.

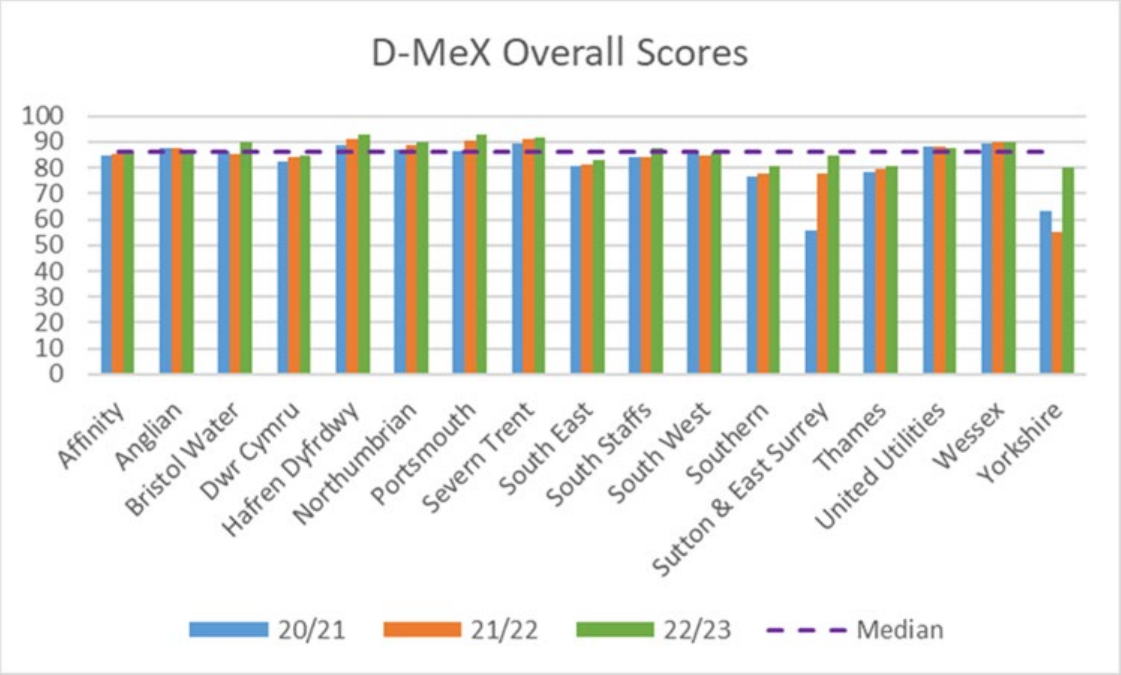
## 9.5 Our performance to date

We struggled to keep pace with the industry in the early part of AMP7 due to legacy systems and resourcing issues. However, we worked closely with Ofwat on a successful turnaround plan. 2022-23 has been a turning point in our performance and we have built greater competency, aligned resource to meet demand and introduced initial digital improvements through a dedicated performance excellence and transformation approach.

Our ambition is Median performance for the remainder of AMP7 and as per D-Mex scores below taken from Water UK reporting we have been continually closing the gap on other water companies and Median performance. At the end of FY22/23, we have had 6 successive

quarters of improvement in our D-Mex quality scores and greater than 60% improvement in our D-MeX Quantitative performance moving form circa 61% to over 99.5%.

**Figure 21 D-MeX Scores**




## 9.6 Sector differentiators and how this impacts YW Performance

Highly systemised and companies with automated and integrated processes have outperformed YW in AMP7 as our processes remain highly manual. Developers compare different Water companies and this is reflected in our D-MeX quality scores and verbatim feedback. We rely on manual processing with non-integrated systems which means higher operating costs and that other companies often have quicker response times.

New technology being adopted by others does not fit in to our IT strategic roadmap meaning others who are already more agile will build on their current advantage over Yorkshire Water until the early part of AMP8 when our systems will be refreshed and integrated.

## 9.7 How past performance and industry performance has influenced PCLs

In AMP7, there was not an absolute target for D-MeX. Instead, companies' performance in the industry was compared against each other and overperformance and underperformance payments were made based on how each company performed relative to the rest of the industry. Therefore, it is not possible to provide a comparison of whether Yorkshire Water has underperformed or overperformed against the AMP7 target.

As this performance measure is a relative one, measuring our performance against other water companies, we are not proposing a target for this measure.

## 9.8 Social and environmental benefits

Developer Service enable economic growth throughout Yorkshire, it is essential to developers including domestic, industrial, Self-Lay providers, New Appointees and Variants, along with local authorities and our communities that we deliver effective and efficient service at a high quality to support that growth.

In AMP8 we forecast we will support the development of circa 88k new properties each generating employment and economic growth. A critical element of Developer Services is ensuring development is environmentally sustainable and we offer incentives to developers to

promote this along with our requirements to ensure development is completed to relevant regulatory requirements, we generate infrastructure revenue which provides funding to reinforce our Water and Sewerage Networks. We continually gather feedback from developers both proactively and through D-MeX surveys to provide insight into improvement areas and shape future thinking.

## 9.9 Our plans to deliver this commitment

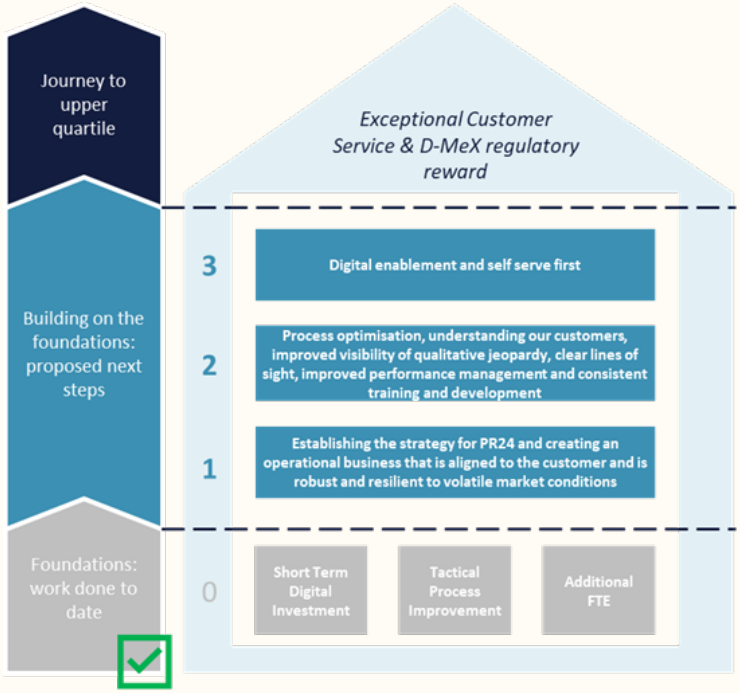
Activities to deliver proposed service levels across people, process and systems include:

- **Strategy and Operating Model** – Clear vision and purpose translated into the design and delivery of future operating model to deliver our strategy.
- **People & Change** – Build colleague capabilities and organisational design around customer experience and value creation.
- **Digital & Technology** – Digital transformation from strategy to Operating Model, delivering tools and systems to reduce colleague and customer effort.
- **Delivery & Performance** – Source and utilise customer, market, and regulatory insight to aid decision making and continuous improvement to drive effective and efficient service.

This plan is articulated at a high level in the **'D-MeX house' diagram** (below) the activities we will focus on are:

- Creating a customer-first organisation
- Optimising processes, greater customer insight and better performance management
- Digital enablement and self-serve first.

### Figure 22: A diagram of customer service




A more detailed delivery plan showing alignment to specific customer outcomes is outlined in Appendices "Developer Services Strategy".

More detail on this subject can be found in **Developer Services Strategy**

**Risks posed to the delivery of our plan:**

### D-MeX Consultation

A consultation period was open until September 2023 on weighting of performance measures and incentive payments for D-MeX. We have inputted our views into this consultation however the overall outcome will not be known and could impact on our future decisions.

### NAV Growth Rates

NAV growth rates have been estimated based on near term historical performance and developer engagement feedback, however if these forecasts are significantly out due to NAV strategic decisions, economic climate etc. there may be significant shifts in Developer Services income and expenditure. We have very limited data to inform our forecast as the NAV market is emergent. We have used best estimates based on 3yrs of AMP7, along with feedback from Developers to inform our forecast however market conditions and regulatory changes will dictate NAV growth rates and we will need to react to the shifting market conditions which we will be well placed to do as we move to a more agile and flexible multi-skilled workforce.

## 9.10 Our incentive to deliver.

**Table 29: Our incentive to deliver**

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| Incentive form | Revenue |
| Incentive type | Penalty / Reward |
| Price control allocation | TBC |
| ODI rate used | TBC |
| Outperformance payment- standard | TBC |
| Underperformance payment - standard | TBC |
| Timing of underperformance and outperformance payments | In-period or end of AMP |

## 9.11 Performance Possibilities

We will be operating at a base case investment which will not enable upper quartile performance in AMP8, however we are confident given the improvements we have made in AMP7 and our improvement plan for AMP8 that we can move from our FY22/23 17th position and 12% penalty and achieve closer to Median performance and a neutral penalty / reward position in AMP8.

We accept that in the early part of AMP8 there will be some disruption as new systems are introduced and we have accounted for this in our planning and will put robust governance and jeopardy management processes in place to mitigate any disruption.

### Table 30: Committed performance levels

| PC Ref | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | **2025-26** | **2026-27** | **2027-28** | **2028-29** | **2029-30** |
| Proposed AMP8 PCL | Ranking | TBC | TBC | TBC | TBC | TBC |

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 9.12 Deadbands

The current definition of D-MeX does not include deadbands.

## 9.13 Cap/Collars

Ofwat will be setting caps and collars at an individual and aggregate level at Draft Determinations. As such we have not proposed caps or collars as part of our plan.

# 10. BR-MeX

## 10.1 PC Type

Customers receiving excellent service everyday

## 10.2 Performance targets

**Table 31: BR-Mex Performance levels**

| PC Ref | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | TBC | TBC | TBC | TBC | TBC | TBC |

The business and retailer measure of experience (BR-MeX) is a new performance commitment for PR24, and therefore it is not possible to set out at this stage our proposed performance commitment level without a further understanding of the proposed performance commitment definition.

We understand that the specification of the performance commitment will be set out in the PR24 draft determinations in June 2024.

## 10.3 Summary

As set out in the consultation on the measures of experience performance commitments (due to close on 26 September), this is a new performance commitment for PR24, and Ofwat is planning a pilot on this performance commitment during 2023/24 and will confirm the definition of this performance commitment in autumn 2024.

This measure is likely to incorporate two elements which are the business customer measure of experience and the retailer measure of experience.

- BR-MeX being introduced in AMP8 is an output of all our plans for improvements that impact customers across the wholesale functions. We will deliver more effective customer contact experiences, excellent communication, and the delivery of fast and effective resolution of network issues – as well as positively engaging with all our customers and stakeholders on issues affecting the water industry.

Our chapter on what our plan will deliver (8.12) covers much of the improvement activity that will impact the core services we deliver and the front-end customer experience – with a systems and channels focus which will see us become more proactive and preventative, deliver easy and reliable customer journeys, and provide a more multichannel, digitally enabled experience. We will also look to offer value added services that meet the needs of our diverse range of customer.

Our chapters on wholesale water (8.8) and wholesale wastewater (8.9) include plans around how we will reduce the incidence of issues impacting customers, become better at identifying issues through more network monitoring and alerts, and deliver fast, more effective resolutions to issues that do occur.

More detail on this subject can be found in **Chapter 8, Section 2:**

This will ensure we continue to drive excellent outcomes for retailers, non-household customers and the wider market. All this will ensure Yorkshire remains a place where retailers and businesses can thrive.

## 10.4 Customer and Stakeholder Engagement

We pride ourselves on the relationships we have built with our retailer and business customers and engage with them as well as our regulators, the market operator (MOSL), NAVs and industry groups (such as the Retailer Wholesaler Group) on a regular basis. You can find more information on our approach to engagement in Chapter 6 and Chapter 8.

More detail on this subject can be found in **Chapter 6: Customer and Stakeholder Priorities**

More detail on this subject can be found in **Chapter 8: Our Totex Plan**

We have been actively participating in the design of future performance incentivisation for non-household customers, including our membership in the Market Performance Framework (MPF) Advisory Group and have been involved in Ofwat workshops on the development of the BR-MeX performance commitment. Specifically related to BR-MeX as a performance commitment, in February 2023 we carried out a BR-MeX replica study that evaluated the methodologies involved in BR-MeX and identified areas we should focus on to secure high scores in the future.

Our engagement output was shared in full with Ofwat working groups. The engagement consisted of a total of 205 computer assisted telephone interviews (CATI) with business customers, 180 of these interviews where with business customers who contacted us directly, and 25 interviews were with bilateral contacts whereby business customers required a wholesale service from us but went via their retailer to obtain this service. The interview script broadly followed the script created by Ofwat and MOSL.

The research identified some issues with the methodology proposed, namely the inability to obtain interviews from bilateral contacts, however none of the issues identified were considered showstoppers. Recommendations for changes to the script and methodology were provided in our research report (slide 22).

Using the BR-MeX replica survey, our mean performance across customer satisfaction for fully resolved contacts was 7.86, but this was significantly lower for unresolved issues and contacts at 4.79. The research helped us to understand critical areas of service to non-household customers and the areas we should focus our efforts on to ensure a more positive delivery of services going forward.

We know from this engagement, that our strengths across business and retailer customer service, according to satisfied customers, include:

- Our responsiveness
- Our ability to resolve issues
- Being proactive in our updates on issues
- Our helpful staff

But we also found areas we should build on, according to some dissatisfied customers, including:

- Better communication
- Better customer service
- Taking more responsibility
- Resolving the issue

As shown, there are differences in experience across satisfied and dissatisfied customers, showing that we need to be more consistent in our application of service, particularly with regards to resolution and communication.

The research also allowed us to validate non-household customers' interest in reducing water use, the appeal of smart meters and appeal for future services such as water use audits. Interestingly, the engagement results found that 65% of participants did not believe a smart water meter would help reduce unnecessary water usage. This is despite calls from retailers to improve availability, quality and consistency of consumption data to help customers with their usage and subsequent bills, through smart meter implementation (UKWRC response to Ofwat consultation on methodology for PR24). However, this may be because many of these

customers claimed they did not use enough water or felt they were already doing their bit to reduce their water their use.

Read more about our wider engagement in **Chapter 6**

MOSL have been undertaking R-MeX surveys since October 2020 and through our R-MeX survey reviews we know that our overall performance is good. Retailers have told us through this survey, they want us to engage with them more on performance, continued data accuracy and smart metering roll out. Based on the latest results from February 2023, we know we are performing well – we ranked 6th out of 15 – but we also understand that there are opportunities for improvement, and we will relish being able to drive even better performance in the future.

Through our engagement with UKWRC and our PR24 workshops we know that the industry wants wholesalers to:

- Provide excellent wholesale services
- Explore water efficiency services
- Implement smart meters

These insights have helped shape our plans to deliver excellent outcomes for retailers, non-household customers and the wider market. All this will ensure Yorkshire remains a place where retailers and businesses can thrive.

## 10.5 Our performance to date

BR-MeX is a new measure it is not possible to report on performance to date or compare our performance with other companies. On a similar but different measure YW were assessed as the 6th best performing wholesaler in March 2023.

**Figure 23: Performance on similar measure**

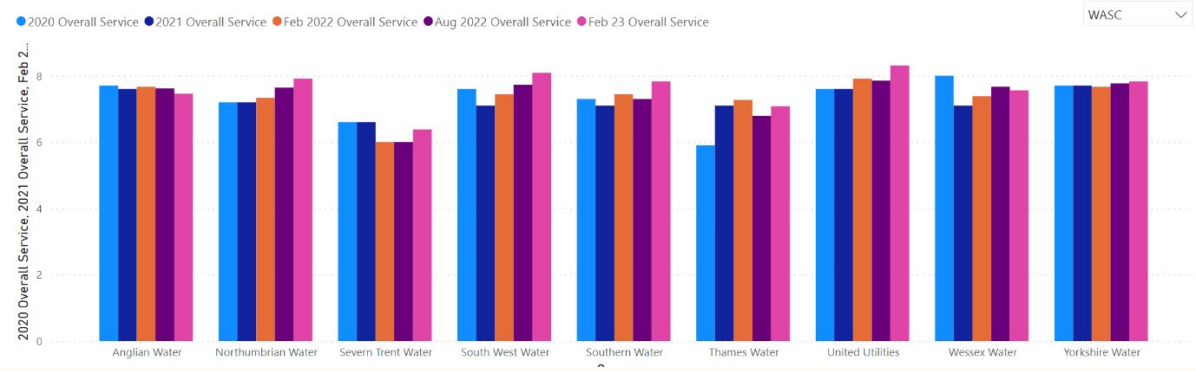
| Rank | Wholesaler | Overall service |
|---|---|---|
| 1 | Affinity Water (WSL) | 8.67 |
| 2 | United Utilities Water | 8.31 |
| 3 | South West Water | 8.09 |
| 4 | Portsmouth Water | 8.00 |
| 5 | Northumbrian Water | 7.91 |
| 6 | Southern Water | 7.83 |
| 6 | Yorkshire Water | 7.83 |
| 8 | Wessex Water | 7.56 |
| 9 | Sutton and East Surrey Water (WSL) | 7.50 |
| 10 | Anglian Water (WSL) | 7.46 |
| 11 | South Staffordshire Water | 7.36 |
| 12 | Bristol Water (WSL) | 7.10 |
| 13 | Thames Water | 7.08 |
| 14 | Severn Trent Water | 6.38 |
| 15 | South East Water | 6.12 |
| | Total | 7.55 |

This is an existing market measure (MOSL not Ofwat) which will be superseded with a new measure which is not like for like – this table is for indicative purposes only

| | |
|---|---|
| AMP 7 Improvement | New Performance Commitment & ODI |
| AMP8 proposed improvement | New Performance Commitment & ODI |

The figure below shows that Yorkshire Water has been a consistently top performer on R-MeX across a number of surveys. It is important to take a view over more than one survey as the sample size is small and anomalies can occur in any one survey that artificially inflate or reduce the score. Based on these latest results, we know we are performing well – we ranked 6th out of 15 – but we also understand that there are opportunities for improvement, and we will relish being able to drive even better performance in the future.

### Figure 24: Overall Service




We have considered whether any sector differentiators impact our performance and no items have been identified. In addition, a benchmarking exercise took place in spring 2023 with 5 UK water and sewerage companies and no further performance impacting differentiator was identified.

## 10.6 Setting the target

The business and retailer measure of experience (BR-MeX) is a new performance commitment for PR24, and therefore it is not possible to set out at this stage our proposed performance commitment level without a further understanding of the proposed performance commitment definition.

We understand that the specification of the performance commitment will be set out in the PR24 draft determinations in June 2024.

## 10.7 Social and environmental benefits

BR-MeX reflects the extent to which we are meeting the needs of the business customers and non-household retailers that we serve. Those needs may be specific to the resolution of a particular issue, but also include broader needs and expectations around the societal and environmental value we provide. Doing the right thing for our customers and the environment should contribute to higher BR-MeX scores.

## 10.8 Our plans to deliver this commitment

Chapter 8.12 covers what our plan will deliver for retailers and business customers including improvement activity. We will deliver our core activities and focus on digital and service improvements), whilst continuing to support the wider market through our engagement strategy.

We will continue to undertake the following activities while driving continuous improvement:

- Accurate and timely data and settlement - continue to perform upper quartile in the market
- Operational service delivery – continue to perform upper quartile in the market
- Playing our part in making the NHH market a success – continue to be active contributing participants in the market
- Value added services – adapt our market leading service to the opportunities of smart metering

This will be supported by the digital and service improvements (further detail outlined in detail in Chapter 8).

### Table 32: Activities for improvement

| Area of improvement | Activities |
|---|---|

| | |
|---|---|
| **Digital** | • maintain and improve automated market integration,<br>• leveraging new Customer Interaction Management system opportunities<br>• smart metering opportunities including granular consumption data opportunities.<br>• utilising wider market data sets |
| **Service** | • joined-up approach across wholesale, retail, water and wastewater teams to deliver for business customers,<br>• enhancing continuous improvement through Performance Excellence<br>• Collaborating with retailers and the wider market to reduce market frictions and to support a fully functioning effective market delivering great outcomes for customers.<br>• Improve how we engage with retailers and NAVs during severe weather incidents including droughts. |

To improve our performance, we will grow the following services:

- New Appointment and Variations (NAVs)
  - We will establish a new billing solution for NAVs such that we will remain efficient and effective.
  - We will continue to provide an excellent service
  - We will explore opportunities for other value-added services building on our Water Network Emergency Agreement.

Subject to WRMP, we will also offer the following new services:

- Water efficiency (demand reduction) service
- Smart metering services

More detail on this subject can be found in **Smart Metering – Enhancement Case**

There are several risks to our delivery plans which should be noted, these are set out in more detail below.

Firstly, we will be operating at a base level for investment and are reliant on that investment being sufficient to adequately service the needs of Yorkshire businesses and to ensure our BR-MeX performance.

Secondly, our ability to support businesses in furthering their water efficiency wants and needs and achieve our BR-MeX ambition is reliant on sufficient funding for water efficiency services (Business Demand reduction), additionally BR-MeX performance has critical dependencies on water and wastewater operational components of service delivery.

Thirdly, it is essential that we keep pace with market developments and continue improving wholesaler service offerings to ensure our BR-MeX performance.

Lastly, the BR-MeX methodology has not been defined by Ofwat for AMP 8 as yet and as such presents unknow risks that we may well need to react to once the methodology has been determined.

## 10.9 Our incentive to deliver

### Table 33: Our incentive to deliver

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | TBC |
| **Incentive type** | TBC |
| **Price control allocation** | TBC |
| **ODI rate** | TBC |
| **Outperformance payment- standard** | TBC |
| **Underperformance payment - standard** | TBC |
| **Timing of underperformance and outperformance payments** | TBC |

## 10.10 Performance Possibilities

We will be operating at a base case investment however we will strive to achieve upper quartile performance in AMP8, we are confident given the levels of service achieved in AMP7 and our improvement plan for AMP8 that we can continue to deliver excellent service in AMP8.

We accept that in the early part of AMP8 there will be some disruption as new systems are introduced and we have accounted for this in our planning and will put robust governance and jeopardy management processes in place to mitigate any disruption.

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk and Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 10.11 Deadbands

The current definition of BR-MeX does not include deadbands.

## 10.12 Cap/Collars

Ofwat will be setting caps and collars at an individual and aggregate level at Draft Determinations. As such we have not proposed caps or collars as part of our plan.

# 11. Serious pollution incidents

## 11.1 PC Type

Environmental outcomes

## 11.2 Performance targets

### Table 34: Committed performance levels

| PR24_SPL | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | Number of serious pollution incidents | 0 | 0 | 0 | 0 | 0 |

## 11.3 Summary

This Performance Commitment incentivises Yorkshire Water to reduce total pollution incidents that impact the environment. By doing so, the health of the water environment and the ecosystem services that it delivers are safeguarded. Reducing pollution has long been a priority to us, and this has become more so during AMP7 with increased customer, political and media scrutiny. We are working hard to reduce overall pollution, with a special focus on ensuring we minimise those which can lead to serious impacts.

The PC is being introduced in AMP8, with the definition being aligned with the Environment Agency's serious pollution incidents metric set out in the water and sewerage company Environmental Performance Assessment (EPA) methodology version 9. The PC covers the number of Categories 1 and 2 pollution incidents in a calendar year from clean water and wastewater assets that affect the water environment. Unlike the Total Pollution Incidents PC, this measure is not normalised and instead is reported as absolute number of incidents.

In line with Ofwat's expectation on the level of performance for this PC as set out in the PR24 Final Methodology (Appendix 9, Table 4.2), Yorkshire Water is committed to driving for zero serious pollution incidents through AMP8.

Our Valuing Water Research showed that household customers view this PC as 4th highest priority for Yorkshire Water, while non-household customers view this PC as 3rd highest priority. This is understandable due to the impact of pollution incidents on the environment, especially Category 1 and 2 incidents.

This PC overlaps to some extent with the Total Pollution Incidents PC. However, the Total Pollution Incidents PC covers Categories 1 to 3 incidents for wastewater assets only.

The ODI rate for this PC is based on a Return on Regulated Equity (RoRE) approach developed by Ofwat. The ODI rate for this PC is £1.14m per serious pollution incident in 2022/23 CPIH prices.

## 11.4 Customer and Stakeholder Engagement

All our research and the current media scrutiny tells us that pollution is an important area to customers. It is an emotive failure that is unacceptable in the eyes of our customers. This is evident not more than ever as the health of the natural environment grows in importance in the wake of covid and resulting lockdowns. Indeed, our qualitative research as part of our affordability and acceptability testing found that in light of the coverage on pollution and the use of storm overflows, the priority of tackling issues relating to these areas was frequently mentioned.

Looking at research carried out by Ofwat/CCWater on customer preferences, we can see pollution is of medium importance to customers, when considering it within a wider list of performance commitment areas. However, the research found low awareness of pollution, which may have impacted importance ranking.

Our own Valuing Water research found pollution to be in the top priority category of failures to avoid for our customers here in Yorkshire. The research also reported that Yorkshire Water is 'expected to do the right thing in terms of protecting the environment and this is focused heavily on reducing sewage pollution and preventing problems through sufficient infrastructure investment'.

Our 2030 target to drive to zero serious pollution incidents was supported by our customers through our own affordability and acceptability research (outside of Ofwat guidelines), with 85% of our customers stating they were supportive of our ambition regarding performance commitments within our outcome of 'a healthy natural environment' and 79% finding our plan acceptable overall.

Read more about this in **Ofwat acceptability & affordability qualitative research**

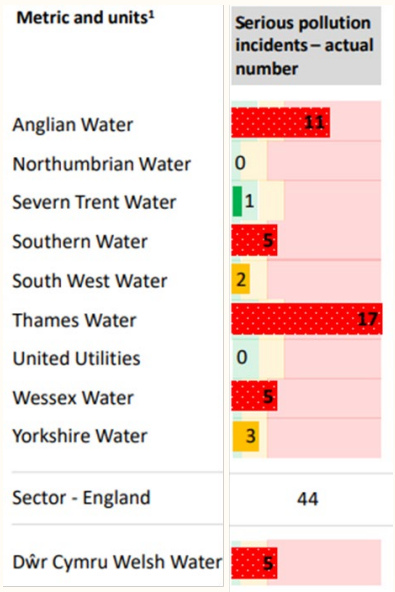
Read more about this in **Valuing water customer priorities research**

More detail on this subject can be found in **Chapter 6: Bills & Affordability**

## 11.5 Our performance to date

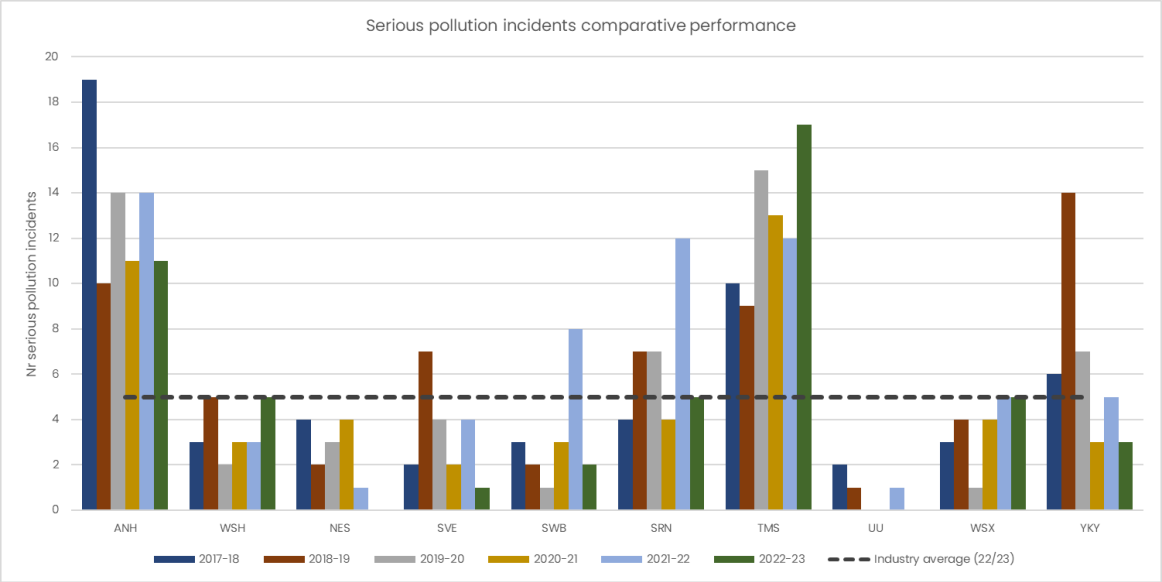
This PC has not been part of the suite of AMP7 Performance Commitments. Nevertheless, reducing the number of incidents of serious pollution is a high priority to us and our customers, with our performance on this measure being assessed and reported via the Environment Agency's water and sewerage company Environmental Performance Assessment. Our performance for 2022 is shown in Figure 25, which equals our best ever performance, but showing us still as amber for this metric.

**Figure 25: Overview of performance by company for serious pollution incidents**




Serious pollution performance has improved from AMP6 through AMP7, as with total pollution incidents, to better than the industry average in 2022/23 (see Figure 26). This performance contributed to a wider improvement to an EPA 3-star rating during this year.

### Figure 26: Company and industry performance over time




The key factors that have driven this improvement in AMP7 include:

- Improved ways to identify potential blockages in higher risk locations, through better understanding of our network using the Siemens blockage predictor.
- Ongoing audits of high-risk pumping station and rising main assets with associated investment in optimisation, monitoring and rehabilitation.
- Increased awareness of pollution response and mitigation within the operational teams, including e-learning, classroom and practical site-based exercises.
- Completion of thorough root cause analysis to stop repeat incidents and to enable trending to identify themes for wider improvement.
- Deployment of intelligent pump reversal to relieve blockages at pumping stations prior to any potential pollution.
- Dedicated combined sewer overflow maintenance team to ensure that planned maintenance is completed to schedule for these assets.
- Deployment of pressure sensors on rising mains to alert us and enable quick response to potential issues.
- For clean water incidents we have increased our monitoring, visibility, and awareness of high-risk water treatment works and improved processes for mitigation and resolution of any issues.

## 11.6 Setting the target

Current performance forecasts, investment plans and decision-making processes are based on current EPA methodology and interpretation, as set out by the Environment Agency at the time of business plan writing. The target for serious pollution incidents is zero. However, if there are any changes to this guidance or methodologies, this will require changes to our investment plans.

These potential changes include the following:

- Incidents from overflows (combined and settled storm overflows at WwTWs) that are satisfactory / permit compliant, deemed not to be having an unacceptable impact on the environment are non-reportable and not included in the reported pollution incidents. The proposed change could see overflows that are active in the absence of rainfall or still active 24 hours after the end of a rainfall event deemed as non-compliant, and therefore a reportable pollution incident.
- Any other changes to the Common Incident Classification Scheme (CICS) and 16_02

These potential changes could result in the pollution improvement plan activities somewhat volatile, so continued review will be required between Ofwat, the Environment Agency and water companies as we transition to AMP8.

### 11.6.1 How past company performance and industry performance have influenced PCLs set

Table 36 provides the company proposed targets for AMP8 for this serious pollution incidents.

**Table 35: Company proposed AMP8 target for serious pollution incidents**

| Number of serious pollution incidents | AMP8 | | | | |
|---|---|---|---|---|---|
| | 2025/26 | 2026/27 | 2027/28 | 2028/29 | 2029/30 |
| Company business plan proposed targets | 0 | 0 | 0 | 0 | 0 |

This performance commitment is new for AMP8, and therefore we do not have historical Ofwat data (e.g. PR19 determination figures) against which to compare our performance. However, section 1.1.5 highlights what we understand about industry performance through EPA data, and our comparison to this, and improvements through AMP6 and AMP7.

We are proposing a target of zero serious pollution incidents per year across AMP8. We will achieve this target through embedding our intelligent alarms process, focusing on rising mains, engaging early with communities on river health issues and through the design and implementation of new environmental management of change processes, as well as driving improvements in overall total pollution.

## 11.7 Our long-term ambitions

The long-term ambition for this PC is to continue to aim to have zero serious pollution incidents.

## 11.8 Social and environmental benefits

Reducing serious pollution incidents means better overall environmental performance, reducing the potential impact we have on the water environment from escapes of sewage from our wastewater assets and ensuring no impacting incidents through escapes from our treated water assets too. Through establishing our new River Health team, we endeavour to improve our relationships with key stakeholders and community groups to understand and improve in this critical performance area, especially for incidents could have serious impacts.

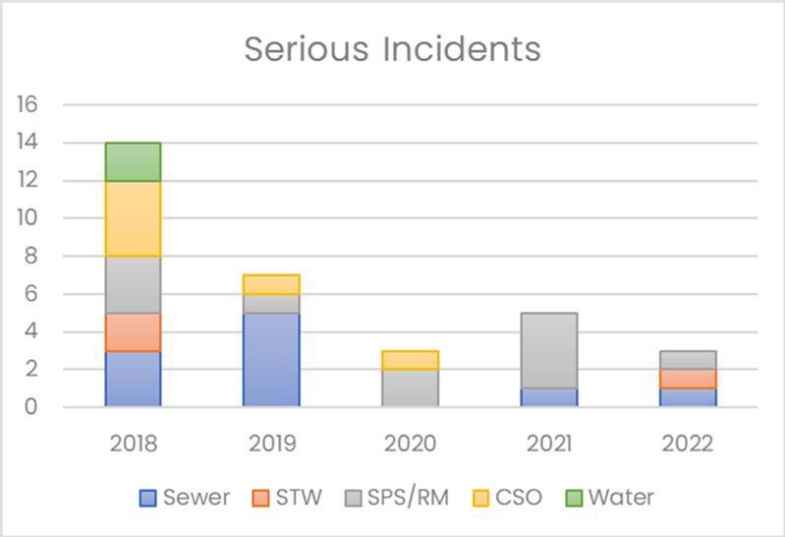
## 11.9 Our plans to deliver this commitment

One way we can reduce the likelihood of a serious environmental impact from a pollution event is to reduce overall total pollution incidents (see Section 0: Total pollution). We are focussed on delivering further improvements in performance for the remainder of AMP7 through our Pollution Incident Reduction Plan and pollution Recovery plan. The elements of these plans that will directly support achieving as close to zero serious incidents as possible include:

- Utilising industry best practice for incident investigation, including wider training and improved data gathering.
- Fully embedding into business-as-usual new processes around increased visibility in our network and at pumping stations and rising mains.
- Intelligent alarms linking flow to treatment to UMON monitoring flow to storm. Providing early indication of a serious pollution risk through premature discharge and allowing operational field teams to respond appropriately prior to environmental impact. A recent example of this was at Goathland WwTW in August 2023, when a screen restriction caused pre-mature spilling to the storm tanks. Due to the intelligent alarm, this issue was resolved prior to any environmental impact.
- Fully embedding the use of various blockage prediction software capabilities to proactively intervene on network blockages prior to causing impacting incidents.

Figure 27 shows our serious incidents over the last five years, by asset type. We used this understanding to determine the key areas in which to focus our investment.

**Figure 27: Breakdown of serious incidents over the past 5 years, by asset type**




As we move into AMP8 we will continue to evaluate the root causes of our pollution incidents and serious pollution incidents. Specifically for serious pollution, identifying any themes and targeting action can be challenging due to the small numbers involved, but we believe there are several key initiatives we can focus on to reduce the risk of serious pollution. These include:

- A specific focus on rising mains and pumping stations, which continue to be one of our main contributors to more serious pollution incidents. This will include increased inspection of high-risk mains and follow up rehabilitation/renewal and or installation of new sensors/air valves as required; as well as this we will embed new processes following our increased visibility of RMs and pumping stations through our AMP7 sensor deployment.
- Increased community engagement through our new River Health Department, to proactively work to identify any potential issues which could ultimately lead to a serious pollution at the earliest opportunity.
- Implementation of a new environmental Management of Change process.
- Continually monitoring risks and emerging risks posed by clean water production treatment assets through our Clean Water EPA DAG group, plus additional operational awareness training.
- Implementing the various initiatives outlined to deliver total pollution performance improvement to decrease overall numbers of serious incidents.

## 11.10 Our incentive to deliver

**Table 36: Summary of Incentives**

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Underperformance payments only |
| **Price control allocation** | TBD |
| **ODI rate** | £1.14m per serious pollution incident |
| **Underperformance payment - standard** | £1.14m per serious pollution incident |
| **Timing of underperformance and outperformance payments** | In-period |

## 11.11 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 11.12 Deadbands

Deadbands do not apply to this PC.

## 11.13 Cap/Collars

As set out in Ofwat's methodology for PR24 business plan submissions, no caps or collars will apply to this PC.

# 12. Total pollution incidents

## 12.1 PC Type:

Environmental outcomes

## 12.2 Performance targets

### Table 37: Committed performance levels

| PR24_POL | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | Number of incidents per 10,000 km of wastewater network | 16.58 | 14.72 | 12.86 | 10.98 | 9.13 |

## 12.3 Summary

This Performance Commitment incentivises Yorkshire Water to reduce total pollution incidents that impact the environment. By doing so, the health of the water environment and the ecosystem services that it delivers are safeguarded. Reducing pollution has long been a priority to us, and this has become more so during AMP7 with increased customer, political and media scrutiny. Our Valuing Water research showed that household customers view this PC as 4th highest priority for Yorkshire Water, while non-household customers view this PC as 3rd highest priority.

Because pollution is so important to our customers, during the 2025 – 2030 period we want to continue to improve our pollution performance, so we are proposing a stretching target of halving the number of total pollution incidents during the 2025 – 2030 period (by the end of the 2020 – 2025 period we are forecasting to achieve around a halving of the number of incidents when compared to 2019/20 outturn).

Read more about all of our engagement in **Chapter 6**

This is already a common PC in AMP7, with a common industry normalised target of 19.50 incidents per 10,000 kms of sewer at the end of AMP7. For PR24, the definition of this Performance Commitment is aligned with the total pollution incidents metric set out in the Environment Agency's water and sewerage company Environmental Performance Assessment methodology version 9. This covers the number of categories 1 to 3 pollution incidents from a water company sewerage assets, normalised per 10,000 kms of sewer length for which a water company is responsible.

All plans for this performance commitment set out within our base Totex plan are in line with current EPA methodology and interpretation, as set out by the Environment Agency at the time of business plan writing. Any changes to this guidance or methodologies will require review of the PCL and our performance expectations.

## 12.4 Customer and stakeholder engagement

All our research and the current media scrutiny tells us that pollution is an important area to customers. It is an emotive failure that is unacceptable in the eyes of our customers. This is evident more than ever as the health of the natural environment grows in importance. Indeed, our qualitative research as part of our affordability and acceptability testing found that in light of

the coverage on pollution and the use of storm overflows, the priority of tackling issues relating to these areas was frequently mentioned.

Our acceptability & affordability qualitative research also found that not meeting targets on pollution was 'inexcusable' and that the areas they would most like Yorkshire Water focus on was reducing pollution and leakage. Regarding pollution specifically, the report notes that "The main thing for customers is to see occurrences almost, if not mostly, eradicated entirely". The research found that this was particularly salient for household customers, and while NHH customers didn't report it as important for them from a business perspective, it was evident that the importance still resides with them from a personal customer perspective.

Our plan outlines an ambitious target for pollution, matching customers priorities, in our affordability and acceptability research conducted following Ofwat guidelines we showcased our planned target for pollution - 78% of customers found the plan to be acceptable and in our own independent affordability and acceptability testing research, 79% of customers found our overall plan to be acceptable including this target.

Looking at research carried out by Ofwat/CCWater on customer preferences, we can see pollution is of medium importance to customers, when considering it within a wider list of performance commitment areas. However, the research found low awareness of pollution and the feeling that pollution doesn't generally affect them on a day-to-day basis, which may have impacted importance ranking. While people felt strongly towards pollution, the general view was that this resulted from industrial malpractice, which, again will impact the importance placed on the performance commitment from a water company perspective.

Read more about this in **Ofwat/CCWater Customer Preferences Research**

Our own Valuing Water research found pollution to be in the top priority category of failures to avoid for our customers here in Yorkshire, supporting what we have heard in our affordability and acceptability qualitative testing. The Valuing Water research also reported that Yorkshire Water is 'expected to do the right thing in terms of protecting the environment and this is focused heavily on reducing sewage pollution and preventing problems through sufficient infrastructure investment'.

Our 2050 target to deliver zero serious pollution incidents was supported by our customers through our research on our long-term delivery strategy, with 69% of our customers stating they were supportive of our ambition regarding performance commitments across the area of 'supporting our natural environment'.

Read more about all of our engagement in **Chapter 6**

### 12.5 Our performance to date

Figure 28 and Figure 29 show the company's performance against the rest of the industry in 2022 and across time, respectively.

## Figure 28: Comparison of Yorkshire Water's performance for the last reported year 2022 against the wider industry

| Metric and units[1] | Total pollution incidents per 10,000km²(actual) |
|---|---|
| Anglian Water | 33 (255) |
| Northumbrian Water | 20 (60) |
| Severn Trent Water | 21 (193) |
| Southern Water | 90 (358) |
| South West Water | 62 (108) |
| Thames Water | 30 (331) |
| United Utilities | 16 (126) |
| Wessex Water | 31 (110) |
| Yorkshire Water | 22 (117) |
| Sector - England | 31 (1,658) |
| Dŵr Cymru Welsh Water | 25 (89) |

## Figure 29: A comparison of our performance over time against our industry peers

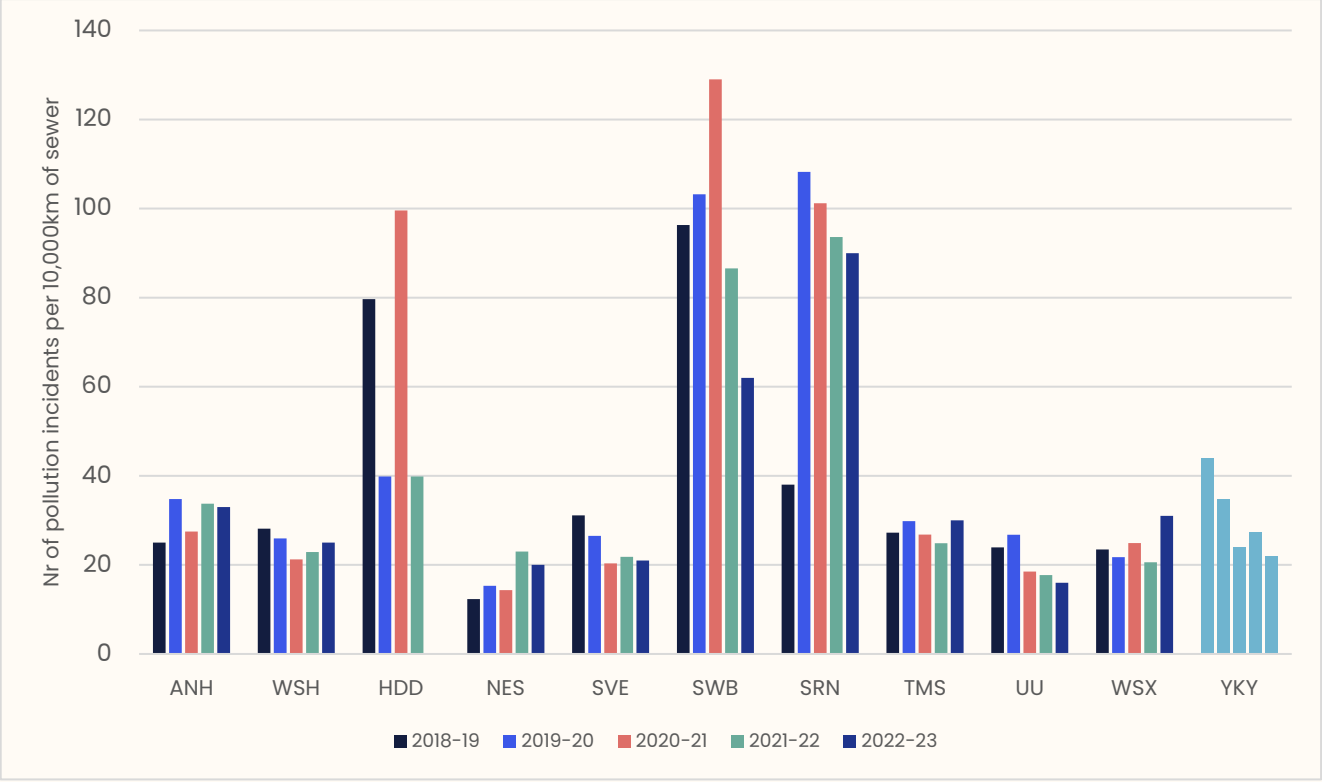
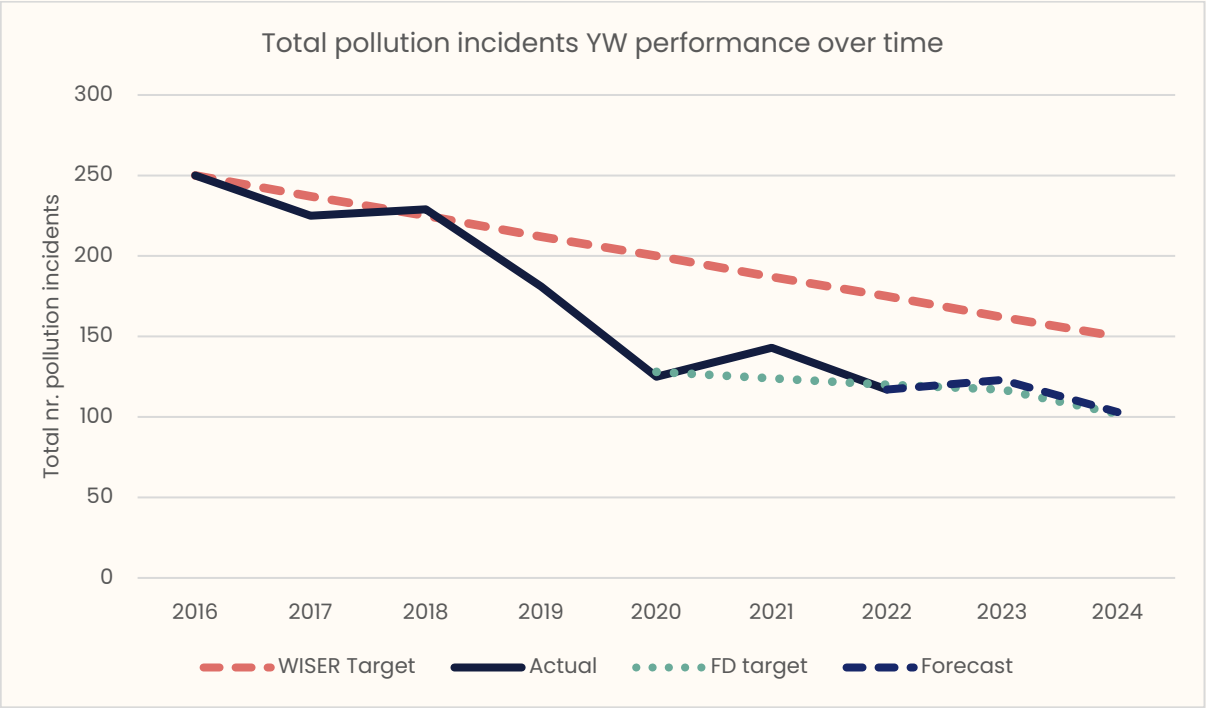



Figure 30 shows for YW the overall performance since 2016, with significant improvement over time. This is ahead of the WISER target, and we are projecting to achieve in line with our PR19 FD target by the end of AMP7.

**Figure 30: Yorkshire Water's performance since 2016 against both the PR19 targets and WISER**




This steady improvement in AMP7 has been in despite of the following:

- changes in the categorisation of pollution incidents under the responsibility of Yorkshire Water
- the inclusion of "assumed impact" against the count of number of incidents rather than actual impact as per the Common Incident Classification Scheme (CICS)
- an increase in "compliant incidents" which are incidents where all areas of the permit are being met but the EA deem that there is still an impacting pollution incident.

Yorkshire Water's targets were not re-baselined given these changes.

For the remainder of AMP7, we have developed our Pollution Incident Reduction Plan and performance recovery plans. The actions included in these include:

- More targeted levels of proactive maintenance on telemetered and un-telemetered assets.
- Increased use of intelligent alarm monitoring, “reach out” control and predictive capability.
- Proactive misconnection investigations in historically high yielding areas.
- Increased telemetry of Rising Mains to support fault identification.
- Utilising industry best practice for incident investigation.
- Increasing the productivity and effectiveness of operational resources via planning and scheduling.

In addition to these, we will:

- Be undertaking wider pollution training and awareness for colleagues across the business.
- Fully embed our capital and operational intervention and process changes from our transformation/modernisation programmes of work in AMP7.

In 2023 we have also set up a new River Health department, with a dedicated focus on driving operational and tactical improvements to reduce both pollution incidents and storm spills.

### Figure 31 SPS Case Study

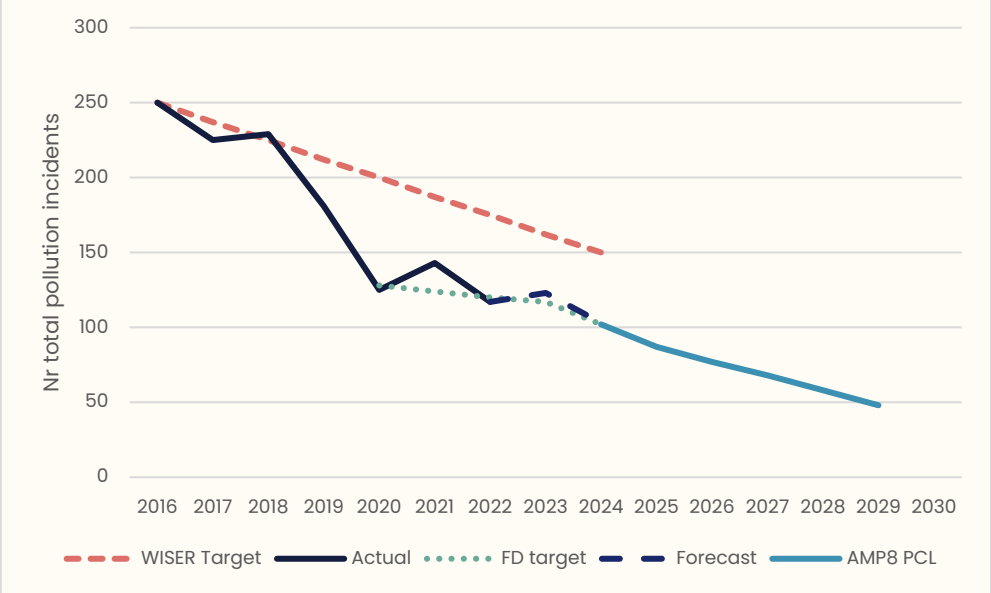
SPSs have been a keen focus of our modernisation programme, as blockages which are not resolved quickly, can lead to these assets causing pollution incidents. In AMP7 we are aiming to install Electrical Signal Analysis capability on around 80% of our SPS assets, which will give early warning of an issue, and allow intervention swiftly, preventing pollution to the environment. The photo shows one example of items removed from an SPS, following the data identifying an issue and the required activity initiated to resolve.

The learning from the implementation of the recent recovery plans and our revised PIRP has fed into our development of the AMP8 activities and initiatives to be delivered to continue to drive improvement.

## 12.6 Setting the target

Our target for AMP8 is for a continued reduction in total pollution incidents by around a further 51% from AMP7 outturn levels, as shown in Figure 32: Historic and Forecast AMP8 performance levels for total pollution incidents.

### Figure 32: Historic and Forecast AMP8 performance levels for total pollution incidents




Performance forecasts, investment plans and decision-making processes are based on current EPA methodology and interpretation, as set out by the Environment Agency at the time of business plan writing. We are forecasting to achieve industry upper quartile calculated performance by the end of AMP8. However, if there are any changes to this guidance or methodologies, this will require review of the PCL and our performance expectations as well as corresponding investment plans.

These potential changes include the following:

- incidents from overflows, combined and settled storm overflows at wastewater treatment works (WwTWs) that are satisfactory / permit compliant, deemed not to be having an unacceptable impact on the environment are non-reportable and not included in the reported pollution incidents. Changes could see overflows that are active in the absence of rainfall or still active 24 hours after the end of a rainfall event deemed as non-compliant, and therefore a reportable pollution incident.
- Any other changes to the Common Incident Classification Scheme (CICS) and 16_02
- Changes to include Category 3 incidents from water assets within the pollution reporting.
- AMP8 will see the start of the deployment of continuous water quality monitoring. The impact that real time data will have on pollution performance is unknown at present, but we are working on how this can be quantified and will continue to engage with national groups on this matter.

These changes could make the pollution improvement plan activities somewhat volatile, so continued review will be required between Ofwat, the Environment Agency and water companies as we transition to AMP8.

We are engaged in industry wide Task and Finish groups to understand potential and extent of impact, for dry day spills for example. We believe we could be disproportionally impacted due to our exogenous factors such as rainfall, number of overflows and combined sewer length.

### 12.6.1 How past company and industry performance have influenced PCLs set

Table 39 provides both the industry and company actuals and forecasts for the pollution incidents performance commitment for both AMP7 and AMP8, as well as the PR19 final determination for this performance commitment.

**Table 38: Industry and company actuals and forecasts and PR19 final determination for pollution incidents**

| Number of pollution incidents per 10,000 km of wastewater network | AMP7 | | | | | AMP8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2020 /21 | 2021 /22 | 2022 /23 | 2023 /24 | 2024 /25 | 2025 /26 | 2026 /27 | 2027 /28 | 2028 /29 | 2029 /20 |
| **PR19 final determination** | 24.51 | 23.74 | 23.00 | 22.40 | 19.50 | | | | | |
| **Industry upper quartile actuals and *arithmetic forecast*** | 20.81 | 22.10 | 21.07 | ***19.33*** | ***17.55*** | ***15.48*** | ***13.19*** | ***11.45*** | ***9.94*** | ***8.64*** |
| **Industry average actuals and *arithmetic forecast*** | 32.41 | 37.25 | 35.11 | ***30.66*** | ***27.17*** | ***24.39*** | ***22.14*** | ***20.30*** | ***18.78*** | ***17.51*** |
| **Company actuals, *arithmetic forecast and business plan proposed targets*** | 23.92 | 27.36 | 22.39 | ***23.53*** | ***18.56*** | ***16.58*** | ***14.72*** | ***12.86*** | ***10.98*** | ***9.13*** |

As can be seen in Table 39, our blind forecast for Year 4 and 5 are 23.53 and 18.56 per 10,000 km of sewer length. And during AMP7, with the exception of years 2 and 4, we have or are forecast to outperform the targets that were set at PR19. We have or are forecast to exceed the performance of the industry average, and our performance is close to the upper quartile with the gap between our performance and the industry average closing by the end of AMP7.

For AMP8, we are proposing a stretching target of 16.58 incidents per 10,000 km of sewer length in year 1, improving to 9.13 incidents per 10,000 km of sewer length. This will be

achieved through an enhanced asset maintenance system, through an improvement in operational capability, through TotEx investment, and through a more joined-up approach to improving our rivers.

## 12.7 Our long-term ambitions

Improving pollution performance and reducing our potential impact on the water environment will continue to be a high priority post AMP8. By the end of AMP10 (2040) we are forecasting to achieve a total pollution performance of 3.76 incidents per 10,000km of sewer network (30 incidents), with further improvements to zero incidents by the end of AMP12 (2050). Our overall long-term targets are shown in Table 40: Our long-term ambitions.

### Table 39: Our long-term ambitions

| Units | AMP8 | AMP9 | AMP10 | AMP11 | AMP12 |
|---|---|---|---|---|---|
| **No. incidents per 10,000km of sewer length** | 9.13 | 5.65 | 3.76 | 1.88 | 0 |

We will continue to assess and invest in the best available technologies for proactively and pre-emptively managing our sewer network, pumping stations, rising mains and wastewater and water treatment works processes, to prevent escapes into the water environment.

## 12.8 Social and environmental benefits

Reducing total pollution incidents means better overall environmental performance, reducing the potential impact we have on the water environment from escapes of sewage from our assets. Through establishing our new River Health team, we endeavour to improve our relationships with key stakeholders and community groups to understand and improve in this critical performance area and identify interventions proactively.

## 12.9 Our plans to deliver this commitment

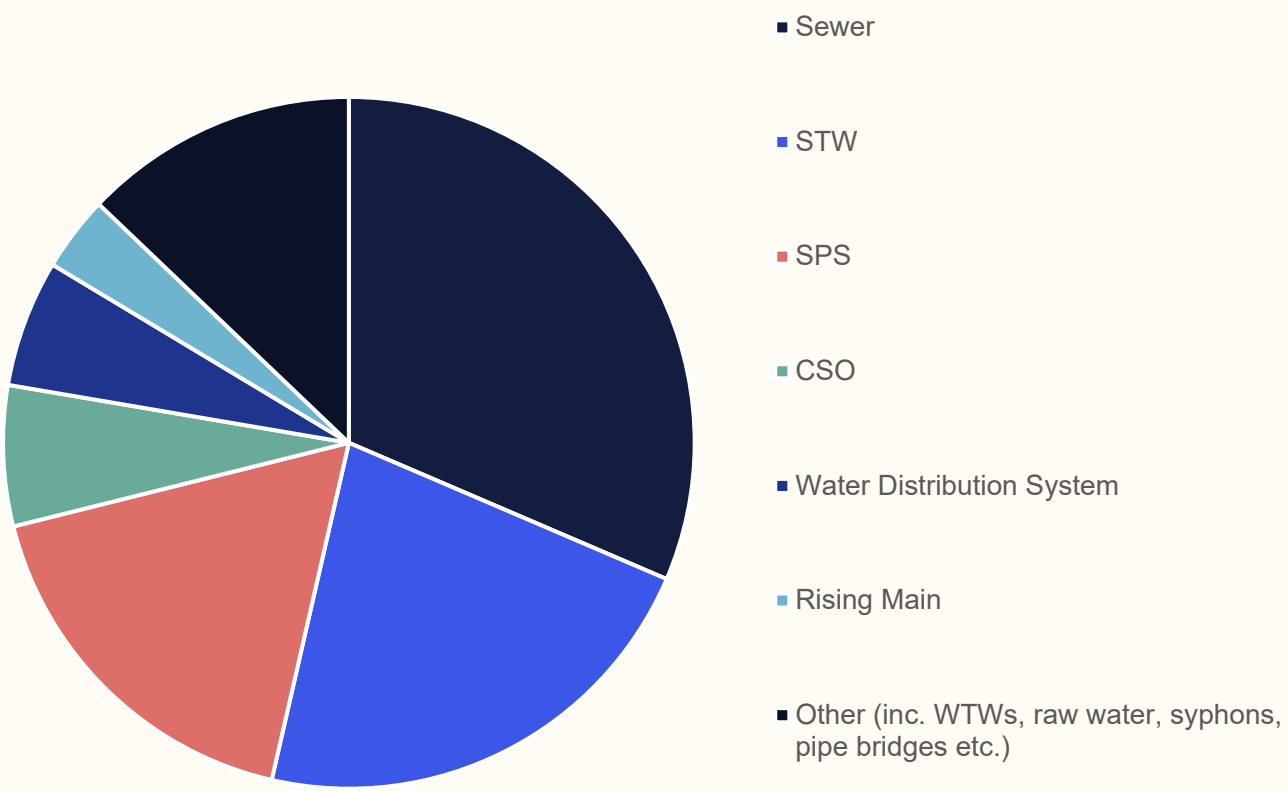
Targeting our Totex interventions in the right activities and at the right locations will be critical in driving continued pollution reduction through AMP8.

How we plan on reducing our overall pollution incidents can be summarised into five key theme areas:

1. Better asset maintenance – We will deliver enhanced asset maintenance through our new maintenance system, improving the health and resilience of our assets.
2. Improved visibility & central intelligence – Improved asset performance data and enhanced analytical capabilities will allow us to better predict failure and allow response before any environmental impact.
3. Operational capability – We will continue to invest in the training and development of our operational teams to ensure an effective operational response for both planned and reactive work. We will have a dedicated, specialist resource that will enable a swift, high-quality response to all pollution incidents.
4. Totex investment – Through improved asset intelligence, we will target investment where it is most needed to drive resilient performance at best whole life cost. We will deliver a blend of tried and tested techniques and new innovative approaches informed by industry best practice.
5. River health approach – We will take a more joined-up approach to improving our rivers, working closely with stakeholders and community groups.

We know that the key asset types which lead to the majority of our pollution incidents (close to 75% of the total) are the sewer network, wastewater treatment works and sewage pumping stations, as can be seen in Figure 33.

**Figure 33: Breakdown of proportion of pollution incidents by source asset (AMP7)**




We continually learn from our incidents through thorough root cause analyses, to ensure we continue to target the right type of investment and enabling activities such as business process improvements (e.g. training).

More specifically, our proactive and pre-emptive approach to managing the sewer network, SPSs, and rising mains will be expanded through an extensive programme of visibility and targeted operational interventions including:

- Installation of 20,000+ monitors in sewers/manholes deemed at a higher risk of pollution coupled with sewer cleansing teams deployed where monitors show risk of pollution event occurring. We will move from more manual analytical techniques to use machine learning to integrate these sensors into a wider system view (e.g. through wider use of Siemens blockage predictor or Stormharvester). We will implement learning from our AMP7 Smart wastewater networks work in the Ilkley and Holbeck catchments.
- Ongoing activity to improve customer awareness of impacts of their behaviour on flooding and pollution, the scale and extent of which will be determined following review of recent “Learning and recommendations from customer behaviour campaigns on blockage reduction (SW01F201)” UKWIR study.
- Targeted inspection of high-risk rising mains with follow-up repair / maintenance activity, including installation of air valves and or pressure monitors where appropriate.
- Smarter SPS management - predictive analytics using AMP7 improved data; ensuring that data is used in the most effective way possible, including our extensive Electrical Signal Analysis capability.
- Adopting a more targeted approach to SPS cleaning, tackling higher risk SPSs based on material entering, and refining this programme following assessment of installation of

pump reversal capabilities in AMP7 (aim to visit 50% of higher risk sites on a continuous basis).
- Power resilience assessments at highest risk SPS assets (circa 30 sites), with improvements to increase power resilience and start up (following “brown-outs” where identified) following pumps failing to restart after power outage/dip.

We will also combine this with further activity on our WwTWTs including:

- Improved / refurbished sludge handling capacity at some of our smaller more rural activated sludge treatment works, which can carry excess biological sludge solids which risks performance degradation through the growth of ‘filamentous’ or poor settling sludges to reduce the risk of sludge blanket loss.
- Rationalisation of legacy, non-standard control regimes at medium sized activated sludge plant sites to allow enhanced monitoring and control, leading to remote cause determination, potential remote resolution and improved operational effectiveness.
- Targeted programme of investment for civil structures, screens and detritors which are beyond their useful life and subject to increased reactive maintenance intervention and increased mitigation measures. Further to this, other critical treatment process components such as UV systems and inlet and interstage pumps will also receive a heightened focus of planned proactive maintenance in AMP8.
- Improved power resilience of critical assets on smaller WwTWs through the installation of smart generators.
- Expanded monitoring of third-party, high-risk trade discharges if issues are identified.

Pollution processes continuous improvement is fundamental to our plans, with key enabling activities including:

- Continued improvement to root cause analysis of incidents and learning (including engagement with other water companies and at national groups).
- New River Health department with dedicated River Health Strategy and more specific Incident Management roles.
- Revised target operating model with a dedicated operational pollution response resource (as opposed to multi-skilled teams) to ensure deployment of right expertise with the right training and equipment to resolve issues quickly and efficiently.
- Intelligent, data-based approach to network maintenance using asset condition, incident history, proximity to water course, job history and weather data etc.
- Embedding new processes from our significant programmes of transformation/ modernisation investment in in AMP7 including Intelligent Pump Reversal and Electrical Signature Analysis.

For each of the above key areas of focus we will establish a robust benefit monitoring and realisation framework to ensure that we are on track to deliver the improvements outlined. We will be responsive to the benefits monitoring framework and other external factors and will adapt our programme as our insight into the effectiveness of each initiative improves.

## 12.10 Our incentive to deliver

### Table 40: Outperformance and underperformance payments

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Outperformance and underperformance payments |
| **Price control allocation** | 100% wastewater network plus |
| **ODI rate** | £1.18m per pollution incident per 10,000km of sewer length |
| **Outperformance payment- standard** | £1.18m per pollution incident per 10,000km of sewer length |
| **Outperformance payment- enhanced** | £2.36m per pollution incident per 10,000km of sewer length |
| **Underperformance payment - standard** | £1.18m per pollution incident per 10,000km of sewer length |
| **Timing of underperformance and outperformance payments** | In-period |

## 12.11 Outperformance and underperformance payments

The ODI rate for this PC is £1.18m per pollution incident per 10,000km of sewer length connections. These values were provided to Yorkshire Water by Ofwat on 23 June and are in financial year 2022/23 values.

Yorkshire Water is not proposing a different ODI rate from that proposed by Ofwat.

## 12.12 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk and Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 12.13 Deadbands

Deadbands do not apply to this PC.

## 12.14 Cap/Collars

As per the methodology set out by Ofwat for the submission of business plans for PR24, no caps and collars will apply to this PC.

# 13. Bathing Water Quality

## 13.1 PC Type

Environmental outcomes

## 13.2 Performance targets

### Table 41 - Proposed AMP8 Performance Commitment Levels

| PR24_BWQ | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | % | 73.5 | 73.5 | 73.5 | 82.3 | 82.3 |

## 13.3 AMP 8 Performance Commitment

The bathing water quality performance commitment focusses on improving the water quality at designated bathing waters. This supports public health protection through improved water quality as well as supporting the provision of public information at designated bathing waters. By improving bathing water quality, coastal and inland environments will be enhanced and support the development of further economic, social, and environmental value in these areas.

We have previously had bespoke bathing water performance commitments; however, AMP8 introduces a new common performance commitment with company specific targets. The AMP8 bathing water performance commitment is a new common performance commitment for AMP8 and is calculated as a single overall average 'score' for bathing water quality as follows:

$$\frac{\sum_i Weighting + number\ of\ bathing\ waters\ that\ meet\ the\ classification}{Number\ of\ bathing\ waters\ in\ the\ company\ area}$$

where:

i = bathing water classification which can be excellent, good, sufficient or poor.

The relevant weightings are 100% for excellent classification, 66% for good classification, 33% for sufficient classification and 0% for a poor classification.

For the performance commitment, classifications for eligible bathing waters will be consistent with the classification of that water by the Environment Agency, save regarding short term pollution. Samples taken during short term pollution will be included when determining classification, irrespective of whether these have been disregarded in the Environment Agency's classification.

If a bathing water is closed and sampling cannot be undertaken, the most recent classification will apply. If an eligible bathing water is de-designated during the period, it will continue to be included in calculating the average score and will be given a weighting based on the last classification it received. Any additional bathing waters, newly designated during the 2025-30 period, will not be eligible for the purpose of calculating performance against this performance commitment.

The performance commitment is based on eligible bathing waters as designated by the Environment Agency at the time of PR24 final determinations.

### 13.3.1 The Bathing Water Regulations

Bathing water quality is legislated under the Bathing Water Regulations 2013. This legislation aims to protect and improve bathing water quality to protect public health and improve the public information available at these designated waters.

Under the Regulations, applications can be made to designate recreational waters as formal bathing waters. Where a designation exists, the Environment Agency (EA) must monitor the water for faecal indicator organisms (FIOs), specifically Escherichia coli (E. coli) and Intestinal enterococci (IE) throughout the duration of the bathing water season (May – September).

Following the bathing water monitoring, an annual classification based on the previous four years data must be published to advise the public on the bathing water quality at each designated bathing water. The four classifications are:

- Excellent
- Good
- Sufficient
- Poor

Each year, signage must be displayed by the local authority to inform the public of the bathing water classification at each designated bathing water.

### 13.3.2 Factors Impacting Bathing Water Quality

Bathing waters are highly complex and can be impacted by numerous factors, as summarised in Figure 34 below:

**Figure 34: Factors which can impact bathing water quality**


Influences on bathing water quality include sewerage infrastructure, meteorological conditions, surface run off, traders and agriculture, local wildlife, and beach usage.

- Sewerage infrastructure can impact bathing water quality through treated final effluent discharges, storm overflows, and misconnections in networks where waste connections from a property may be connected directly to a surface water sewer or watercourse.
- Meteorological conditions can impact bathing water quality through numerous factors including the levels of natural ultraviolet (UV) light emitted and levels of rainfall.
- Surface runoff can increase the level of faecal indicator bacteria which can run off the land.

- Traders and agriculture can both directly impact bathing water quality as a source of bacteria, for example, as a by-product of trade waste processes or directly from livestock.
- Local wildlife and beach usage may also impact bathing water quality through direct input of bacteria into the waterbody, for example, dog waste or recreational use of the beach such as by donkeys.

All of these factors have the ability to impact the water quality and therefore the annual classifications issued under the regulations.

### 13.4 Customer and Stakeholder Engagement

We carry out extensive engagement with our customers, communities and stakeholders. Information on our engagement approach can be found in Chapter 6, but specific customer engagement related to bathing water quality can be found below.

More detail on this subject can be found in **Chapter 6: Customer and Stakeholder Engagement**

Through the Ofwat/CCWater customer preferences research, we understand that bathing water quality is ranked in the lowest group in terms of priority when considered across the range of performance commitments. The report found that people had a high level of trust in relation to bathing water safety and felt it was easy to avoid where bathing water was deemed to be questionable. While many recognised the potential health consequences of swimming in low quality bathing waters, individuals felt that this was minor and likely only to affect a very small number of individuals.

Read more about this in **Ofwat/CCWater customer preference research**

However, in contrast, in our own valuing water customer priority research treating wastewater to a high standard to ensure good quality water in Yorkshire's rivers and beaches, was considered in the top 6 priority service areas for both household and non-household customers when considered alongside 27 other priorities. In addition to this, reducing storm overflow spills and reducing pollution also sat in the top teir priorities for our customers suggesting that protcting the natural environment was a high priority area.

Read more about this in **Valuing Water Customer Priorities Research**

An example of a specific piece of customer engagement carried out on bathing waters was in our research to explore customer views on designated bathing water sites. We used our online community in August 2022 to test customer views on supporting the statutory obligations we have at bathing sites in our regions, but also support for optional investigations to go beyond our statutory obligations. The research supported our valuing water research that this area was one of importance, and this was particularly salient for those that live near designated and non-designated bathing water sites. The online community supported going above and beyond statutory obligations, with 86% of people agreeing that investigations should be carried out at both coastal and inland sites, with 70% of people willing to pay for improvements in this area.

In our own affordability and acceptability testing research (our own independent study, outside of Ofwat guidelines), we informed customers that by 2030 our plan is to have no bathing water impacted by our operations - 5 years ahead of target. The vast majority of customers supported our plan – 79% of customers found our plan acceptable.

Read more about this in
**Exploring customer views on Designated Bathing Water sites**

## 13.5 Our performance to date

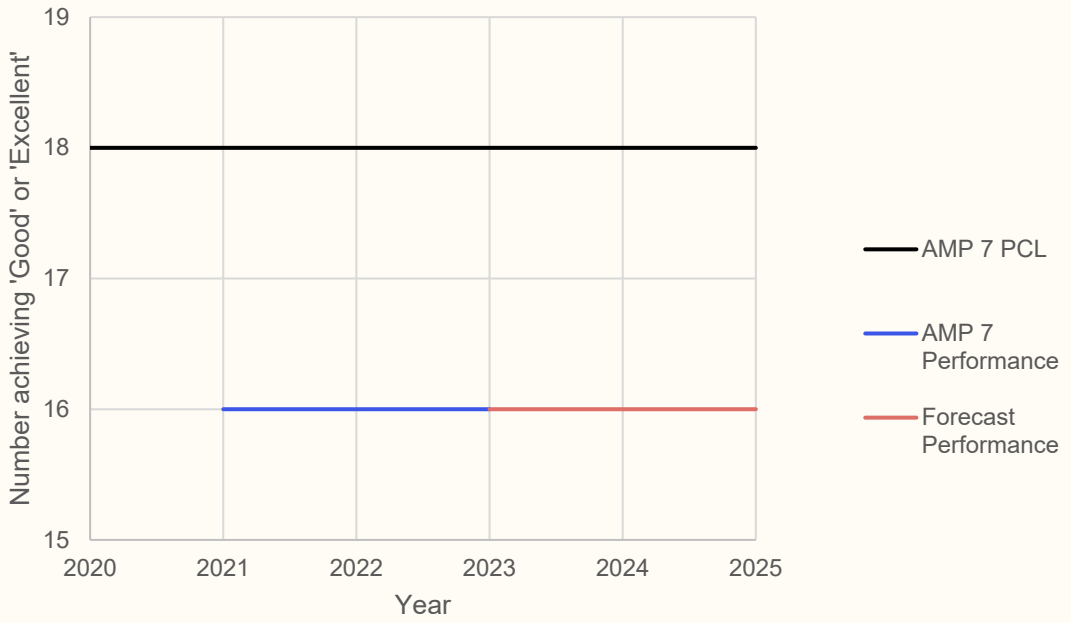
### 13.5.1 AMP 7 Bathing Water Quality Performance Commitment

In AMP 7, we have had a bespoke bathing water performance commitment to measure the number of designated bathing waters which exceed the European Union Bathing Water Directive requirements in the 2020-2025 period, as reported by Defra. The designated bathing waters included in our AMP 7 performance commitment are:

1. Bridlington North Beach;
2. Bridlington South Beach;
3. Cayton Bay;
4. Danes Dyke;
5. Filey;
6. Flamborough South Landing;
7. Fraisthorpe;
8. Hornsea;
9. Reighton;
10. Robin Hoods Bay;
11. Runswick Bay;
12. Sandsend;
13. Scarborough North Bay;
14. Scarborough South Bay;
15. Skipsea;
16. Tunstall;
17. Whitby;
18. Wilsthorpe; and
19. Withernsea

Our performance against the AMP 7 definition is detailed in Figure 35 below:

**Figure 35: AMP7 Bathing Water Performance Commitment**




Due to Covid-19 restrictions in 2020, there was no data available to report against the performance commitment in year 1. Since 2021, we have had 16 of 19 designated coastal bathing waters achieve ‘Good’ or ‘Excellent’ classification and forecast this performance level to continue through to 2025. This performance falls below our AMP 7 performance commitment level and has been subject to an underperformance payment of £1.235 million per bathing water per year, for any bathing waters performing under our performance commitment level.

The three bathing waters which have not achieved ‘Good’ or ‘Excellent’ standard are Bridlington South Beach, Scarborough South Bay and Tunstall. Bridlington South and Scarborough South were both ‘Sufficient’ in 2021, dropping to ‘Poor’ in 2022 and remain complex bathing waters. We are working closely with the Yorkshire Bathing Water Partnership to continue to investigate the complexities and sources of faecal indicator organisms at these bathing waters, and remain committed to improving bathing water quality at these locations. Tunstall, a historically performing ‘Excellent’ bathing waters, has been ‘closed’ for the duration of the AMP 7 due to significant coastal erosion and therefore this has not achieved ‘Good’ or ‘Excellent’ status. In 2023, Tunstall has been de-designated as a bathing water and therefore will not impact performance through to AMP 8.

### 13.5.2 AMP 8 Bathing Water Quality Performance Commitment

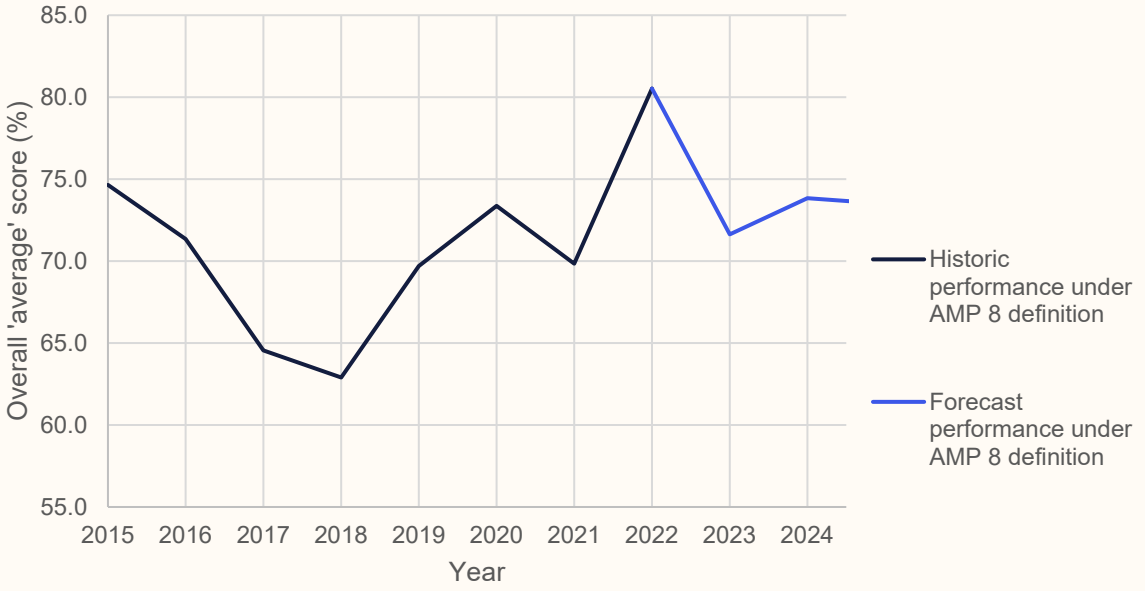
We have also assessed our historic performance against the AMP 8 performance commitment definition as shown in

below. For this assessment, we have used the principles set out in the performance commitment definition above. For the purposes of these classifications, this includes:

- Including short term pollution samples, historically discounted by the Environment Agency within the calculations.
- Assigning Staithes a weighting of 0%/Poor for the remainder of AMP 6 following on from its de-designation in 2015
- Assigning Tunstall a weighting of 100%/Excellent for the remainder of AMP 6 and AMP 7 following on from its closure and last classification in 2018
- Assigning all designated bathing waters their 2019 weighting/classification in 2020 due to the lack of sampling and classifications from Covid-19 restrictions, with the exception of Staithes which is removed from reporting figures at the start of AMP 7 due to its de-designation within the AMP 6 period.
- Not including the Wharfe at Cromwheel, Ilkley’s classification in AMP 7 assessments due to its designation within the AMP 7 period.

also forecasts our bathing water performance for the remainder of AMP 7 under the AMP 8 definition.

**Figure 36: Historic and forecast bathing water performance under the AMP8 performance commitment definition.**




When comparing our AMP7 performance against the AMP 7 and AMP 8 performance commitment definition, our performance under the AMP 8 definition is less stable. As discussed in Section 13.3.2, bathing waters are complex, and their quality can be impacted by various sources of bacteria. Due to these complexities, we have a number of bathing waters, which, although they exceed the 'Sufficient' standard as required in our AMP 7 definition, their performance can vary between 'Good' and 'Excellent' status, leading to the variability under the AMP 8 performance commitment definition.

These complexities and the numerous factors which can impact on bathing water quality means the future performance of bathing waters can be challenging to predict. Our year 4 performance (71.6%) has been forecast on the year-to-date data available (covering the three preceding years and the 2023 bathing water season samples to date up to 18th August 2023). Our year 5 performance (73.8%) is based upon an average for each of the classifications across the preceding years.

From our historic work on improving bathing water quality, we know that working in partnership is essential for improving and maintaining bathing water quality. We form part of the Yorkshire Bathing Water Partnership alongside the Environment Agency, North Yorkshire Council and East Riding of Yorkshire Council. Our AMP 5 bathing water improvement plans were supported by the Yorkshire Bathing Water Partnership and we worked closely with our partners to minimise disruption to the coast, improve bathing water quality as well as support the improvement of coastal facilities.

We have continued to work in partnership since our AMP 5 works. For example, we have supported the launch of the 'Do your bit' campaign. This campaign, originally launched in 2019 is still promoted at designated bathing waters across Yorkshire today. It is an education and engagement campaign to raise awareness of the behavioural factors which can impact on bathing water quality e.g., feeding seabirds, dog waste, sanitary disposal, and litter. We have supported the partnership with promotional materials, expanding the campaign to sanitary disposal units across North Yorkshire and through promotional activity on social media.

We have one designated inland bathing water, the River Wharfe at Cromwheel, Ilkley, which was designated in December 2020. Partnership is also essential for delivering improvements to this bathing water. Since the designation of the River Wharfe, we have worked closely with the Yorkshire Dales Rivers Trust, the CaBa catchment host for Dales to Vales Rivers Network. We have supported the iWharfe project, designed to investigate and improve the bathing water quality. This project originated as a citizens science project prior to the bathing water

designation, to collect water quality samples and raise awareness along the River Wharfe. The project has now evolved and whilst in continues to engage with citizen science it also includes engagement with communities, landowners and the agricultural industry across the catchment and the identification and implementation of improvements.

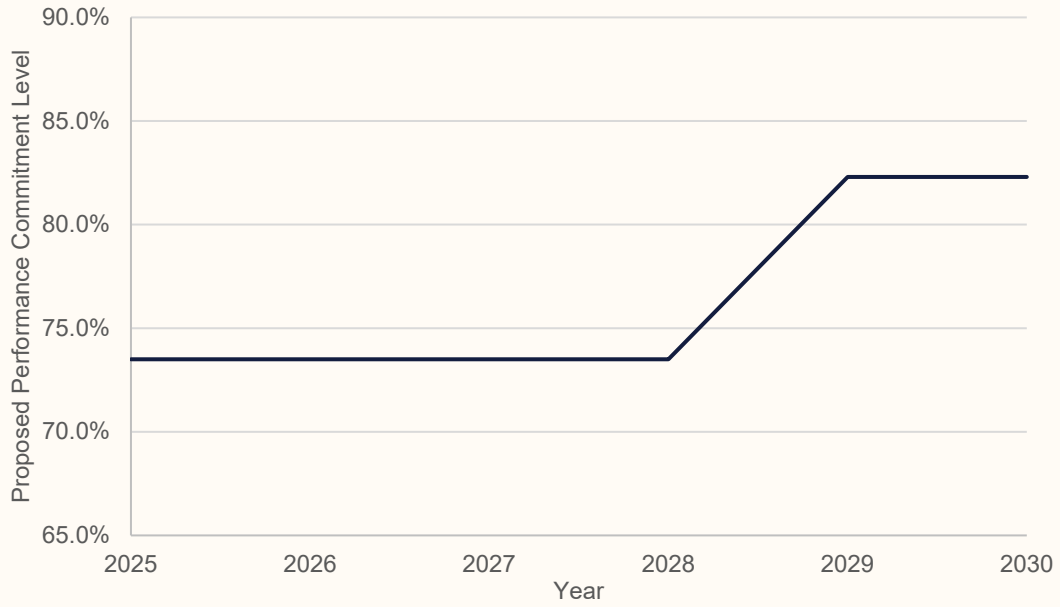
## 13.6 Setting the target

The bathing water performance commitment is a common performance commitment for AMP 8, with a company specific performance commitment level. For the AMP8 bathing water performance commitment, we are proposing the following performance commitment levels as shown in
Table 43 and Figure 37.

**Table 42: Proposed performance commitment levels**

| Year | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
|---|---|---|---|---|---|
| **Performance Commitment Level (%)** | 73.5% | 73.5% | 73.5% | 82.3% | 82.3% |

**Figure 37: AMP8 Bathing Water Proposed Performance Commitment Levels**




Although under the Ofwat performance commitment calculation, our performance in 2022 was 80.5%, we are proposing a PCL of 73.5% for years 1-3, increasing to 82.3% in years 4 and 5. We consider this a challenging target when assessing our historic performance. This performance commitment level reflects numerous considerations including bathing water designation changes, calculation methodologies and historic expenditure and performance. These are explained in greater detail below.

### 13.6.1 Setting the Target - Bathing Water Designation Changes

During AMP 7, we have had the designation of one new bathing water (the River Wharfe at Cromwheel, Ilkley) and the de-designation of one of our coastal bathing waters (Tunstall). The River Wharfe at Ilkley has been classified as ‘Poor’ since its designation, and Tunstall had historically been classified as ‘Excellent’. When assessing our performance, we have considered our AMP 7 performance in line with the Ofwat definition, but also reflected these designation changes in our assessment. This can be found in Table 44 below:

### Table 43: Comparison of AMP7 performance with Ilkley and Tunstall adjustments

| Year | AMP 7 Performance | AMP 7 Performance (Ilkley and Tunstall adjusted) |
|---|---|---|
| **2020** | 73.4% | 71.9% |
| **2021** | 69.8% | 64.6% |
| **2022** | 80.5% | 75.3% |
| **Average performance** | 74.6% | 70.6% |

As these designation changes have taken place within AMP 7 and align to our expected designation entry point for AMP 8, we have utilised the adjusted AMP 7 performance when setting our performance commitment level.

### 13.6.2 Setting the Target – Calculation Methodologies

When comparing the Bathing Water Regulation classifications with the Ofwat classification methodology, from 2015 to 2022, three of our designated bathing waters drop a classification in 50% of the available dataset. These are Bridlington North Beach, Robin Hoods Bay and Runswick Bay as highlighted in Table 45 below:

### Table 44: Differences between Defra classification methodology and Ofwat classification methodology

| Designated Bathing Water | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | No. of differences | % of years with difference |
|---|---|---|---|---|---|---|---|---|---|---|
| **Bridlington North Beach** | | | Difference | Difference | Difference | | Difference | | 4 | 50 |
| **Bridlington South Beach** | | | | | | | Difference | | 1 | 13 |
| **Cayton Bay** | | | | | | | | | 0 | 0 |
| **Danes Dyke, Flamborough** | | | | | | | | | 0 | 0 |
| **Filey** | | | | | | | | | 0 | 0 |
| **Flamborough South Landing** | | | | | | | Difference | | 1 | 13 |
| **Fraisthorpe** | | | | | | | | | 0 | 0 |
| **Hornsea** | | | | | | | | | 0 | 0 |
| **Reighton** | | | | | | | | | 0 | 0 |
| **Robin Hoods Bay** | Difference | Difference | | | Difference | | Difference | | 4 | 50 |
| **Runswick Bay** | Difference | Difference | Difference | Difference | | | | | 4 | 50 |
| **Sandsend** | | Difference | | | | | | | 1 | 13 |
| **Scarborough North Bay** | | | | | | | | | 0 | 0 |
| **Scarborough South Bay** | | Difference | | | | | | | 1 | 13 |
| **Skipsea** | | | | | | | | | 0 | 0 |
| **Staithes** | | | | | | | | | 0 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Tunstall** | | | | | | | | | 0 | 0 |
| **Wharfe at Cromwheel, Ilkley** | | | | | | | | | 0 | 0 |
| **Whitby** | | | | | | | | | 0 | 0 |
| **Wilsthorpe** | | | | | | | | | 0 | 0 |
| **Withernsea** | | | | | | | | | 0 | 0 |

We accept Ofwat's intention for performance to be reflective of customer's experiences at designated bathing waters through their AMP 8 methodology. However, due to our historic funding and performance being aligned to the classification methodology utilised by Defra as set out in the Bathing Water Regulations, 2013, we have adjusted our current (2022, Tunstall and Ilkley adjusted) performance level of 75.3% to include an allowance for this. We have included an allowance for one of the three designated bathing waters to be impacted by the inclusion of short-term pollution samples in Years 1-3 and propose therefore propose a performance commitment level of 73.5%.

### 13.6.3 Setting the Target - Historic Expenditure and Performance:

In AMP 6 and 7 we have had limited enhancement expenditure to improve bathing water quality and our performance has been maintained through base. In our business plan submission and as set out in detail below, we are proposing bathing water quality investment through both base and enhancement. As bathing water classifications are calculated on four years rolling data, our proposed performance commitment level is 73.5% for Years 1-3 whilst we start to deliver our proposed investment programmes and then increasing to 82.3% in Years 4 and 5. We propose this change in year 4, to take into account delivery of our investment plans detailed below as well as the four-year rolling calculation.

### 13.6.4 Our proposed PCL targets

Table 46 provides the business plan proposed targets for bathing water quality for AMP8.

**Table 45: Company business plan proposed targets for bathing water quality**

| Bathing water quality score (percentage) | AMP8 | | | | |
|---|---|---|---|---|---|
| | 2025/26 | 2026/27 | 2027/28 | 2028/29 | 2029/20 |
| **Business plan proposed targets** | 73.5 | 73.0 | 73.5 | 82.3 | 82.3 |

For AMP8, we are proposing a bathing water quality score of 73.5 in year 1 improving to 82.3 by the end of AMP8. We propose to achieve this target through improving coastal storm overflow performance, through a programme of investment at Cromwheel, and through participation in the Yorkshire Coastal Bathing Water Partnership.

## 13.7 Social and Environmental Benefits

We anticipate that our bathing water quality expenditure programme will add societal, economic, and environmental value to the Yorkshire region, supporting our vision for a thriving Yorkshire. This will also support the vision of our Yorkshire Bathing Water Partnership which is to support the development of a thriving and prosperous coastline in Yorkshire by unlocking the benefits of excellent bathing water quality on the coast.

Our proposed expenditure programmes to meet the PCLs include improving bathing water quality through enhancing our wastewater asset performance; we will focus on both reducing spill frequencies at storm overflows and enhancing the quality of our final effluents. Where possible, we will look to deliver solutions using blue/green infrastructure which also enhances the environmental value of our improvements. Although there are other factors that impact on

bathing water quality, our enhancements will improve the environmental value and reduce public health impacts from our assets.

The benefits of outdoor recreation are widely documented, with both physical and mental health benefits which can be derived from the natural environment. Through our investment plans, we are proposing to improve both designated and non-designated bathing waters which in turn will allow a greater proportion of Yorkshire to have access to improved bathing water quality.

Bathing waters, both coastal and inland also create opportunities to support tourism. It is estimated that nature contributed an estimated £12 billion to tourism and outdoor leisure within the UK in 20198. Additional revenue is generated locally from improved bathing water quality from tourist expenditure, recreation and activities provided as well as from the employment opportunities created through the tourism industry.

We will also look to maximise the social and environmental benefits by collaborating with the Yorkshire Bathing Water Partnership. Collaborating and working in partnership allows us to deliver additional benefits and good value for our customers. We appreciate how our coastal and inland bathing environments support local economies and therefore we will also therefore explore opportunities to work in partnership to align investment programmes with our partners and minimise disruption to local communities as much as possible.

## 13.8 Our long-term ambitions

Our long-term ambition is to continually improve bathing water quality at our existing designations as well as supporting new bathing water designations. This aligns to our company vision of a thriving Yorkshire, right for customers, right for the environment as well as the objective of the Yorkshire Bathing Water Partnership, which is to achieve excellent bathing water status at all of Yorkshire's designated bathing waters.

From our engagement with stakeholder groups across Yorkshire, we know there is an interest in applying for future bathing water designations. We also know from our customer engagement survey, 'Exploring customer views on Designated Bathing Water sites', that our customers want to see us to go beyond the statutory requirements at bathing waters.

In our Long Term Delivery Strategy, we have accounted for 3 successful bathing water applications per AMP, which will require improvements to our wastewater assets. Based on our current understanding within Yorkshire and across the industry of monitoring of inland recreational locations for bathing water quality, we have assumed that these future designations will be classified as Poor, requiring both improvements across our asset base and in collaboration with our stakeholders to manage diffuse bathing water sources. In our long-term strategy, due to the current regulations where bathing waters are de-designated after five years of consecutive 'Poor' classification, we have accounted for the de-designation of one bathing water per AMP where a collaborative approach to improving bathing water quality cannot sustain an improvement in classification despite an improvement in bathing water quality.

Through our long-term delivery strategy, we will also continue to drive improvements in the performance of our designated coastal bathing waters. In our investment plans detailed below in Section 1.1.9, Our plans to deliver this commitment, we outline how our coastal assets will be addressed to support bathing water quality improvements, through our long-term delivery strategy, we will continue to work in partnership to manage diffuse sources across our catchments.

## 13.9 Our plans to deliver this commitment

### 13.9.1 Scale of Investment

Our investment plans for bathing water quality will be in excess of £700 million in AMP 8 and align to our vision for the region, a thriving Yorkshire, right for customers, right for the environment. Our plans address our customers preferences as detailed above to deliver

8 https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/tourismandoutdoorleisureaccounts naturalcapitaluk/2021

environmental improvements for bathing water quality and meet our proposed performance commitment levels.

Our expenditure plans will focus on three key themes:

- **Investigate:** where we have new designations, or popular recreational swimming locations, we will investigate to ensure we have a robust understanding the factors impacting bathing water quality. For our existing designations, we will continue to develop our understanding of the complexities of these bathing waters.

- **Enhance**: we will increase the capacity of our networks and seek opportunities for surface water management to ensure we meet the new bathing water spill reduction standards set out in the Government's Storm Overflow Discharge Reduction Plan (SODRP). Under the SODPR, the following bathing water targets have been introduced:
    - For designated coastal storm overflows, there is a mandatory spill target of fewer than 2 spills per bathing water season
    - For designated inland storm overflows, there is a mandatory spill frequency target of 1 spill per bathing water season

  We will also use advanced treatment technologies for enhance the quality of our final effluent discharges where required.

- **Collaborate**: we will continue to work in partnership to ensure bathing water quality is managed collaboratively. We will explore where we can collaborate on our investment proposals to deliver additional benefits and good value for our customers and communities.

### 13.9.2 Enhancement Expenditure for Bathing Water Quality

Our enhancement expenditure programme for bathing water quality, includes allowances under the following areas of our plan:

- Our Water Industry National Environment Programme (WINEP) submissions. This includes enhancement expenditure proposed under:
    - Bathing Water Quality – Inland Bathing Waters enhancement case
    - Storm Overflow Reduction Plan enhancement case
- Our additional coastal storm overflow enhancement Case, outside the WINEP

More detail on these subjects can be found in
**Enhancement Case – Bathing Water Quality**
**Enhancement Case – Storm Overflows**
**Enhancement Case – Coastal Storm Overflows**

Further details of these expenditure programmes are provided below under our three key themes of investigate, enhance, and collaborate.

#### Investigate: Bathing Water Quality

The River Wharfe at Cromwheel, Ilkley was designated as the UK's first riverine bathing water in December 2020, and our interim investigations have highlighted it is a complex bathing water with numerous factors which can impact on the water quality. We also have two popular recreational swimming locations in Yorkshire, the River Wharfe at Wetherby and River Nidd at Knaresborough where our communities want to apply for bathing water designation. At these locations, we will undertake complex investigations under the WINEP to understand the impacts to bathing water quality to ensure we have a detailed understanding of our wastewater assets impacting these (beyond those identified as bathing water assets under the Environment Act and Storm Overflow Discharge Reduction Plan).

#### Enhance: Storm Overflow Discharge Reduction

The Environment Act and the introduction of the Government's Storm Overflow Discharge Reduction Plan requires water companies to protect public health by significantly reducing

harmful pathogens from storm overflows discharging into and near designated bathing waters by 2035. This includes the following targets:

- Designated coastal bathing waters: a reduction to 2 spills per bathing water season for storm overflows discharging directly into, or less than 1km upstream in hydraulic continuity of the designated coastal bathing site.
- Designated inland bathing waters: a reduction to 1 spill per bathing water season for storm overflows discharging within 5km upstream of the designated inland bathing site.

These spill frequency targets are mandatory, regardless of historic investment driven by marine impact modelling.

We are driving an ambitious programme to deliver all of our designated bathing water storm overflows by 2030, five years ahead of the target set out under the Storm Overflow Discharge Reduction Plan. Our coastal expenditure will be driven through the following programmes:

- Twelve coastal storm overflows will be improved through our Water Industry National Environment Programme for Storm Overflows and the Environment Act.
- Our remaining 22 coastal storm overflows will be improved through our additional enhancement expenditure for coastal storm overflows.

We are also delivering storm overflow improvements at the UK's first designated riverine bathing water, at the River Wharfe at Cromwheel, Ilkley. This programme will all be driven through the WINEP enhancement expenditure for designated inland bathing waters.

We are accelerating our storm overflow discharge reduction under Ofwat's Accelerated Infrastructure Delivery Project for the River Wharfe at Cromwheel, Ilkley and Wheatcroft Storm Overflow, one of our storm overflows located at Scarborough South Bay.

We also recognise our communities' desires to apply for bathing water status at inland waters used for recreation. This is supported by our customer research, 'Exploring customer views on Designated Bathing Water sites', where 80% customers expressed Yorkshire Water should investigate non-designated bathing sites, and 86% customers expressed Yorkshire Water improving non-designated bathing sites. We are therefore aligning our WINEP obligations for non-designated bathing water improvements on the River Wharfe at Wetherby and River Nidd at Knaresborough to the targets set out above.

### Enhance: Final Effluent Quality

To further support the improvement in bathing water quality, we will enhance our final effluent quality through microbiological treatment. At our inland bathing and recreation waters, we will improve the quality of our final effluent discharges. We will ensure optimal solutions are delivered to protect public health and support improvements in bathing water quality.

### Collaboration and Partnerships

We understand the importance of working in partnership to improve bathing water quality. As detailed above, we will be driving a significant spill reduction programme at both designated and non-designated bathing waters. Effective surface water management can control both the volume and velocity that surface flows enter the sewer network, which can in turn support in spill reduction from our sewer overflows. We will continue to explore opportunities to work in partnership to support our storm overflow reduction.

The natural environment, particularly the coastline significantly supports local economies. We have an ambitious programme to deliver storm overflow reductions at all our designated bathing water storm overflows as defined under the Environment Act, including the coastal programme detailed above. We will work closely with our local authorities to reduce impacts to the local community and economy. We will explore opportunities to align our infrastructure improvements with any local authority activities in the region and seek to deliver additional benefits where possible.

During our interim bathing water investigations, we have worked with our local communities. Citizen science provides a great opportunity for us to learn from local communities about their

local environments and also for our communities to connect with the work we undertake. We will continue to explore opportunities for working with our communities through our bathing water investigations.

### 13.9.3 Base Expenditure for Bathing Water Quality.

Significant investment was made in 2010-2015 to improve our sewage treatment works and outfalls along the coast to ensure our assets were able to achieve and surpass the new tighter consents introduced by the EU Revised Bathing Water Directive in 2015. This has led to a significant improvement in bathing water quality along the Yorkshire Coast, however, we propose to improve our performance further. Through our base expenditure programme, we will continue to optimise our coastal infrastructure to support bathing water quality improvements and support the work of the Yorkshire Bathing Water Partnership to ensure all impacts to bathing water quality are collaboratively managed.

Our ongoing organisational improvements will continue to contribute to our performance levels. For example, through activities such as our Dynamic Asset Maintenance programme and the implementation of a new computerised maintenance management system we are improving asset health and process control, which delivers more consistently good quality continuous discharges from our wastewater treatment works. Specific examples include;

- the implementation of our new sewage pumping station standards where we utilise real time asset health monitoring and predictive failure technology to prevent failures earlier on the P-F curve (P = potential, F = Functional failure)
- The deployment of condition monitoring devices across process critical equipment to ensure early potential failure is detected and acted upon, in advance of the functional failure.

#### Investigate: Bathing Water Quality

We will continue to review and optimise our coastal and inland wastewater assets each year ahead of the bathing water season. We will carry out extensive pre-season reviews on our assets to ensure there is no impact to bathing water quality. We will survey our sewer network and inspect our assets, addressing any impacts on bathing water quality.

We are also continuing to focus on river health, where our teams activities will include investigating misconnections in our bathing water catchments to identify where waste connections could be impacting on the environment and bathing water quality through a connection to our surface water networks or direct to watercourse. These create background pollution within streams and watercourses which can impact on bathing water quality. We will also investigate where diffuse catchment sources are impacting on bathing water quality, and look to optimise the actions of the Yorkshire Bathing Water Partnership to address these.

#### Enhance Performance

We will invest in a number of our smaller sewage treatment works on the coast to introduce tertiary treatment and improve the quality of their final effluent to protect bathing water quality. We will also enhance our treatment at Bridlington and Hornsea STWs to support an improvement in bathing water quality.

#### Collaboration and Partnerships

As reflected throughout this document, partnership working is essential for continuing to improve coastal bathing water quality. Through our base expenditure programme, we will maximise opportunities for working collaboratively via the Yorkshire Bathing Water Partnership. Alongside our capital enhancement programme, we will prioritise less capital-intensive investments through working in partnership. We will:

- Maximise opportunities to resolve misconnections within our bathing water catchments and work with our local authorities through to resolution
- Educate and engage beach users on opportunities to improve bathing water quality through best practice and behavioural changes.

- Explore opportunities to maximise drainage and sewerage facilities at our harbours to reduce impacts to bathing water quality.
- Promote catchment management to reduce surface run off that could be impacting on bathing water quality

### *13.9.4* Deliverability Risks

Bathing water quality is complex and can be impacted by various sources as explored above in section 13.3.2, therefore, we have reviewed the following risks in relation to our performance commitment levels:

- **Factors outside management control**. Due to the complexities and the numerous factors which can impact on bathing water performance, performance against our performance commitment level is subject to influence by factors outside direct management control. To mitigate against this risk, we will strengthen the work of the Yorkshire Bathing Water Partnership and optimise our base expenditure programme to support collaborative risk management.
- **Historic impacts.** Bathing water quality is calculated using four years of water quality data and therefore, the impact of our AMP 7 performance, will continue to impact into year 3 of AMP 8. This is reflected in our proposed performance commitment levels.

## 13.10 Our incentive to deliver

**Table 46: Our incentive to deliver**

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Underperformance and outperformance |
| **Price control allocation** | 100% wastewater network plus |
| **ODI rate** | £0.96m per percentage point |
| **Outperformance payment- standard** | £0.96m per percentage point |
| **Underperformance payment - standard** | £0.96m per percentage point |
| **Timing of underperformance and outperformance payments** | In-period |

## 13.11 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 13.12 Deadbands

Deadbands do not apply to this PC.

## 13.13 Cap/Collars

The guidance published by Ofwat to inform the development of business plans indicates that there will be a cap and collar for this PC of +/- 0.5% of RoRE.

# 14. Storm overflows

## 14.1 PC Type

Environmental outcomes

## 14.2 Performance targets

### Table 47: Committed performance levels

| PR24_SOF | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | Number of spills per storm overflow | 34.98 | 32.11 | 30.02 | 28.43 | 26.86 |

## 14.3 Summary

This performance commitment targets the reduction in spills from storm overflows. It is the average number of spills per year across all storm overflows measured through event duration monitors (EDM). Our plan aligns with the requirements of the Storm Overflow Discharge Reduction Plan meeting the targets defined over the next 25 years from 2025 to 2050.

The average number of spills per storm overflow will be calculated to two decimal places as follows:

$$\frac{Number\ of\ monitored\ spills}{Number\ of\ storm\ overflows} + Unmonitored\ storm\ overflows\ adjustment$$

For the purpose of this performance commitment the 'Number of monitored spills' is the number of spills monitored by EDM over the reporting period from all of the company's storm overflows as of 1st January of the reporting period. It uses an approved counting method in 12/24 hour blocks to count spills.

The unmonitored calculation results in a pro-rata adjustment of when a storm overflow is not monitored (including downtime) of 100 spills per year. This provides a potential exposure of circa £1m/annum for every 1% of monitor downtime.

This is a new performance commitment and has been introduced for AMP8 as a result of EDM coverage being widespread and providing a mechanism to indicate performance and in response to the Environment Act (2021).

We have over successive AMPs invested in storm overflows as part of the national environmental improvement programmes where we have improved the quality of our rivers. This improvement has typically been through installing screens and providing storage at storm overflows in the network and at wastewater treatment works to intercept solids and flow respectively. We are continuing this work in AMP7.

Ofwat has suggested that companies should consider 20 spills per storm overflow as a baseline target for this PC at the start of AMP8. However, this value fails to consider:

- This historical setting of permits across England and Wales (pre and post privatisation) has not been consistent nor targeted a spill frequency, highlighted by improvements over successive AMPs being driven to prevent ecological harm and / or install screens where deemed necessary
- Permits have typically been set as a function of the population and base flow, e.g. as a multiple of dry weather flow, Formula A calculation and not by how much water has to be managed and controlled.
- The regional differences in rainfall, the runoff generated and the percentage of combined sewers capturing the runoff significantly changes the volume of water

presented to each overflow on average. These factors typically drive higher number of spills per overflow per company
- The subsequent adjustment to industry performance when unmonitored storm overflows are considered (in the 2021 baseline)

Hence, we propose and demonstrate that the baseline position in AMP7 and AMP8 should be set differently for each company. The need for different baselines is robustly demonstrated based on strong engineering and econometric modelling rationale. Our econometric modelling using the most robust model indicates through two different methods that a company with our factors should have an expected starting point in AMP8 of between 26.7 and 37.3 spills per year on average. The econometric modelling values assume all monitors are in place and recording 100% of the time, i.e. would be higher if a percentage of down time was included.

Our proposed starting point in AMP8 of 34.98 includes an allowance for not all monitors working all the time (the equivalent to 28 spills per year on average if monitors work 100% of the time). This recognises that having 100% of monitors working all the time is a progressive activity, but clearly towards the lower range of the econometric modelling (applying the same methodology). By the end of AMP8 we predict we will have 26.9 spills per year on average. Our glide path is based on:

- a proportionate approach to meet the Environment Act (2021) which targets overflows that discharge to sensitive waters,
- gaining the full benefit of the £180m of investment in AMP7 and
- the improving live monitor coverage of overflows.

Our interventions to reduce the number of spills including blue-green solutions, storage, treating more flow, active system control of the system and operational improvements. Delivery of this performance commitment will create further environmental and social value for the Yorkshire region, in line with Ofwat's Public Value Principles, by contributing to improving river health and amenity value.

### 14.4 Customer and Stakeholder Engagement

We carried out extensive engagement with our customers, communities and stakeholders. Information on our engagement approach can be found in Chapter 6. Specific customer engagement related to storm overflow spills is detailed below.

Reducing spills from storm overflows has gained more prominence amongst campaigners, regulators and society in recent years. Awareness has increased surrounding storm overflows that spill linked to the publishing of EDM data. However, according to the customer preference research, as published by Ofwat and CCWater, storm overflows are ranked within the least important group of service areas. This is due to the fact that generally people do not personally experience the impact of them, and therefore rank them lower than other areas. Additionally, people shared the view that the use of storm overflows was generally outside the control of a water company as it was perceived to be weather related, in response to a weather event, and not that they were in constant use. Individuals did not spontaneously connect the use of storm overflows to other performance commitment areas, and rather ranked performance commitments as high priority if they had a direct and personal impact on them.

Our own customer priority research, Valuing Water, out of 20 tested priority areas, household and non-household customers ranked reducing the release of untreated sewerage mixed with rainwater into rivers and streams during times of heavy rainfall as the fifth highest priority area.

This does contrast with the Ofwat CCWater customer preferences research; however, our valuing water research is more explicit on pollution as a potential result of the use of storm overflows, rather than the act itself. Our research also found relatively low awareness of storm overflows initially, and it was only after provision of information that views of priority were stronger.

We also covered the use of storm overflows in our DWMP research. Initially, customers were horrified of the thought of storm overflows dumping sewage straight into a watercourse, however, once explained that this means homes and businesses are less likely to flood as a result of using these, they are more understood and accepted. However, the view is that these should be used less overall.

Finally, in testing our plan with customers in the initial stages of qualitative testing, our customers supported in the inclusion of the statutory storm overflow programme of work in our plan. We tested an option to include additional coastal storm overflows in our plan for an additional cost over and above the bill presented to customers to deliver the least-cost plan. More customers supported their inclusion than not and given the extent of support across all of our research to improve environmental water quality and reduce spills overall, we were confident it was the right decision to proceed with this element in our proposed plan in final testing.

In the final quantitative affordability and acceptability research conducted following Ofwat guidelines we outlined our planned target for storm overflows overall - 78% of customers found the plan to be acceptable and in our own independent affordability and acceptability testing research, 79% of customers found our overall plan to be acceptable including this target. Below are a number of quotes from customers about the inclusion of storm overflows in our plan.

> *"Storm overflows and the risk of flooding does affect and worries a large number of people. It does need major investment and Yorkshire Water are taking the appropriate action." Customer, Yorkshire Water Independent Affordability and Acceptability Testing Research, September 2023.*

> *"Good to see they are trying to address issues from storm overflows that affect the beaches." Customer, Yorkshire Water Independent Affordability and Acceptability Testing Research, September 2023.*

> *"It's quite clear from seeing YW representatives facing up to the high profile issues on TV news channels and the printed media, that steps are being taken in both the short and long term, to rectify and improve all aspects of water supply and sewage treatment. I accept there have been problems nationally, particularly regarding storm overflows, however I do appreciate that it is a massive undertaking to provide water to millions of households and businesses, and to manage treatment of the sewage created by those households and businesses." Customer, Yorkshire Water Independent Affordability and Acceptability Testing Research, September 2023.*

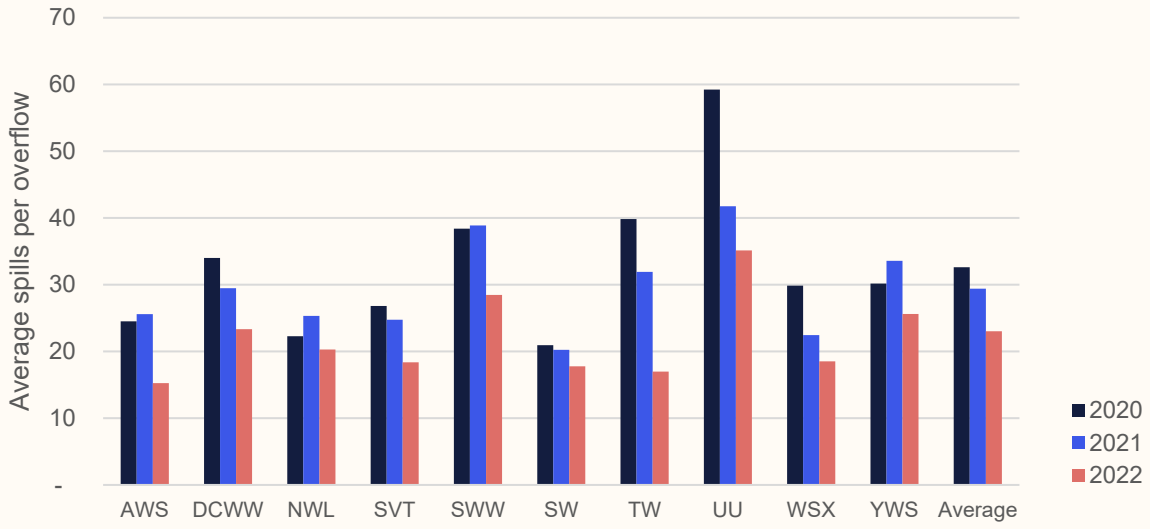
## 14.5 Our performance to date

### 14.5.1 Our performance and position.

Our storm overflow performance to date, based on an average number of spills per year (as defined by 12 hour / 24 hour spill counting method) from installed event duration monitor (EDM) was 30.01 (2020), 31.99 (2021) and 25.05 (2022) spills per year. In 2022, 98.4% of our storm overflows had EDM installed. These values do not include an adjustment for unreported periods when an EDM was not functioning correctly.

Figure 38 shows our reported average number of spills per year, and how we compare to other water companies. Performance across the industry is affected by variance in annual rainfall (and runoff) plus the type of rainfall events, exogenous network factors, volatility in data due to measurement errors and operational performance. This variation can create substantial changes in year-on-year performance at storm overflows.

**Figure 38 Comparison of the English and Welsh water company performance for storm overflows – Average spills per overflow 2020-22.**




Our reported average number of spills per storm overflow, as for other companies, do not include any down time in the EDMs. Our average availability across the three years is circa 89%. The pro-rata influence on our spills (allowing for downtime proportionally) would see an increase in average spills per year to 33.5 (2020), 35.9 (2021) and 28.3 (2022).

#### 14.5.1.1 Previous investment that influences our current performance

There may be a current Ofwat expectation that all storm overflows should achieve an average of 20 spills per year, with the ask that compelling evidence is to be provided as to why this is not appropriate. To date, there has not been the focused investment drivers to achieve such performance, with performance to date being driven by a number of different factors, which we outline here.

Over AMP3 to AMP6 we invested over £700m in storm overflows through previous regulatory environmental programmes. Our investment included major programmes in AMP3 and AMP4 to introduce 100s of new 6mm 2D screens that prevent solids being discharged.

We have undertaken multiple water quality studies from AMP3 onwards that investigate the performance of the sewer system and its impact on the receiving water. Our work has assessed 100s of storm overflows in this time. The investigations were agreed and signed off by the Environment Agency (EA), and where appropriate pass a cost benefit test. These investigations have resulted in major investment in storm overflows that typically stored flows at storm overflows to reduce spills and therefore not cause environmental harm, using Urban Pollution Management (UPM) standards and approaches (either fundamental intermittent standards and/or a percentile approach). The result of this work was a spill reduction at some storm overflows, but not driven to a specific spill frequency standard, rather an environmental performance dictated by the local environmental need. This is typically different to the EU infraction proceedings[9] that happened in the UK and for example saw a 20 spills/year target applied to discharges at Whitburn in Northumbria.

In AMP6 we carried out Water Framework Directive (WFD) / UPM (Urban Pollution Management) studies and applied the Storm Overflow Assessment Framework (SOAF) to investigate agreed storm overflows with the EA. The purpose was to determine if they caused ecological harm on a river reach. We have investigated 136 storm overflows in AMP6 and 105 in AMP7 using UPM studies and 138 storm overflows using the SOAF in AMP7.

Our work in AMP7 is seeing a range of solutions being developed and implemented. This includes blue-green solutions in the network, system control to maximise the network performance, traditional grey storage tanks and nature-based wetland solutions.

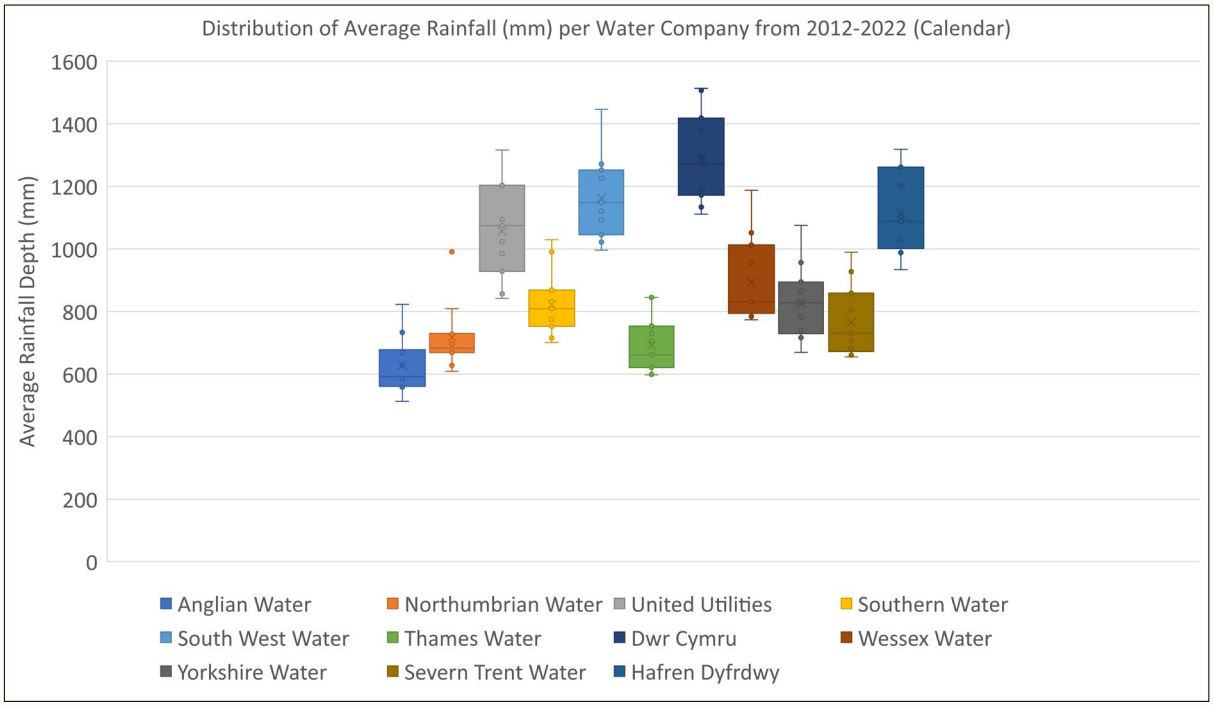
[9] CURIA - Documents (europa.eu)

#### 14.5.1.2 Rainfall variations across England and Wales influencing performance

The rainfall across England and Wales, along with the contributing area where the rainfall falls, will drive the amount of water being managed within a combined sewer system and at storm overflows.

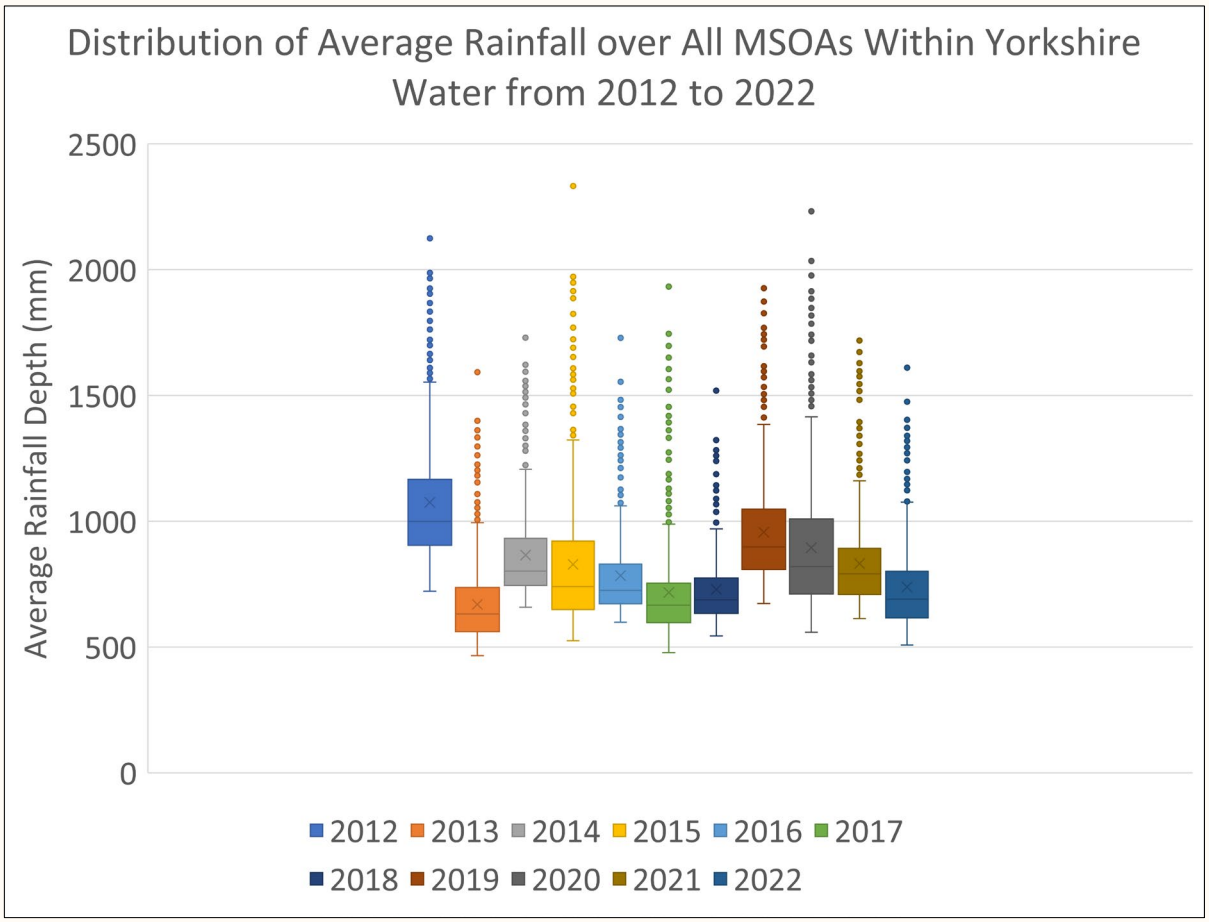
shows the rainfall totals for each year on average for each water company region. This highlights that the water companies on the west coast receive predominantly more rainfall than companies further east, which becomes broadly progressively less the further east you go. It indicates that Yorkshire Water sits in the middle of the ranges with a relatively narrow interquartile range, and in comparison to Dwr Cymru which has a wider interquartile range that could result in a wider range of spills in any given year. Hence it is possible that some years, the differences and variations between each company's storm overflow performance could vary significantly.

**Figure 39 Annual average rainfall over 11 years for each water company**




shows the year-on-year variation in rainfall in each Middle Super Output Area (MSOA) across our region. By year it demonstrates visually the variation by year, size of interquartile range and the size of the distributions. These two graphs highlight the variation and distribution of rainfall that will significantly influence the spills every year by company and within our region.

**Figure 40 Annual rainfall falling on MSOAs that 'contribute' urban runoff using Ofwat methodology within the Yorkshire Water region**




#### 14.5.1.3 Understanding the impact of runoff and proportion draining to storm overflows

A key aspect that effects the operation of storm overflows along with the permits (i.e. the level of control in the drainage network) is the amount of rainwater each storm overflow receives. This is a function of the rainfall, urban surfaces (which can include permeable surfaces – not included in this calculation) and the sewer network it drains to.

We can be confident that combined sewers carry rainwater and will affect the operation of the storm overflows. Data submitted as part of the APR indicates the length of public sewers which are combined, foul and surface water. Using these lengths provides an indication of what proportion of runoff will drain to a storm overflow. The runoff in each MSOA can be estimated from the rainfall that lands in the area, using Ofwat methodology for urban runoff with MSOA. We therefore used the percentage of the public sewers that are combined to multiply the runoff volumes to determine what drains to storm overflows.

By understanding the volume being managed, we can then understand performance per storm overflow (on average). Volume does not fully translate to average number of spills but is a good indicator for why each company may have a different baseline position on average number of spills, and the size of programmes to address each storm overflow. This is particularly the case, as overflow settings (linked to permits, see section 14.5.1.4) are a function of the population and base flows. To determine then a normalised basis of storm overflows we divided the volume by the number of storm overflows as reported in the APR (including settled storm overflows).

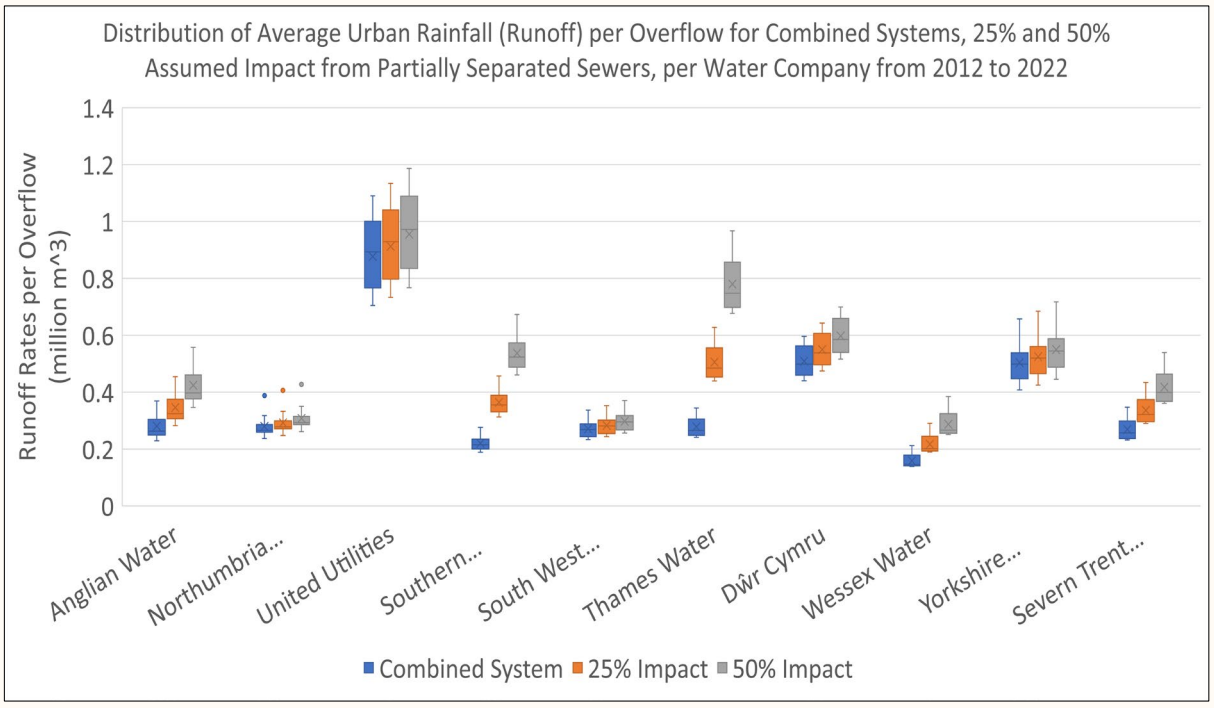
When considering combined sewers only,
indicates that United Utilities have the greatest volume to deal with and hence may have a greater number of spills. Dwr Cymru have the second and Yorkshire Water third greatest volume, although the range for Yorkshire Water becomes wider, but the interquartile range is smaller.

However, the water conveyed to storm overflows are also generated through foul networks, and more significantly when considering partially separate networks that carry foul and a proportion of surface water in an urban area. To approximate the runoff that each company may be managing it is appropriate to consider the proportion of foul sewers and an estimate of the runoff. Using engineering judgement, we have assumed that 50% of impermeable area may drain to partially separate foul sewer networks (i.e. representative of either the roof or road draining to the foul sewer).

To address this uncertainty and taking a sensitivity approach,
also shows an assumption of 25% and 50% of the foul sewers are partially rather than fully separate. The figure indicates how considering the influence of partial separate sewers may indicate that per storm overflows, there is a greater volume to manage, and may increase the number of spills per company. This still indicates that Yorkshire Water has a high volume per overflow that we must manage which translates into higher spills and a starting base position that is higher than many other companies.

Fundamentally these graphs indicate the variability and magnitude that each water company needs to address to reduce the average number of spills. Whilst there will be other factors on regional basis, Figure 41 clearly indicates that each company will have a very different starting position from which to reduce the number of spills, i.e. some companies including us will be greater than 20 spills per overflow.

**Figure 41 Average runoff per storm overflow to be managed by each water company over a period of 11 years**



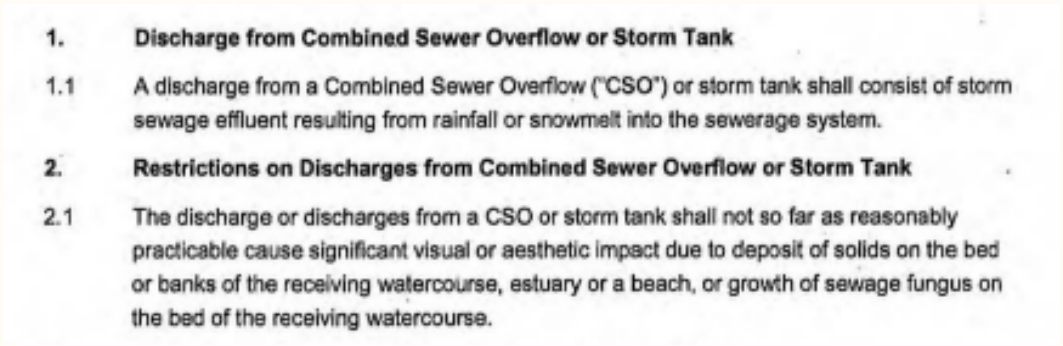

#### 14.5.1.4 Permit variations influencing current performance and baseline spill position

Issuing of permits across the UK has varied over the years for storm overflows and has driven different performance requirements at each individual storm overflow. Hence it is not possible to expect a common starting position. Furthermore, different ways to set “flow” pass forward settings have been undertaken such as using the industry Formula A[10] or a specific storm event, e.g. a 1 in 1 year return period summer storm and flows at first spill. Another permit example agreed with the EA previously included a Formula A equivalent where an offset storage volume

[10] Technical Committee on Storm Overflows and the Disposal of Storm Sewage (1970) . **Final report / Technical Committee on Storm Overflows and the Disposal of Storm Sewage.**

was agreed to store at first spill as the pass forward flow could not be economically achieved i.e. causing significant detriment downstream so requiring other works. Examples of permits set across the England are shown in Figure B to Figure D which shows the examples of conditions that might be set, of which none were defining a spill frequency requirement.

**Figure 42 *Permit with no stated pass forward flow conditions***



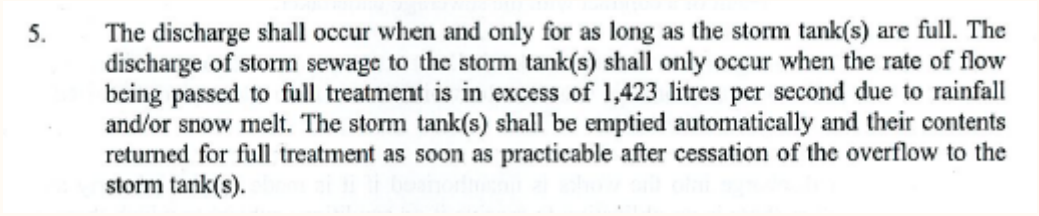
1. **Discharge from Combined Sewer Overflow or Storm Tank**

1.1 A discharge from a Combined Sewer Overflow ("CSO") or storm tank shall consist of storm sewage effluent resulting from rainfall or snowmelt into the sewerage system.

2. **Restrictions on Discharges from Combined Sewer Overflow or Storm Tank**

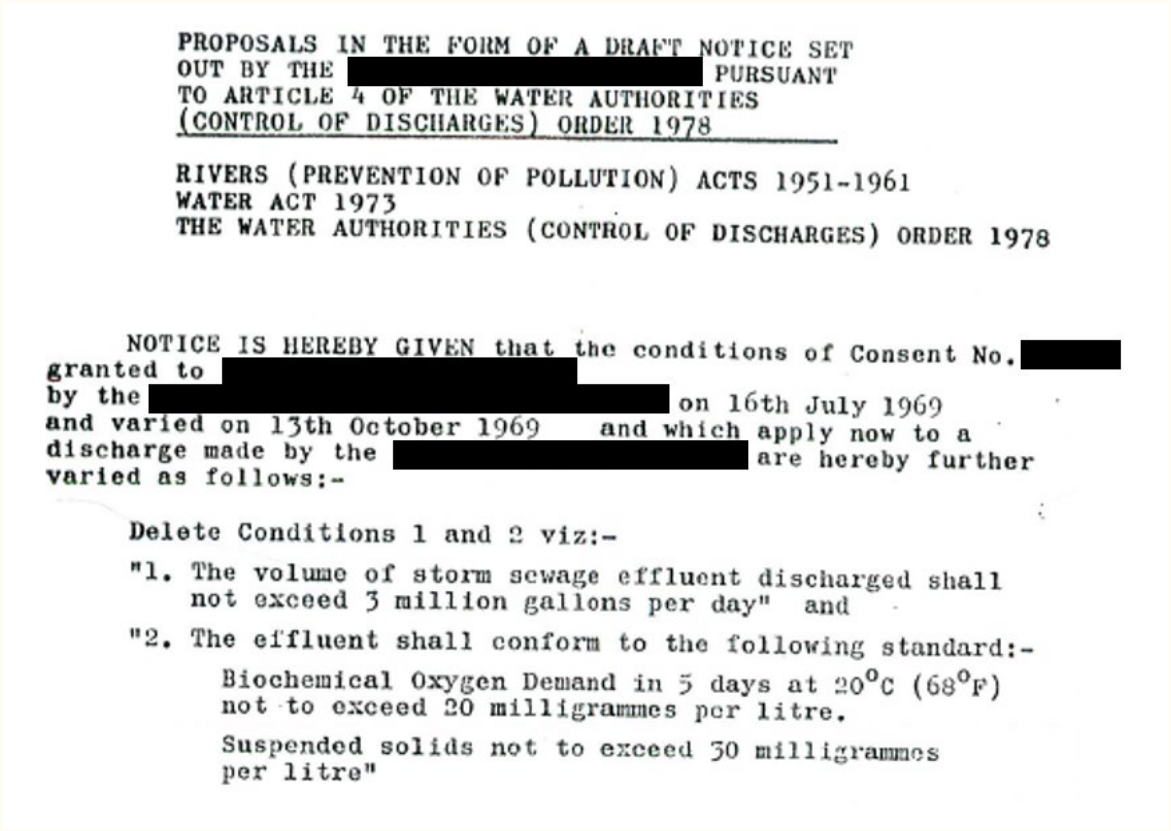
2.1 The discharge or discharges from a CSO or storm tank shall not so far as reasonably practicable cause significant visual or aesthetic impact due to deposit of solids on the bed or banks of the receiving watercourse, estuary or a beach, or growth of sewage fungus on the bed of the receiving watercourse.

**Figure 43 *Pass forward flow during a storm event in excess of a flow rate***



5. The discharge shall occur when and only for as long as the storm tank(s) are full. The discharge of storm sewage to the storm tank(s) shall only occur when the rate of flow being passed to full treatment is in excess of 1,423 litres per second due to rainfall and/or snow melt. The storm tank(s) shall be emptied automatically and their contents returned for full treatment as soon as practicable after cessation of the overflow to the storm tank(s).

**Figure 44 *Maximum discharge conditions for flow and water quality parameters***



PROPOSALS IN THE FORM OF A DRAFT NOTICE SET OUT BY THE [redacted] PURSUANT TO ARTICLE 4 OF THE WATER AUTHORITIES (CONTROL OF DISCHARGES) ORDER 1978

RIVERS (PREVENTION OF POLLUTION) ACTS 1951-1961
WATER ACT 1973
THE WATER AUTHORITIES (CONTROL OF DISCHARGES) ORDER 1978

NOTICE IS HEREBY GIVEN that the conditions of Consent No. [redacted] granted to [redacted] by the [redacted] on 16th July 1969 and varied on 13th October 1969 and which apply now to a discharge made by the [redacted] are hereby further varied as follows:-

Delete Conditions 1 and 2 viz:-

"1. The volume of storm sewage effluent discharged shall not exceed 3 million gallons per day" and

"2. The effluent shall conform to the following standard:-

Biochemical Oxygen Demand in 5 days at 20°C (68°F) not to exceed 20 milligrammes per litre.

Suspended solids not to exceed 30 milligrammes per litre"

### 14.5.2 Estimate of performance to the end of AMP7

Our Year 4 and 5 forecast for **average number of spills per overflow - monitored** (calendar years 2023 and 2024) of AMP7 is 32.30 and 32.32 respectively using 2021 as a base year.

When adjusting for unmonitored overflows (as per Table line OUT5.77), the average spills are 42.30 and 41.32 for calendar years 2023 and 2024 respectively. To understand the forecast for Years 4 and 5, a comparison is needed for a back-calculation using the same methodology. The baseline year used, 2021, has an adjusted regional average spills of 44.5.

The actual overflow performance for 2023 and 2024 will be heavily influenced by rainfall which is out of our control, and will broadly dictate the range in performance of each individual storm overflow in the year.

Our forecast estimates for Year 4 and 5 consider:

- The impact of potential monitor down time where we have adjusted our estimates based on previous performance to reflect an inferred position. We are taking steps to improve the operating time of all our EDMs and improve our response time when EDMs are not recording.
- Our work utilising the available EDM data has enabled deep dives to commence and for higher spilling storm overflows. This analysis helps us to understand the types of spills occurring at the storm overflow and identify potential types of interventions which may include system optimisation in the sewer network and at the treatment works.
- Where we are currently undertaking programmed work in our AMP7 WINEP, including storage schemes, flow removal and treating storm overflow discharges.
- We are investing an extra £180m to reduce storm overflow spills in the final two years of AMP7. With the timing of this investment and implementation of schemes, we fully see its benefit in Year 1 and Year 2 of the 2025-2030 period.

Performance is also linked by the capacity of the drainage systems. As sewers convey solids, silt and sediment from highways, the capacity can start to erode. Since 2021 we have co-developed with Siemens a blockage predictor tool and applied this to our storm overflows using data from the EDMs. This work focuses on pollution reduction (i.e., to prevent spills that might occur in dry weather), but is also used to identify where there may be a capacity issue forming e.g. with deposition of silt. Our system learns data trends and identifies where there is inconsistency in the latest data and indicates a problem is forming which is then investigated and resolved by our operational teams. By continuing to develop this analysis and in re-organising our response approach will continue to help us reduce spills.

For more detail on the methodology behind our AMP7 forecast performance and resulting AMP8 PCL proposal, please see OUT5 Storm Overflows Table methodology and accompanying supporting documents.

More detail on this subject can be found in **OUT5 Storm Overflows Table methodology**

## 14.6 Setting the target

### 14.6.1 Our approach to setting the target

Table 49 below provides the business plan proposed targets for storm overflows for AMP8.

**Table 48 Company business plan proposed targets for storm overflows**

| Average number of spills per storm overflow | AMP8 | | | | |
|---|---|---|---|---|---|
| | 2025/26 | 2026/27 | 2027/28 | 2028/29 | 2029/20 |
| **Calendar year** | **2025** | **2026** | **2027** | **2028** | **2029** |
| **Business plan proposed targets** | 34.98 | 32.11 | 30.02 | 28.43 | 26.86 |

This is a new performance commitment for PR24, and therefore there is no PR19 final determination or industry data against which to compare our historic performance. The graphs in Figures 9 and 10 later in this document provide a helpful illustration of our back-casted PC data from our EDM returns, which shows clearly our overall improvements in spill numbers through the programmes of work during AMP7 and on the transition to AMP8.

For AMP8, we are proposing a target of 34.98 spills per storm overflow in year 1, improving to 26.86 spills per storm overflow by the end of the AMP. We will achieve this through the various methods as discussed in other parts of this document.

The baseline position is taken from a 2021 starting point, with various reductions/improvements applied for our AMP7 activities, as set out in 1.5.2.

The AMP8 PCLs are based on the programme we created to comply with the Storm Overflow Discharge Reduction Plan in 2022. The focus of our programme in AMP8 and AMP9 is to target storm overflows that spill to sensitive waters, meeting the commitment that 75% of those storm overflows will be addressed (to ten spills or less) by 2035, as well as reducing the spills at coastal assets to bathing waters by 2030 (to two spills per bathing season on average).

Our deliverable programme for AMP8 focuses on storm overflows that are efficient to deliver and least regret, that will also enable learning to be carried forward into AMP9. Our WINEP programme for AMP8 is detailed in our Enhancement Investment Appendices for Bathing Water and Storm Overflow.

More detail on this subject can be found in **Enhancement Cases – Bathing Water, Storm Overflows**

This list may evolve as we have better engineering understanding or that opportunities arise in other assets (discharging to sensitive waters) that make it easier to retrofit blue-green solutions.

Our delivery plan takes into account the time it takes to deliver a wide range of schemes and develop appropriate partnership opportunities. Spill reductions will not be seen fully in terms of EDM data for over a year due to the calendar year reporting of EDM and the completion impact of the schemes.

We have estimated the spill reduction value based on the EDM recorded average number of spills for the selected storm overflows. Our average number of spills starting position for Year 1 performance is 34.98 (when accounting for unmonitored adjustments and improvements in AMP7 (outlined above). This starting position is impacted by:

- the previous investment outlined earlier,
- the number of storm overflows for the proportion of combined sewers we have and the runoff volume being managed (See
- )

- a function of the permits set, which typically did not focus on spill reduction and
- a function of how we meet the permit at each storm overflow

Our total reported spills is likely to increase through to the end of AMP7. This is as a result of the different reporting approaches (e.g. including for unmonitored periods of time and pro-rata increase based on 2021 values) and the number of storm overflows with EDMs. The estimated spills will decrease in Year 1 of AMP8 as a result of the investment in AMP7 being fully realised. We anticipate a continual reduction thereafter, before the full effects of AMP8 investment being seen in Year 1 of AMP9.

In setting our proposed target, we understand the reality that the number of spills (as seen in 2022 compared with 2021) will vary significantly due to the rainfall size and type of events during the year (e.g. the 12hour/24hour counting method means 1 spill with a 30min duration from short duration rainfall is the same as 1 spill of 11 hours from several hours of rainfall). Permit setting of storm overflows historically has been highly variable across the industry. Comparing across the industry and having a common starting target is not appropriate due to a wide range of factors.

### 14.6.2 Estimating a performance target range based on our regional circumstances

We consider that the unique characteristics of our network, in particular the characteristics that are out of our control, are a substantial hinderance to meeting the “default” 20 spills per storm overflow performance level by 2025. If Ofwat were to set targets at this level for 2025 we would not be able to achieve this due to exogenous factors and would be subject to significant penalties.

To demonstrate potential performance commitment levels based on strong evidence we have worked with Economic Insight to design and develop an econometric modelling framework. This framework allows us to estimate the relative effect of key exogenous drivers of storm overflows performance, and therefore estimate the expected performance level of a company with our unique regional circumstances. We then estimated an adjustment to the proposed PCL of 20 spills per storm overflow, which represents the amount by which an efficient company would differ in performance if it faced our unique regional characteristics.

Our analysis indicates that the performance commitment level should be between 26.7 and 37.5 spills per storm overflow for YW by the end of 2024/25, rather than the suggested common target of 20 spills.

Our econometric modelling is designed to fulfil four criteria:

- The model is founded on engineering and economic rationale.
- The input data accurately describes the determinants of performance.
- The model is robustly estimated.
- The results are appropriately applied to the regulatory issue.

The specific model detail is set out in section **14.14**. We demonstrate that our modelling meets each criteria in turn below.

#### Founding the model on engineering and economic rationale

Our econometric models are based on solid engineering and economic rationale. This allows us to estimate the relative impact of key exogenous drivers on storm overflow performance.

We have found that the following exogenous factors are likely to be key drivers of storm overflow spills, and therefore we include them in our econometric models:

- **Annual rainfall.** Spills from storm overflows are more likely where there is higher annual rainfall, putting additional strain on the (combined) sewer system.[11,12]

[11] Defra (August 2022) ‘Storm Overflows Discharge Reduction Plan.’; page 8.
[12] Environment Agency (June 2018) ‘Storm Overflow Assessment Framework.’; page 4.

- **Modern waste issues.** Modern waste (e.g. wet wipes, oils and cooking fats) entering the sewer network can congeal together, forming blockages that increase the use of storm overflows.[13]
- **Combined sewer systems.** These systems are more prone to blockages and are more likely to reach hydraulic capacity during a storm, triggering the use of a storm overflow.[14] If a greater surface area captures water that drains into combined sewers, this will also impact the likelihood of a combined sewer reaching hydraulic capacity.
- **Impermeable surfaces.** The reduction of permeable surfaces, such as the paving over of roads and gardens, means that when there is rainfall, the surface water goes into the sewer systems, putting additional strain on it.[15]

Furthermore, we found that these exogenous factors interact with one another through a chain of causation that leads to spills. In periods of rainfall, combined sewers are more likely to reach hydraulic capacity, leading to the use of storm overflows.

In addition, we observe that has been a downwards trend in spills across the industry over the 3 years of reporting, which is unlikely to be driven by these exogenous engineering factors (as they do not change much over time with the exception of rainfall). In order to reflect this, some of our models include a linear time trend. However, given the short time period for which data is available, our preferred model does not include a time trend.

### The input data accurately describes the determinants of performance

The input data employed in our modelling accurately describes the variables that may impact on performance. This allows us to robustly estimate their impact on storm overflow performance. Below, we discuss: (i) the data used in our analysis and; (ii) the structure of our final data set.

#### *The data used in our analysis*

Table 48 presents the data employed in our econometric models. It sets out : (i) the name of the variable; (ii) its purpose in the modelling; (iii) the source of this data; (iv) any further calculation notes; and (v) the relevance of the variable to the engineering rationale.

**Table 49: Data employed in our econometric model**

| Variable | Purpose | Source | Notes | Relevance to engineering rational |
|---|---|---|---|---|
| **Average number of spills per storm overflow** | Dependent variable | DEFRA – Event Duration Monitoring – Storm Overflows | This variable is already normalised by the number of storm overflows. We adjust this variable to account for unreported spills[16]. We set out the details of this adjustment in **14.14**. | This is the variable of interest. |
| **Annual urban rainfall** | Independent variable | Stantec | CEDA HadUK-Grid - Gridded Climate Observations on a 1km grid over the UK, which is created by the MetOffice.<br><br>This variable has been prepared by Stantec specifically to | Annual urban rainfall captures years where there is a large amount of total runoff across the urban region operated by the wastewater company (value in m3).<br><br>This effect is captured by the scaling of the annual |

[13] House of Lords (March 2023) 'The affluent and the effluent: cleaning up failures in water and sewage regulation.'; paragraph 170.
[14] United Utilities (November 2022) 'Storm overflow incentives for PR24.'; page 12.
[15] Defra (August 2022) 'Storm Overflows Discharge Reduction Plan.'; page 8.
[16] Assumes that EDMs work 100% of the time

| | | | | |
|---|---|---|---|---|
| | | | estimate the amount of urban rainfall affecting each wastewater company's sewer network each year. | urban rainfall variable to reflect the prevalence of urban areas in each wastewater company's network. |
| **Length of combined sewers** | Independent variable | PR24 Cost Assessment Master Dataset, Wholesale Wastewater Base Costs | This variable is normalised by the total length of sewers in the network and presented as a percentage. We describe our method of calculating this in **0** | **Combined sewer systems.** This captures the prevalence of combined sewers in the wastewater network. |
| **Number of Food Service Establishments (FSEs)** | Independent variable | Density of fast food outlets in England, PHE | This variable is normalised by the number of connected wastewater properties (10,000s). | **Waste issues**<br><br>We use data on the number of FSEs to capture the effects of fats, oils and grease going into the sewage network. |
| **Weighted average density (WAD)** | Independent variable | PR24 Cost Assessment Master Dataset, Wholesale Wastewater Base Costs | This is the weighted average of residents per km squared (MSOA). | **Modern waste issues.**<br><br>WAD reflects the growing demand on the sewer network arising from a growing population putting more 'non-flushable' waste into the sewage system. |
| **Length of sewer network** | Normalisation factor | PR24 Cost Assessment Master Dataset, Wholesale Wastewater Base Costs | We describe our method of calculating this in **0**. | |
| **Number of connected wastewater properties** | Normalisation factor | PR24 Cost Assessment Master Dataset, Wholesale Wastewater Base Costs | | |

Source: Economic Insight

***The structure of our final data set***

This yields an industry wide panel data set of 10 wastewater companies over the period 2020 to 2022. We combine data for Severn Trent and Hafren Dyfrdwy in line with Ofwat's base cost model methodology at PR24. This yields a total of 30 data points in our regression models.

### The model is robustly estimated

We have tested the robustness of our approach to different specifications and find that they pass relevant statistical tests. Below, we discuss: (i) the specification of our econometric models; and (ii) the results of our modelling.

#### *Specification*

We use a total of eight model specifications, estimated each using both Ordinary Least Squares (OLS) and Random Effects (RE), to estimate the effect of the factors set out in section **Error! Reference source not found.**. The eight model specifications use the natural logarithm of average annual spills per storm overflow as the dependent variable. The independent variables of each of the eight model specifications are as follows:

- **Model 1:** Percentage of combined sewers.
- **Model 2:** The natural logarithm of annual urban rainfall.
- **Model 3:** The natural logarithm of WAD.
- **Model 4:** The natural logarithm of normalised FSEs.
- **Model 5:** Percentage of combined sewers, the natural logarithm of annual urban rainfall, the natural logarithm of WAD, the natural logarithm of normalised FSEs. This encapsulates all variables included individually in models 1 to 4.
- **Model 6:** Percentage of combined sewers, the natural logarithm of annual urban rainfall, the natural logarithm of WAD. This encapsulates all variables included individually in models 1 to 3.
- **Model 7:** Percentage of combined sewers, the natural logarithm of annual urban rainfall. This encapsulates all variables included individually in models 1 to 2.
- **Model 8:** Percentage of combined sewers, the natural logarithm of annual urban rainfall, time trend. This is the same as model 7, with the addition of a time trend.

We do not have a strong preference between the OLS and RE modelling approaches (and, as shown in **0**, they yield very similar results in any case). Of the eight model specifications set out above, our preferred model is Model 7, which excludes FSEs, WAD and the time trend. This is because:

- **The inclusion of FSEs in the model is problematic for the robust estimation of the effect of the other variables of interest.** The number of FSEs is highly colinear with both: the percentage of combined sewers; and urban rainfall. This means that it is hard for the model to disentangle the effect of each of these variables from the effect of FSEs. This collinearity appears to be the cause of the stark change in coefficients in model 5 relative to models 1 to 4 (as shown in **0**). While combined sewers and urban rainfall are colinear with FSEs, they are not colinear with each other. This means we have a choice of whether to include either: (i) percentage of combined sewers and urban rainfall; or (ii) FSEs, but not both. We consider that it is more appropriate to include both the percentage of combined sewers and urban rainfall, rather than just FSEs, because:
  - This allows us to capture more of the drivers of spills described in section 2.
  - Publicly available data on number of FSEs is only available for 2018. This means that our model assumes that FSEs are constant over time. Due to the negative impact of the Covid-19 pandemic on the hospitality industry, the robustness of this assumption is somewhat weakened.
- **The inclusion of WAD in the model is problematic for the robust estimation of the effect of the other variables of interest**. WAD is highly colinear with the percentage of combined sewers. We consider that it is more appropriate to include combined sewers than WAD because:
  - Combined sewers more accurately describes the determinant of performance that it is aiming to measure than WAD. WAD is an imperfect proxy for the amount of 'non-flushable' waste entering the sewage network. While there may be more people to put this waste into the network in more densely populated areas, it is likely the case that, over time, people are becoming less likely to dispose of this kind of waste into the sewer network.
- **It does not include a time trend**. As described earlier in section 3, we observe that there may be a downward trend in spills across the industry, which is not captured by the other variables in the model (which do not change much over time). However, it is challenging to correctly estimate a time trend with only three years of data, thus we do not consider it advisable to include the time trend.

It is unclear whether the exclusion of FSEs from our preferred model results in an under- or over-estimation of our adjusted PCLs. More specifically:

- The exclusion of FSEs and WAD from our preferred model may mean our estimated PCL adjustments are conservative estimates. This is because Model 7 only captures the effect of two of the four exogenous factors which interact through the mechanisms set out in section **Error! Reference source not found.** to affect storm overflow performance.
- The exclusion of this variable may also cause an omitted variable bias in the estimation of the remaining coefficients (i.e. the percentage of combined sewers and the natural logarithm of annual urban rainfall). However, it is not clear how this bias would affect our PCL adjustment estimates.

***Results***

The results of our econometric modelling are presented and discussed in detail in **0**. Our preferred model specification (Model 7) indicates that rainfall and combined sewers are important drivers of performance.

#### 14.6.2.1 The results are appropriately applied to the regulatory issue

We apply a methodology which translates the results of our econometric models into a range of PCLs that are specific to Yorkshire Water. These PCLs reflect the challenging conditions that your wastewater network faces more accurately than the proposed common PCL. Below, we discuss: (i) our approach to calculating uplifts to the proposed common PCL; and (ii) the results of our uplift calculations.

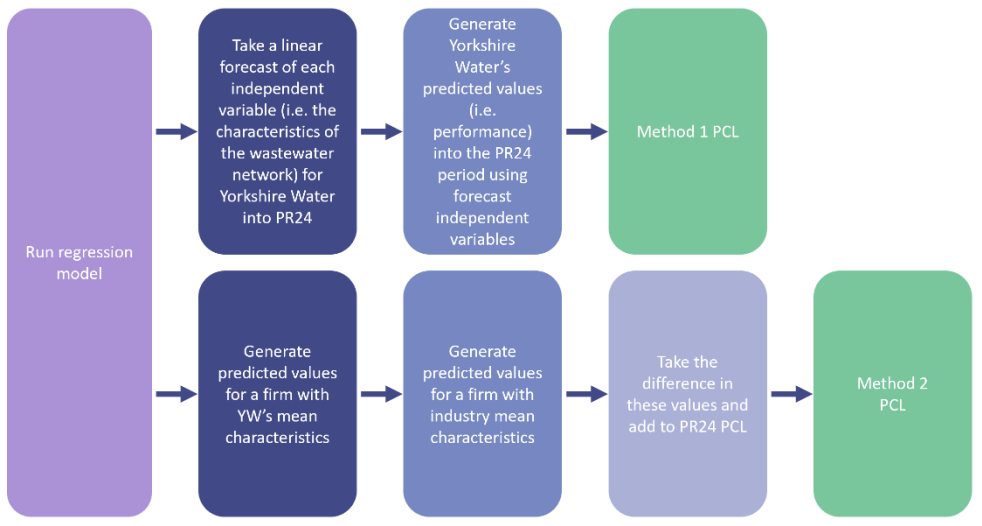
***Approach***

We employ two methods to estimate an adjusted PCL which reflects the unique regional challenges that our network faces.

- **Method 1**: Estimate a unique PCL for Yorkshire Water directly from the econometric model, using the model's predicted values for Yorkshire Water. In order to get model predicted values that continue through PR24 (as the data for the models' independent variables only exists up to 2022), we take a company-level linear forecast for each independent variable over the PR24 period.
- **Method 2**: Rather than estimating the PCL directly, this method estimates an adjustment or 'uplift' to the common PCL (of 20 spills) for Yorkshire Water. This uplift is calculated as the difference between the model's predicted values for Yorkshire Water and the model's predicted values if you had the characteristics of the hypothetical average firm (in other words, if you had the average value of each of the model's independent variables). This uplift is added to the common PCL for spills to get the adjusted PCL for Yorkshire Water.

Figure 45 below illustrates how these two methods stem from the regression model.

## Figure 45: Two methods for estimating uplifted PCLs for Yorkshire Water




Source: Economic Insight.

### *Results*

The results of our adjustment calculations are presented and discussed in detail in **0**. Using our preferred model specification (Model 7, for both OLS and RE), the results indicate that Yorkshire Water should receive an adjusted PCL of between 26.7 and 37.3 spills per storm overflow, to account for our unique regional circumstances. The graphs in Figure 46 and **Error! Reference source not found.** show the range of expected performance via the two modelling methodologies, with our AMP8 target glidepath also included, showing it falling within the range.

The econometric models assumes that EDMs are monitoring 100% of the time, therefore includes no adjustment to the number of spills on average per overflow, i.e. would be higher if a percentage of monitor down time was included. Our bottom-up estimate recognises that there will be a gradual improvement in EDM uptime, and would start at 28 spills per year on average if EDMs worked 100% of the time. Hence our reported spill frequency entry point of 34.98 is appropriate for the expected performance of our network at the start of AMP8, rather than taking the lowest model estimate.

## Figure 46 Model 7 (RE) estimated adjusted PCLs and target for AMP8

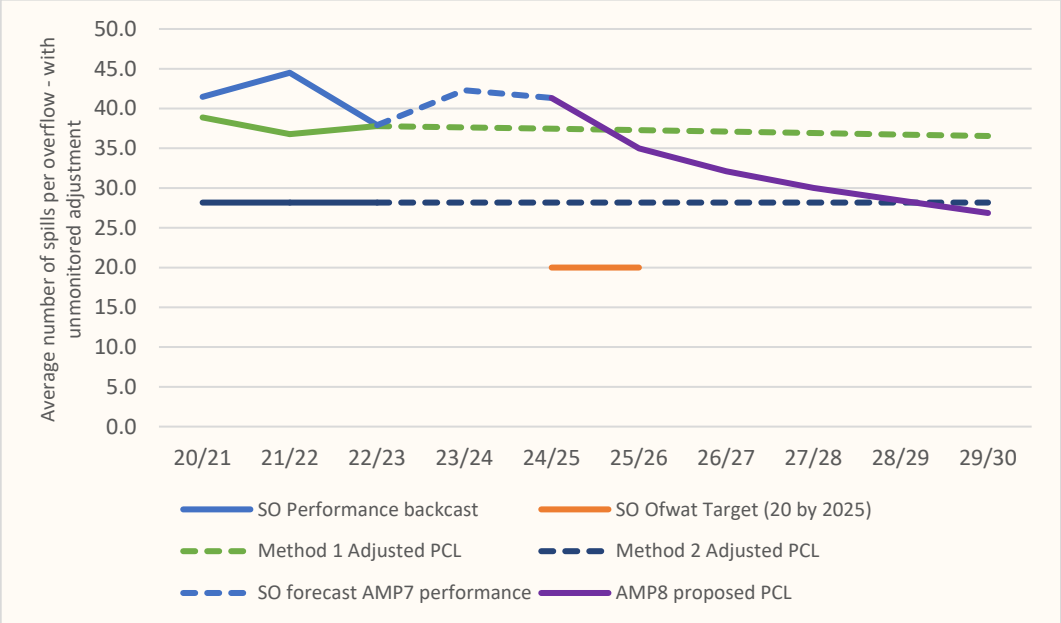
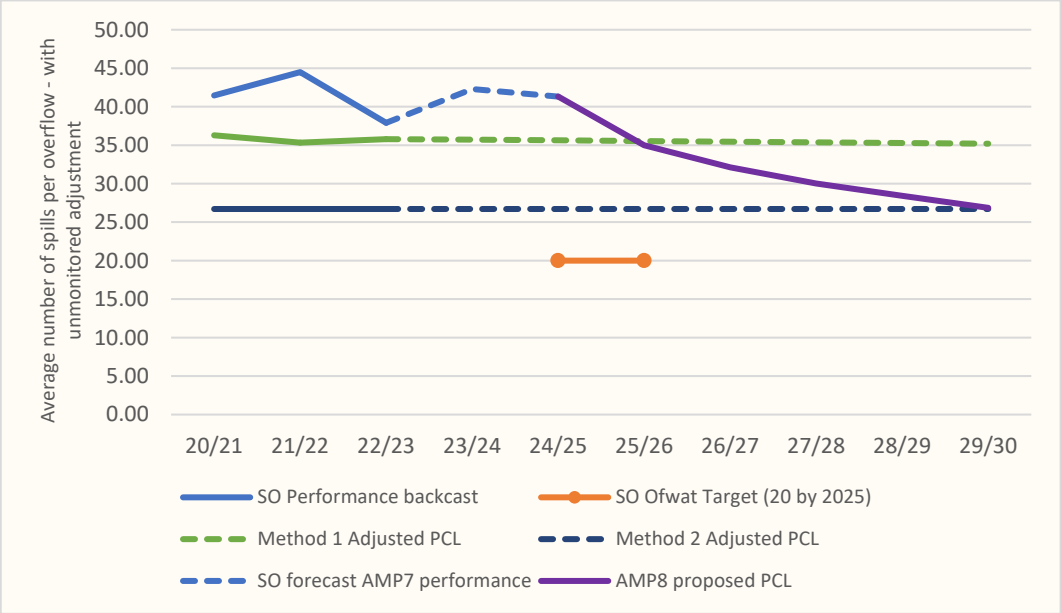


**Figure 47 Model 7 (OLS) estimated adjusted PCLs and target for AMP8**




## 14.7 Social and Environmental Benefits

We anticipate substantial value to be delivered as a result of these interventions linked to society and the environment.

By reducing the number of spills and adding in screens to storm overflow chambers that don't have them, will create benefits by:

- Improving the ecological condition of the receiving water
- By removing a 'disgusting' factor of the impact that society considers this has on the environment
- Preventing any solids from being discharged

By using blue-green solutions that are nature-based we have the potential to:

- Improve the urban environment through greening by understanding the local retrofit context
- Improve air quality
- Create more attractive place to live and work
- Increase the number of green spaces or overlooking vistas that can improve our health and wellbeing
- Create green corridors to support biodiversity net-gain

## 14.8 Our long-term ambitions

Our long-term ambition is to reduce storm overflow spills such that the water environment is protected from our assets and that they do not cause local ecological harm. We will do this by both driving down the number of spills through our day-to-day operations as well as through planned capital interventions (outlined in section 14.9) to meet the requirements of the Environment Act and in line with the SODRP. This was documented in our first Drainage and Wastewater Management Plan 2024 (DWMP24). Our first target working in AMP8 and AMP9 will be to meet the 2035 requirements that means 75% of all storm overflows discharging to sensitive waters have been addressed and that all bathing water schemes have been completed.

A key part of our long-term ambition is to understand where we need to reduce the number of spills to less than 10 per year where a storm overflow may be identified as causing local environmental harm. Our ambition also reflects our desire to increasingly remove the amount of surface water that enters the combined sewer system and divert it directly towards receiving waters (which it reach anyway) but managed and attenuated using blue-green interventions so to not create a fluvial flood risk.

Our intent is to increasingly achieve spill reduction by using nature-based, blue-green infrastructure solutions often referred to as sustainable drainage systems (SuDS). The nature of our catchments though tend to mean we cannot infiltrate into the ground, and hence need to create a joined up system of SuDS that slow the flow and conveys it to a new discharge point. This is in preference to attenuating and returning it back to the combined sewer and ultimately require treating and / or create a further flow to manage at the wastewater treatment works. In AMP8 we are targeting 20% of schemes to have blue-green solutions, moving to 50% in AMP9. A key part of achieving the long-term ambition is to understand the impact that storm overflows have on receiving waters. Whilst there is current uncertainty on the scale and roll out of the monitoring requirements, our experience in undertaking WFD / UPM investigations for many years provides us with a deep knowledge of the need and requirements for monitoring and using the data to determine compliance and implement schemes. We will undertake EnvAct_INV4 investigations to inform "no harm" requirements for the priority assets for AMP9 schemes and beyond.

At the end of AMP9 we expect to have an average of 22.56 spills per year (2035 calendar year). By AMP12, we expect to have an average of less than 10 spills per year. This is a result of schemes that deliver 10 spills per storm overflow annually, bathing schemes which drive fewer spills in bathing seasons, schemes that deliver less than 10 spills per year to address local ecological harm and storm overflows that already spill less than 10 spills per year.
For details of our long-term delivery strategy for storm overflows please see OUT5 Storm Overflows and LS1 Storm Overflows summary tables and methodology.

## 14.9 Our plans to deliver this commitment

### 14.9.1 Scale of investment

Please see our Storm Overflows enhancement case and our Coastal Storm Overflows Enhancement Case or details of our investment plans. In addition, we have included for investment to support our Bathing Waters Enhancement Case which will also reduce the spill frequency of our storm overflows.

More detail on this subject can be found in **Bathing Water PC Appendix**

Further investment will also be made to ensure EDM data accuracy and validation. We will ensure we continue to receive reliable and accurate data and can validate sensor performance. We see this as critical to ensure our reporting is accurate and enables us to share data in real time with our customers.

We anticipate that significant investment for storm overflows is through enhancement as a result of the spill reduction required to a 2050 design horizon. This includes coping with the predicted increases in rainfall and urban creep (where surfaces typically within residential curtilage are paved over or extensions/new buildings erected with flow being discharged uncontrolled to the sewer). We recognise that growth is typically accounted through other mechanisms. The effect of growth (typically now dry weather flow) does not have a material effect on the level of intervention required e.g. the storage to intercept spill flow or the amount of impermeable area that needs to be disconnected from the combined sewer system. We outline these aspects further in our enhancement case for storm overflows.

More detail on this subject can be found in **Storm Overflows Enhancement Case in the WINEP Enhancement case appendix**

A summary of the activities we will be undertaking on storm overflows includes:

- Live EDM provision to the public for each storm overflow.
- Investment in reducing storm overflow spills to less than 10 spills per year for 199 storm overflows.
- Investment in 22 coastal storm overflows to achieve 2 spills or less per bathing season (and less than 10 spills per year on average)
- Investment in 22 storm overflows upstream of our inland bathing water locations/potential locations to achieve 1 spill per bathing season and less than 10 spills per year on average.

- Targeting the delivery of 20% of storm overflows to incorporate aspects of blue-green solutions.

### Organisational delivery approaches

We have identified and are putting in place a number of approaches to efficiently deliver our AMP8 storm overflows plan. This covers how we work internally, how we work with our supply chain and how we work with external partners and stakeholders to implement solutions.

We have created a new **River Health Team** that focuses on driving a joined-up approach to river health, acting as YW's hub for improved water quality across Yorkshires rivers, coasts and other water bodies. The team's focus is broad, not just on storm overflows, and includes pollution, permit compliance, working with communities and driving multiple benefits from interventions. The team is adopting a system-based, smart thinking approach to coordinate, collaborate and innovate on catchment improvements. The team will champion aligned investment decisions (internally and externally), helping to deliver on our environmental commitments to both the industry regulators and our customers. Whilst the team will have an on-the-ground presence, it will be responsible for planning and achieving the reduction in storm overflow spills year on year through capital and operational investment.

We have identified that a significant proportion of our investment where larger scale interventions are required will utilise a **Direct Procurement for Customers** route. This will target the 27 coastal storm overflow locations and also at overflows in the vicinity of the inland bathing water at Wetherby. We have taken this approach because it has the potential for positive value for money based on the "bankability" and the cost saving due to efficiency. "Our Plan" discusses our approach to DPC further.
We have developed a **Storm Overflow Alliance Model** to deliver the remaining elements of the programme not being targeted through DPC. This alliance will cover, but not be limited to, design, civil engineering works and process works (including mechanical, electrical, instrumentation and telemetry) as well as scope and programme change management, progress and performance reporting, quality management and commissioning. The alliance will bring together a number of partners in design and construction to work collaboratively with YW, driving efficiency and focus in delivering the storm overflow plan.

To achieve the unprecedented level of delivery across the region with both blue-green and grey solutions, working with our partners and stakeholders will be critical to its success. We are **growing our partnership working**, building on Living with Water[17] and Connected by Water[18] this AMP, to further broadening out our approach. We have developed a Collaborative Opportunistic Adaptive Planning Framework, to help bring integrated opportunities to the fore, test their benefit, and agree delivery approaches with stakeholders involved. We outline our approaches to partnerships further in "Our Plan" document.

More detail on this subject can be found in **Chapter 8: Our Plan**

### Driving data confidence and visibility

In preparing for near real time EDM data being shared publicly we have been maturing our approach in operational readiness to reduce monitor down time.

We are also using data analytics to understand the causes of the spills to target types of interventions. With the roll out of our wider sensor programme as part of the flooding and pollution prevention initiatives, we will combine that data with EDMs, to inform intervention requirements. The analysis system will for example identify whether an storm overflows is prone to very short duration spills or whether long tails post rainfall area indicating an infiltration and inflow challenge.

As part of visibility we have also been developing our Unified Operations Centre proof of concept. This centre will aim to bring a large range of data sets together from different systems to assist planners and operators in making better and quicker decisions.

[17] Living With Water | Living With Water
[18] Connected by Water

### Driving improvement and efficiency through innovation

Innovation plays an important role in supporting how we reduce the frequency of storm overflow discharges, as well as critically the amount of water discharged. We have a particular focus on how we work in partnership, how we control flows above ground before it enters the sewer, and once it is in the sewers and how to limit flows entering the sewer below ground.

Our intent is to have 20% of schemes with blue-green solutions. In the majority of cases across the region, the soil type means we see limited potential to infiltrate rainwater into the ground. As a result, our blue-green solutions will need to be joined up to slow the flow and convey it to a receiving water course. Hence, we will typically apply hybrid solutions that are a combination of blue-green-grey infrastructure. This approach will also avoid surface water that we intercept from returning to the combined sewer system to be treated whilst also avoiding the risk of prolonging (or even increasing) storm overflow spills further downstream.

Our work in partnerships with local authorities has given us significant insight into the delivery of blue-green solutions. This insight includes understanding how to work collaboratively in formal and less formal partnerships, key decisions where early agreement is required (e.g. solution types, operation, maintenance, ownership and adoption) and working with the communities to retrofit in their neighbourhoods. Working in partnership will also help shape our programme where significant opportunities to retrofit blue-green solutions cost effectively may arise, but at this point in time are not visible (or even planned by our partners). These opportunities for example, a highway renewal scheme, may enable us to retrofit at a lower cost and cause less disruption to local communities.

Within the blue-green approaches we are also looking to retrofit stormwater planters and water butts on residential and non-residential properties. Our learning in Living with Water working in collaboration with the University of Sheffield and Local stakeholders such as Timebank on projects such as Moca[19] and Magic[20] has given us insight into the social aspects of property retrofits. This insight includes alternative approaches to how we engage, who we use to engage and deploy solutions on individual properties and locally in the community.

We see digital approaches supporting the control of flows above ground on properties and below ground to maximise the sewer network capacity. We are trialling the use of SMART water butts that may discharge back to the combined sewer or directly to customer land. The critical element is the provision of the storage facility in the water butt when it is needed, and when not ensuring as much water can be retained for customer use – hence reducing potable water demand. Alternative approaches to managing water butts was also explored in the Moca and Magic research projects where the customer is engaged and becomes involved in managing the flow also will be a possibility to trial further.

Below ground we see the potential to manage flows by understanding the system and maximising the storage in the network or increasing pass forward flows for the ‘right storms’ that will not result in a deterioration in levels of service for flooding elsewhere. We are currently undertaking an active system control pilot aimed at understanding the potential and determining the benefit and application ruleset. This approach may yield efficiencies in scheme sizes (e.g. reducing storage size) whilst helping to target where to retrofit blue-green solutions. Such an approach will link the active system control assets to the rainfall predictions and digital twins of the network.

With an aging asset base, and a high proportion of combined sewers, we will have locations to target to reduce infiltration where it is economically affordable to do so. Infiltration typically occurs through joints. Lower cost, less intrusive approaches are needed to reduce infiltration. As part of our approach, we are trialling small diameter spray lining techniques that could yield efficiencies in the delivery infiltration reduction in our network, and with the intent to test on larger diameters in the future. Furthermore, we are involved in supporting national research with local involvement at the University of Sheffield and University of Leeds in Pipebots. This research has the longer-term potential to revolutionise how we understand the level of asset health, determine localised intervention requirements and deploy interventions.

[19] MOCA: Mobilising Citizens for Adaptation: building local flood resilience through cooperative rainwater harvesting - (ukclimateresilience.org)
[20] MAGIC: Mobilising adaptation - governance of infrastructure through co-production - (ukclimateresilience.org)

In preparing for the requirement to deploy a large number of in-river water quality monitors, we are undertaking trials of alternative sensors in the Ilkley catchment. The purpose of this work is to provide us with insight on sensor performance and provide alternative choices based on cost. Understanding the river impact will be important to identify if solutions need to drive beyond 10 spills. Furthermore, we are supporting a PhD with Stantec and the University of Sheffield to understand the uncertainty in water quality monitoring and model predictions to inform investment choices.

### Interventions to support achieving the performance commitment

We are adopting a catchments approach to developing, optimising and implementing solutions. This means that we will apply systems-thinking and develop our solutions by:

- Understanding the interaction of the storm overflows with other storm overflows and the WWTWs in the catchment, including those assets due for improvement in later AMPs.
- Understanding our other catchment needs and drivers (WINEP and non-WINEP) to explore where integrated solutions may be appropriate.
- Our partnership approach by understanding the opportunities that may enable us to deliver schemes more efficiently, effectively or cause less disruption.
- Applying our TotEx and Carbon Hierarchy to schemes, that seeks to minimise what we need to build.
- A capitals approach that understands the wider benefits of intervention choices to maximise the value for society and the environment.

In adopting the catchment approach, we will typically deploy a combination of interventions to reduce the spill frequency. These include:

- Retrofit blue-green infrastructure / sustainable drainage to preferably remove surface water from the combined sewer or attenuate it to slowly drain back. These solutions will target residential and non-residential properties, highways and public open space. Many of our solutions will by hybrid blue-green-grey with the need to join up measures below ground and connect to surface water and storm overflow pipes. 20% of our storm overflows will encompass blue-green solutions in AMP8, increasing to 50% beyond AMP8.
- To disconnect surface water sewer systems and slowly discharge them to a nearby watercourse. These may also require blue-green solutions to attenuate flows locally and prevent impacts to the watercourse.
- Use integrated constructed wetlands to treat storm overflow discharges and (subject to agreement) recognise that the water quality discharged is of appropriate quality and therefore not ‘counted’ as a spill. We will build on the learning of our work at WwTW and schemes currently in play as part of our AMP7 WINEP.
- Active system control of the network to maximise sewer network storage potential for the rainfall events that lead to more frequent storm overflow spills (and not cause a detriment in performance (e.g. flooding). This will include more automation and control, linked with live rainfall forecasting and digital twins, driving the control of penstocks and auto emptying of storm tanks at works and storage tanks (new and existing) in the sewer network.
- Construct storage on the combined sewer system (preferably) at the storm overflow and return it back to the sewer network in a controlled manner to prevent a downstream impact.
- Build screens in CSO chambers that are unscreened to prevent the discharge of aesthetic pollutants such as wipes and sanitary products. Where possible, we will retrofit screens and Yorkshire Water has considerable experience from its AMP3 and 4 programmes of achieving this, but new or extensions to chambers may be required, along with increasing the size of the incoming pipes or spill pipes at times, in line with industry good practice.
- Increase the treatment capacity of the wastewater treatment works. This requires a review of the treatment assets and the hydraulic control through the works and is site specific.
- Reduce infiltration (through lining of the main sewer and potentially property connections) and inflow (disconnect known points) into the combined sewer system. Our analysis of spill data will indicate where this potential lies, and we will target appropriately to prevent or remove these flows.
- Continually improve our analytics identify capacity reduction in the sewer network and organise the appropriate operational response to intervene.

## 14.10 Our incentive to deliver

### Table 50: Storm Overflow PC Incentives

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Underperformance and outperformance |
| **Price control allocation** | 100% wastewater network plus |
| **ODI rate** | £1.39m per average number of spills per storm overflow |
| **Outperformance payment- standard** | £1.39m per average number of spills per storm overflow |
| **Underperformance payment - standard** | £1.39m per average number of spills per storm overflow |
| **Timing of underperformance and outperformance payments** | In-period |

## 14.11 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 14.12 Deadbands

Deadbands do not apply to this PC.

## 14.13 Cap/Collars

The guidance published by Ofwat to inform the development of business plans for PR24 indicates that the cap and collar for this PC will be +/-0.5% of RoRE.

## 14.14 Storm overflows: Supporting evidence to econometric modelling

### Appendix 1: Adjustment to account for unmonitored spills

In this Appendix, we explain how we have adjusted the storm overflow spills variable to account for how some companies collect data, and report from, a lower proportion of their storm overflows.

Published data on storm overflow spills tends to underestimate the true number of spills per storm overflow. If this is not accounted for in our analysis, our models are at risk of suggesting that companies with a low rate of data reporting are performing well, relative to their exogenous characteristics.

We take the following steps to mitigate this:

- Gather data from each company's Event Duration Monitoring (EDM) Annual Return.[21]
- Take the average '% of reporting period EDM operational' for each company in each year. We exclude missing data from the calculation of this average.

[21] Source: https://www.data.gov.uk/dataset/19f6064d-7356-466f-844e-d20ea10ae9fd/event-duration-monitoring-storm-overflows-annual-returns

- Divide each company's annual average spills per storm overflow by their average annual % reporting figure to get the pro rata number of spills each year for each company. This increases the annual average spills per storm overflow more for companies that have a lower rate of reporting
- We assume that all the EDMs are installed and are working 100% of the time, so not adjusted for any performance commitment penalty for down time.

## Appendix 2: Estimating the percentage of combined sewers

In this Appendix, we explain how we calculate the percentage of combined sewers in each network. This is required because Ofwat data does not break down formerly private sewers by sewer type. In addition, we set out a method of testing the sensitivity of our results to assumptions on the proportion of foul sewers that are also combined.

Existing Ofwat data on the length of sewers in each wastewater company's network includes the following elements.

1. Length of foul (only) public sewers (in km).
2. Length of surface water (only) public sewers (in km).
3. Length of combined public sewers (in km).
4. Length of rising mains (in km).
5. Length of other wastewater network pipework (in km).
6. Total length of legacy public sewers as at 31 March (in km).
7. Length of formerly private sewers and lateral drains (s105A sewers) (in km).

Where items 1 to 5 sum to form item 6.

However, following advice from Stantec, we want to remove the total length of surface only sewers from the measure of total sewer length. In other words, we want to calculate the total percentage of combined sewers in each company's wastewater network as the following:

$$\frac{km\ of\ Combined\ Sewers\ (Private\ and\ Public)}{km\ of\ Sewers\ (Private\ and\ Public) - km\ of\ Surface\ Sewers\ (Private\ and\ Public)}$$

The Ofwat data, in its current form, is inadequate for the calculation above because it does not break down the length of formerly private sewers (item 7) by sewer type (foul, surface water, combined, etc.) in the same way that it does for public sewers (see items 1 to 5). Thus, we are unable to add the total length of private combined sewers to the denominator, and we are unable to subtract the total length of private surface sewers from the numerator. We therefore estimate the length of legacy private combined and surface sewers in the following way.

- Firstly, we calculate the ratio of lengths of sewer types for public sewers in the oldest year of data available (2011/12) for each wastewater company.
- Secondly, we multiply the length of legacy private sewers (which is fixed) by this ratio. This gives the estimated length of each legacy private sewer type for each wastewater company.

We also test the sensitivity of our Model 7 to also including a subset of foul sewers in the total length of combined sewers. We do this because some foul sewers also take surface water, making them combined sewers. We test the sensitivity of our results to assuming 25% or 50% of foul sewers are combined (the baseline model assumes 0%). We find that our results are not materially sensitive to these changes, but do find that the models predict that combined sewers have a greater effect on spills than they would if foul sewers were not included in the length of combined sewers.

## Appendix 3: Regression model results

In this Appendix, we present the results from our econometric modelling in the tables below.

### Table 51: Regression results, OLS

| Average spills per storm | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|

| overflow, natural log | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Percentage of combined sewers** | 0.007** | | | | 0.016*** | 0.009*** | 0.008*** | 0.008*** |
| **Annual urban rainfall, natural log** | | 0.150 | | | 0.337*** | 0.196 | 0.225* | 0.184 |
| **WAD, natural log** | | | 0.000 | | 0.293** | 0.149 | | |
| **Normalised FSEs, natural log** | | | | 0.509* | -0.851** | | | |
| **Time trend** | | | | | | | | -0.162*** |
| **Constant** | 3.040*** | 2.180 | 3.356** | 1.829** | 0.232 | 0.233 | 1.235 | 2.373** |
| **R-squared** | 0.268 | 0.043 | -0.036 | 0.109 | 0.541 | 0.421 | 0.415 | 0.602 |
| **RESET test** | PASS | FAIL | PASS | PASS | PASS | PASS | PASS | PASS |

*Source: Economic Insight analysis.*
*Note: Asterisks indicate statistical significance: *** for 1%; ** for 5%; and * for 10%. Standard errors are robust and clustered at the company level, in line with Ofwat's base cost methodology. RESET pass or fail is assessed at 5% significance level.*

## Table 52: Regression results, RE

| Average spills per storm overflow, natural log | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Percentage of combined sewers** | 0.007** | | | | 0.018*** | 0.009*** | 0.009*** | 0.008*** |
| **Annual urban rainfall, natural log** | | 0.670*** | | | 0.505*** | 0.459*** | 0.471*** | 0.237* |
| **WAD, natural log** | | | -0.008 | | 0.268** | 0.014 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Normalised FSEs, natural log** | | | | 0.628** | -1.089*** | | | |
| **Time trend** | | | | | | | | -0.156*** |
| **Constant** | 3.039*** | -1.872 | 3.414*** | 1.473* | -0.254 | -0.765 | -0.74 | 1.914* |
| **R-squared** | 0.293 | 0.076 | 0 | 0.14 | 0.578 | 0.405 | 0.399 | 0.636 |
| **RESET test** | PASS | FAIL | PASS | PASS | PASS | PASS | PASS | PASS |

Source: Economic Insight analysis.
Note: Asterisks indicate statistical significance: *** for 1%; ** for 5%; and * for 10%. Standard errors are robust and clustered at the company level, in line with Ofwat's base cost methodology. RESET pass or fail is assessed at 5% significance level

We make the following observations of our results:

- **Percentage of combined sewers.** The percentage of combined sewers in a wastewater company's network has a statistically significant and material relationship with the number of spills in any given year. The models show that a percentage point increase in the percentage of combined sewers is associated with a 0.7% to 1.8% increase in normalised spills.[22]
- **Annual urban rainfall.** Urban rainfall has a statistically significant and material relationship with the number of spills in any given year. The models show that a 1% increase in urban rainfall is associated with a 0.2% to 0.7% increase in normalised spills.[23]
- **WAD.** The WAD in a wastewater company's network has an unclear relationship with the number of spills in any given year. The models show that a 1% increase in the WAD is associated with a 0% to 0.3% change in normalised spills.[24]
- **FSEs.** The number of FSEs in a wastewater company's network has an unclear relationship with the number of spills in any given year. The models show that a 1% increase in the number of FSEs is associated with a -1.1% to 0.6% change in normalised spills.[25]
- **Robustness and statistical tests.** We find that, with the exception of WAD and FSE, the coefficients of our models are robust to changes in specification. The R-squared of our models and the RESET (correct functional form) test pass rate are both high.

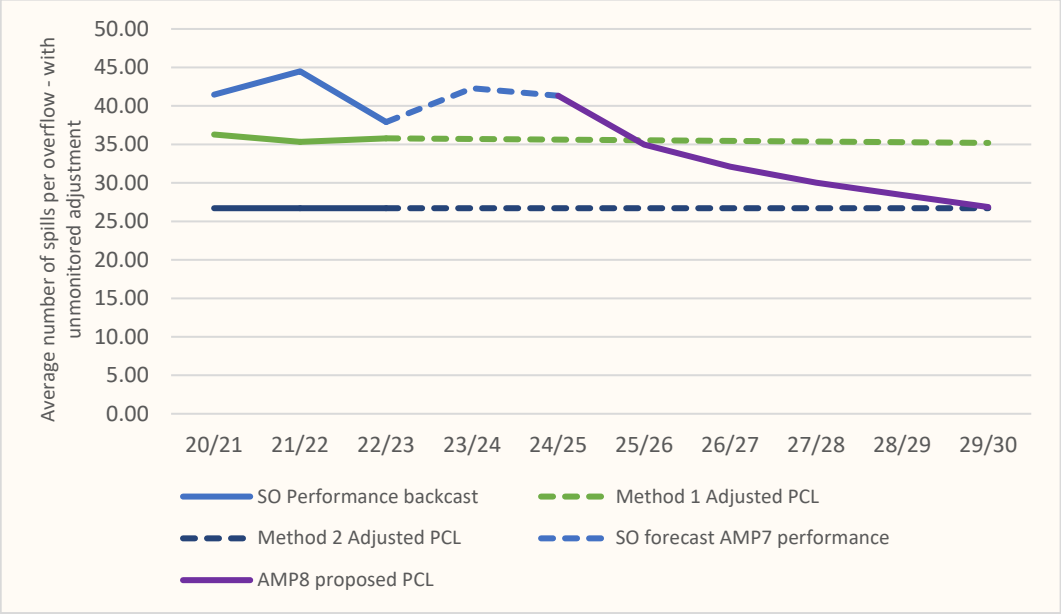
## Appendix 4: PCL adjustment results

In this Appendix, we apply the results from preferred model specification (Model 7) to the two adjustment methods discussed in section 14.6.2.1, yielding uplifts to the proposed common PCL of 20 spills per storm overflow.

The adjusted PCLs generated by the OLS model are shown in Figure 48 and in Table 54. The adjusted PCLs generated by the RE model are shown in Figure 49 and in Table 55. As can be seen, we calculate a range of adjusted PCLs of between 26.7 and 37.5 spills per storm overflow per year (depending on the year and method applied).

22 The interpretation of the coefficient is calculated as 100*(EXP(B)-1)%.
23 The interpretation of the coefficient is simply taken as B%.
24 The interpretation of the coefficient is simply taken as B%.
25 The interpretation of the coefficient is simply taken as B%.

## Figure 48: Model 7 (OLS) estimated adjusted PCLs for Yorkshire Water



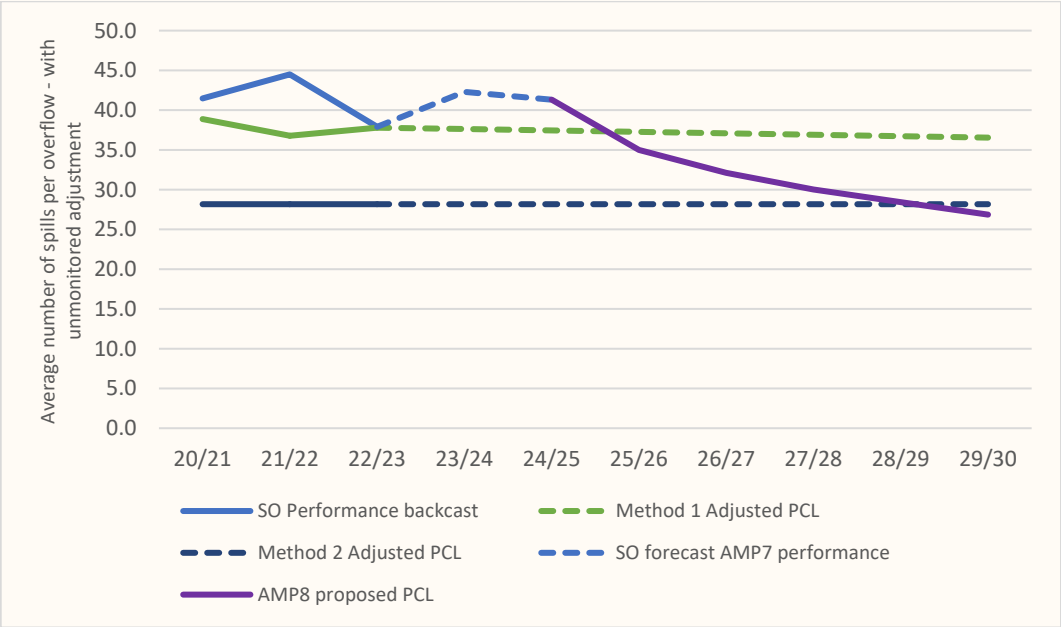

Source: Economic Insight analysis.

## Table 53: Model 7 (OLS) estimated adjusted PCLs for Yorkshire Water

| Year | Method 1 PCL | Method 2 PCL |
|---|---|---|
| **2026** | 35.5 | 26.7 |
| **2027** | 35.5 | 26.7 |
| **2028** | 35.4 | 26.7 |
| **2029** | 35.3 | 26.7 |
| **2030** | 35.2 | 26.7 |

Source: Economic Insight.

## Figure 49: Model 7 (RE) estimated adjusted PCLs for Yorkshire Water



Source: Economic Insight analysis.

### Table 54: Model 7 (RE) estimated adjusted PCLs for Yorkshire Water

| Year | Method 1 PCL | Method 2 PCL |
|---|---|---|
| **2026** | 37.3 | 28.2 |
| **2027** | 37.1 | 28.2 |
| **2028** | 36.9 | 28.2 |
| **2029** | 36.7 | 28.2 |
| **2030** | 36.5 | 28.2 |

Source: Economic Insight.

# 15. Discharge permit compliance

## 15.1 PC Type

Environmental outcomes

## 15.2 Performance targets

### Table 55: Committed performance levels

| PR24_DPL | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | % | 100% | 100% | 100% | 100% | 100% |

## 15.3 Summary

The discharge permit compliance metric is reported as the performance of wastewater treatment works (to treat and dispose of sewage) and water treatment works (for the water supply service) in line with their numeric discharge permit conditions. The discharge permit compliance metric is reported as the number of failing sites and not the number of failing discharges.

The measure itself is defined in the discharge permit compliance (numeric) metric in the Environment Agency's Environmental Performance Assessment (EPA) methodology version 9 May 2021.

Yorkshire Water has over the last two AMPs improved performance for this measure, with the best ever performance in 2022 of only one failing works, leading the way in the industry. Continued investment to maintain asset health stability along with initiatives to increase visibility of treatment works performance in order to pre-empt any deterioration in performance will be key areas of focus for AMP8, with robust plans for quickly responding to prevent failures if required.

## 15.4 Customer and Stakeholder Engagement

Discharge permit compliance links with many of the priority areas that customers ranked as top and medium priority areas within the Ofwat/CCWater customer preferences research - for example river water quality/sea water quality. The research highlights that discharge permit compliance came up in conversation with customers, but that it was not seen as a priority area for discussion as it was taken on trust that the water company would manage this against their mandate. Indeed, the expectation that it is a hygiene factor aligns with our target to be 100% compliant year-on-year.

Read more about this at
**Ofwat/CCWater customer preferences research**

When triangulating against additional research we have carried out, we can see that discharge permit compliance is firmly in the top list of priorities for our customers in our Valuing Water research. The priority area of 'treating wastewater to a high standard to ensure good quality water in Yorkshire's rivers and beaches' all sits within the top 6 priority service areas out of the 20 tested. This was due to the impact discharge failures have on river water quality. The expectation today is that Yorkshire Water's normal operations should not have any impact on the water environment.

When explored in our customer research for the Drainage and Wastewater Management Plan (DWMP), when compared to failures that acutely or directly impact customers like internal and external sewer flooding the priority for discharge compliance comparatively reduces. Despite this, due to increased media coverage and scrutiny we know that river water quality is more

important than ever and therefore customers expect us to be doing all we can to protect the natural environment.

In our own independent affordability and acceptability testing research study (outside of Ofwat guidelines) we included our target to be 100% complaint for this measure and 79% of customers found our plan to be acceptable overall including this target.

Read more about this in **Yorkshire Water independent affordability & acceptability research**

Read more about this in **Valuing water customer priorities research**

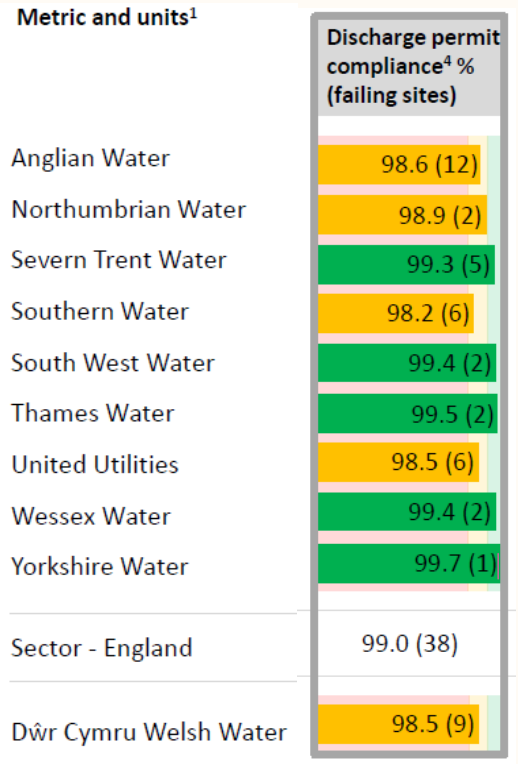
More detail on this More Read more about this in **Drainage and Wastewater Management Plan Research**

More detail on this subject can be found in **Chapter 6: Customer and stakeholder preferences**

## 15.5 Our performance to date

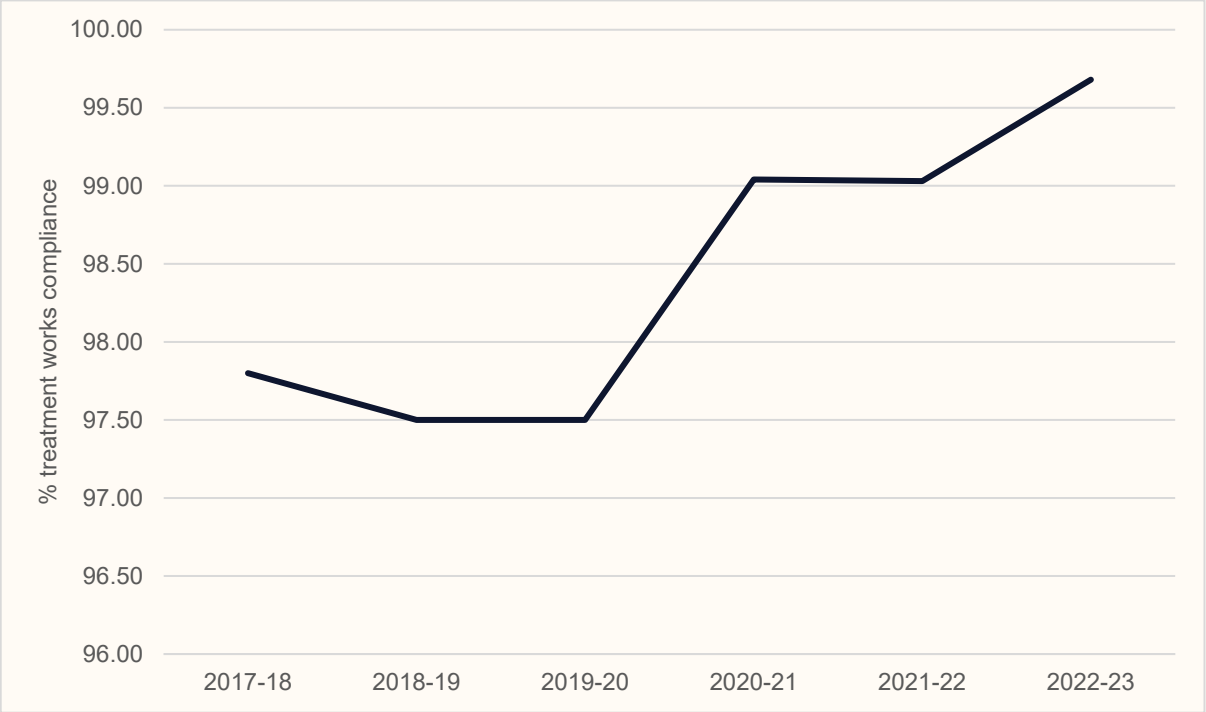
Performance for discharge permit compliance has improved through AMP6 and into AMP7, with our latest performance for 2022 being only one failing site out of our 294 numeric wastewater treatment works (WwTW) and 21 water treatment works (WTW), putting us as an industry leader. This is shown in our Environmental Performance Assessment table for 2022 as shown below in Figure 50.

**Figure 50: 2022 Discharge permit compliance results for Yorkshire Water and industry peers**




Poorer performance in the early part of AMP6 was largely attributed to unauthorised trade effluent discharges and failures, UV treatment issues and failures at WTWs sites. These were addressed through targeted investment and improvements to business processes. Our continued improvements through AMP7 can be largely attributed to significant investments at particularly problematic sites, and improving our preparedness so we can implement mitigation quickly to prevent any deterioration in discharges. This trend can be seen in Figure 51.

### Figure 51: Historical treatment works compliance achieved by Yorkshire Water




While the target in AMP7 for this PC was 100% there has been a dead-band set at 99%. We have or are forecast to perform better than the dead-band target for this PC across AMP7 and for the remainder.

## 15.6 Setting the target

The target performance for AMP8 is for 100% compliance.

### Table 56: Committed performance levels

| PR24_DPL | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| **Proposed AMP8 PCL** | Percentage compliance | 100% | 100% | 100% | 100% | 100% |

Through AMP7, we have seen continued improvement in performance for this PC. There is a risk that this level of performance will not be sustainable year on year, indicated by the fact that no company has ever consistently achieved zero failing works for multiple years. We believe the plans, which we set out below, for this commitment will increase our confidence in sustaining excellent performance, but there is still the potential for un-expected failures.

### 15.6.1 How past company performance have influenced PCLs set

Table 58 below provides both the company actuals and forecasts for the discharge permit compliance performance commitment for both AMP7 and AMP8, as well as the PR19 final determination for this performance commitment.

### Table 57: Company actuals and forecasts and PR19 final determination for discharge permit compliance

| Compliance (percentage) | AMP7 | | | | | AMP8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 20/21 | 21/22 | 22/23 | 23/24 | 24/25 | 25/26 | 26/27 | 27/28 | 28/29 | 29/20 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **PR19 final determination** | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | | | | | |
| Company actuals, ***arithmetic forecast and business plan proposed targets*** | 99.0 | 99.0 | 99.7 | ***99.0*** | ***99.0*** | ***100.0*** | ***100.0*** | ***100.0*** | ***100.0*** | ***100.0*** |

Table 58 shows performance against the discharge permit compliance target in AMP7. While the target for this performance commitment is 100.0% there is a deadband for performance set at 99.0%. We have or are forecast to exceed the deadband for this performance commitment across AMP7 and in Year 3 were the leading company for this measure.

We are proposing a target of 100.0% for AMP8. We propose to achieve this target through increased monitoring of our final effluent discharges, new process for "Above Ground Maintenance", as well as improved processes for mitigation.

## 15.7 Social and Environmental Benefits

Protecting the water environment is considered a top priority for bill paying customers. Discharge permit compliance for our numeric wastewater treatment works and water treatment works contributes to our overall environmental performance, and therefore managing these assets to ensure as close to 100% compliance as possible is important to us.

## 15.8 Our long-term ambitions

As discharges are subjected to ever tighter permit limits and additional discharge permit requirements (through WINEP regulatory and growth drivers), this performance becomes more challenging over time. During AMP7 alone, there will be an 23% increase in determinants analysed Despite this, we will continue to target 100% compliance for this measure beyond AMP8.

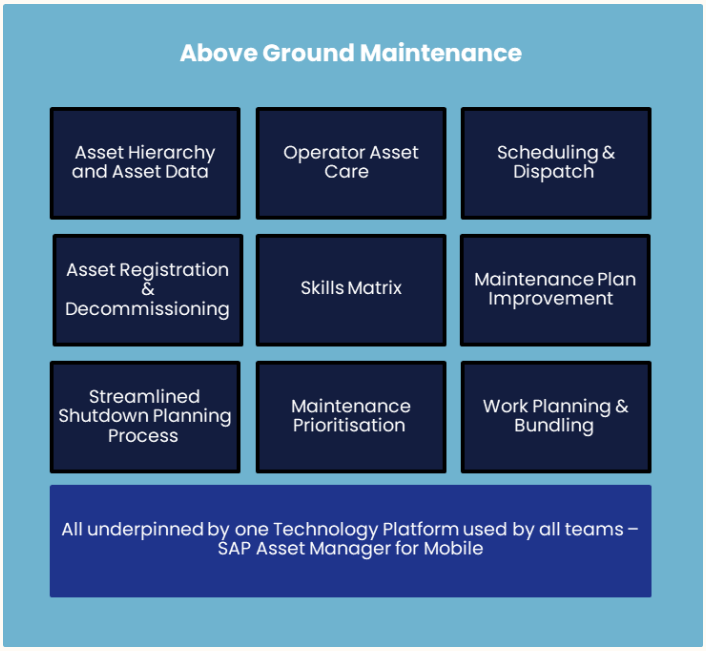
## 15.9 Our plans to deliver this commitment

For AMP8 we have identified a series of initiatives which will increase the likelihood of us being able to achieve as close to zero failing sites as possible.

- **Increased monitoring of our final effluent discharges** at our numeric permitted sites, in conjunction with central control intelligence will allow us to optimise site process performance and respond earlier to any issues. This will involve installation of continuous ammonia and turbidity monitors which will provide information to be used to refine our operational response if process changes are observed. This will also improve our base maintenance investment decision making. In addition, new processes for **optimising phosphorous removal within catchments** will be a key focus, following our largest ever phosphorus removal programme through WINEP in AMP7.

- New processes for **"Above Ground Maintenance"** will be embedded as part of our AMP7 Modernisation programme, which will allow us to more closely monitor asset condition and improve targeting of our operational and maintenance interventions. This will reduce the overall potential for process/asset failure, allowing us to manage the asset base more proactively and be able to pre-empt failures. Key components of this are set out in Figure 52: New approaches to above ground maintenance contributing towards improving discharge permit compliance

**Figure 52: New approaches to above ground maintenance contributing towards improving discharge permit compliance**




If process failure does occur, enhanced resilience through **improvements to our preparedness for mitigation** processes will mean that we can more quickly deploy process units if required. To do this, we will invest in ten mobile Submerged Aerated Filter process units, which can be installed quickly into the wastewater treatment process to secure compliance. We have found this to be extremely effective during AMP7 and we want to build on this improvement.

Ensuring continued compliance with **dry weather flow permits** also forms part of this delivery plan, with reviews undertaken on a monthly basis and any observed trends investigated, and interventions delivered. We review this performance into the future using our growth projections to ensure we investment proactively in our treatment works. More detail can be found in our WwTW growth enhancement case.

For clean water discharge permit compliance, we will continue to monitor performance and risks to compliance via the clean water Environmental Performance Assessment Delivery Assurance Group process and prioritise required investment in areas such as de-sludging and lagoon maintenance as required.

In addition to the above specific initiatives, there are several enabling activities and investment requirements to be delivered through the wastewater treatment base maintenance programme to maintain a stable asset health and provide a solid foundation for driving further improvement.

We will ensure we have a **trained and capable workforce** who understand all aspects of their permits, managing process assets in line with these, as well as having the ability to make processes more efficient. As our asset base continues to change due to our recent and future WINEP, we will increase our skills sets around phosphorous load reduction and optimisation of assets delivering this. Finally, as nature-based treatment becomes more of a key feature of our solutions in AMP8 (to reduce our operational and embodied carbon equivalent emissions, increase biodiversity and increase our overall resilience), we will review what skills are required to manage and optimise these in the most effective way.

We will continually **improve our compliance review processes** (managing reactive events and deterioration, pre-emptive and proactive identification of risk themes) and TotEx board process to continue to make informed decisions to give balanced decision making across the asset base and each of the performance commitments. To assist with this, we will improve risk capture and the use of our **NITRO asset deterioration models and Decision-Making Framework** to prioritise investment decisions at a programme level.

Further interventions have been identified, beyond those able to be funded in the business plan. We will continue to assess the overall cost benefit of these activities alongside the range of measures planned, so we can improve confidence in delivery and adapt our plans accordingly where required.

## 15.10 Our incentive to deliver

### Table 58: Discharge Permit Compliance Incentives

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Underperformance only |
| **Price control allocation** | WWN+ |
| **ODI rate** | £2.29m per percentage treatment works not in line with their permit |
| **Underperformance payment - standard** | £2.29m per percentage treatment works not in line with their permit |
| **Timing of underperformance and outperformance payments** | In-period |

## 15.11 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 15.12 Deadbands

Deadbands do not apply to this PC.

## 15.13 Cap/Collars

The guidance published by Ofwat for the development of PR24 business cases suggests that no caps and collars will apply to this performance commitment.

# 16. River water quality

## 16.1 PC Type

Environmental outcomes

## 16.2 Performance targets

### Table 59: Committed performance levels

| PR24_RWQ | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | Percentage reduction against 2020 baseline | 72.12% | 75.35% | 75.93% | 76.11% | 76.11% |

## 16.3 Summary

The performance measure is the percentage reduction in phosphorus emissions into river catchments because of water company activities when delivering their functions relative to the load of total phosphorus discharged by all wastewater treatment works in the baseline which is 1st January 2020 to 31st December 2020. Delivery of this performance commitment will create substantial environmental and social value through improvements to the health of Yorkshire's rivers and coasts, and the wider amenity and recreational benefits that such environments provide to our customers.

## 16.4 Customer and Stakeholder Engagement

We carry out extensive engagement with our customers, communities, and stakeholders. Information on our engagement approach can be found in Chapter 6, but specific customer engagement related to river water quality can be found below.

More detail on this subject can be found in **Chapter 6: Customer and Stakeholder priorities**

We know, using the Ofwat/CCWater customer preferences research that river water quality is of medium importance to customers, when considering it within a wider list of performance commitment areas. This may be because the research found that it had little impact day-to-day for most people, and areas considered most important were those which had a very personal link to them. It should be noted, however, that it is considered one of the most important environmental performance commitments and more relatable than others.

Read more about this in **Ofwat/CCWater customer preferences research**

In our own Valuing Water customer engagement research, we tested 20 priorities with household and non-household customers, three of which were specifically related to water quality in rivers. streams and the sea. Both household and non-household customers prioritised all three of these priorities within their Top 6 service areas.

An example of a specific piece of customer engagement carried out on phosphorus removal in our rivers was the WINEP research evaluating customer support for investigations and improvements to Wyke Beck and River Wiske. We used our online community in March 2023 to test support for water quality and river habitats improvements in these areas. The online community supported these investigations, with 82% saying that they supported investigations into reductions in phosphorus in the River Wiske, with a preference for any solution to be nature based and treated at source where possible.

Given Ofwat research, our own research, and wider media scrutiny, we understand that river water quality is of the utmost importance today. When undertaking our own independent testing

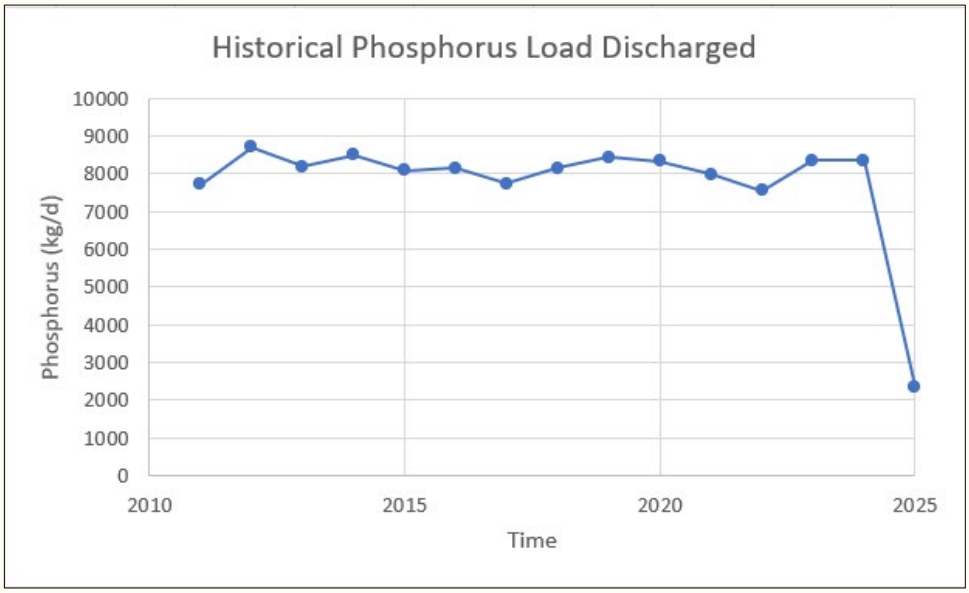
on affordability and acceptability of our plan (outside of Ofwat guidelines) we understand that the outcome 'a healthy, natural environment' is very important to 85% of our customers and our plan overall including this PC and the target outlined is supported by 79% of customers.

## 16.5 Our performance to date

Up until AMP7, YW has had a relatively small amount of P compliance to achieve driven by the Habitats Directive. Many companies have delivered large scale P removal in previous AMPs but in AMP7, 80 waste treatment sites were identified for phosphorous removal schemes. 49 designations were given under the Urban Waste Water Treatment Directive Sensitive Areas to improve P limits to 1 or 2 mg/l. In addition, there were 71 new Water Framework Directive limits given of which 21 were set at or close to the technically achievable limit of 0.25 mg/l. This resulted in 80 schemes, 9 serving a single Urban Waste Water limit, 32 serving the Water Framework Directive alone and 39 serving both directives. YW is on track to deliver these limits by the required compliance dates in 2024 and 2025.

Figure 53 below shows the historical phosphorus reduction in discharge. The significant reduction shown in the final data point is as a result of our large P removal programme as described above.

**Figure 53: Reduction in P from 2020 baseline (kg/day)**




Typically, the solution is additional treatment in the form of chemical dosing and solids capture. In AMP8 we will implement one biological nutrient removal plant at our Knostrop wastewater treatment works and several nature-based solutions based on low-rate biological removal through natural processes. Examples of this are at Clifton near Doncaster and East Marton in AMP7.

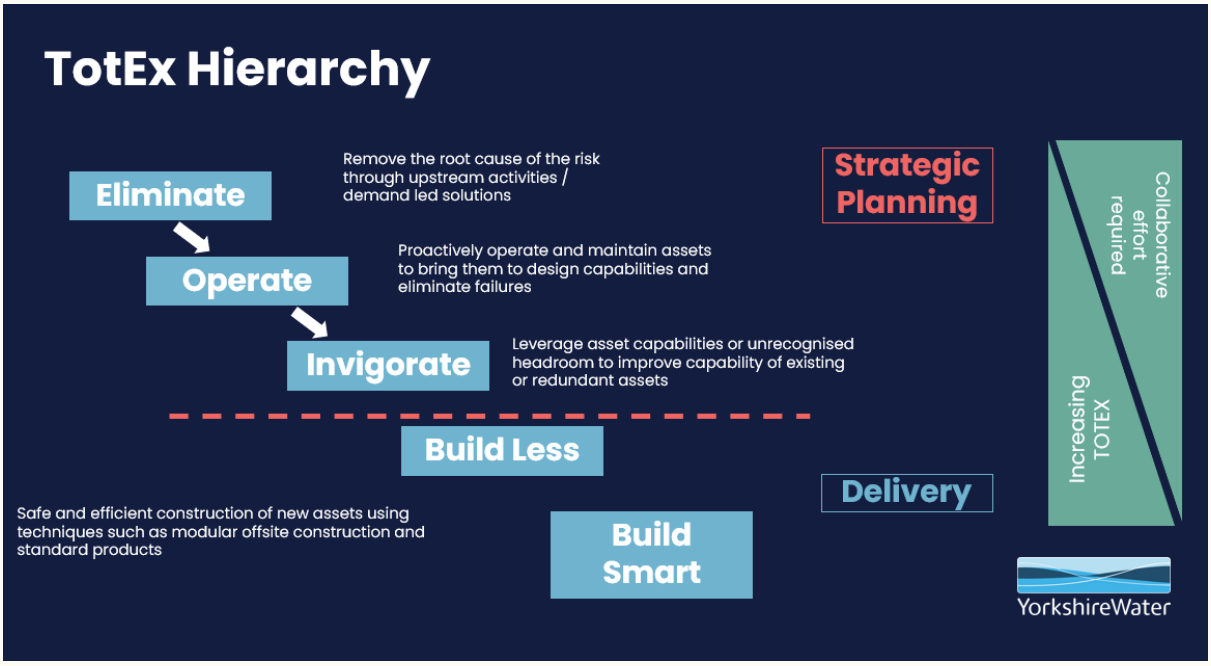
Figure 54 shows our example of a wetland at Clifton, the first nature based nutrient removal process in the country.

### Figure 54: Example of wetland at Clifton

We are committed to following the Totex hierarchy to deliver future nutrient removal and will work with and collaborate with landowners, the Environment Agency, and other stakeholders to develop catchment-based solutions before building new assets.

Figure 55 below shows the totex hierarchy we use in our decision making processes.

### Figure 55: Totex hierarchy used in decision making process




Where the construction of additional assets is necessary, we will deliver lower carbon, nature-based solutions where land and other factors allow before building traditional treatment assets.

Our commitment to using the totex hierarchy and building less and smarter will deliver benefits to net zero in addition to the water quality and wider society benefits that nature based and catchment based solution deliver. We are amassing large amounts of experience of delivering P removal due to the AMP7 obligations and we will build on this during AMP8 building in the innovation and efficiencies from our programmes.

## 16.6 Setting the target

### 16.6.1 How past company performance has influenced PCLs set

| Tonnes of phosphorous removed | AMP8 | | | | |
|---|---|---|---|---|---|
| | 2025/26 | 2026/27 | 2027/28 | 2028/29 | 2029/20 |
| **Business plan proposed targets** | 6,009 | 6,278 | 6,327 | 6,341 | 6,341 |
| **Percentage reduction against a 2020 baseline** | 72.12% | 75.35% | 75.93% | 76.11% | 76.11% |

provides the business plan proposed targets for the river water quality performance commitment for AMP8.

**Table 60: Company business plan proposed targets for river water quality**

| Tonnes of phosphorous removed | AMP8 | | | | |
|---|---|---|---|---|---|
| | 2025/26 | 2026/27 | 2027/28 | 2028/29 | 2029/20 |
| **Business plan proposed targets** | 6,009 | 6,278 | 6,327 | 6,341 | 6,341 |
| **Percentage reduction against a 2020 baseline** | 72.12% | 75.35% | 75.93% | 76.11% | 76.11% |

This is a new performance commitment for AMP8 (the previous performance commitment for river water was defined as length of river improved). As such, there is no equivalent PR19 determination, or industry comparator data against which to measure our performance.

For AMP8, we are proposing to remove 6,009 tonnes of phosphorous in year 1, rising to 6,341 tonnes of phosphorous by the end of AMP8. We will achieve this reduction primarily through the delivery of the WINEP programme. This will be delivered through the installation of additional treatment, as well as the installation of nature-based and biological nutrient removal solutions where possible to do so.

## 16.7 Social and Environmental Benefits

Waterbodies that are rich in nutrients can be affected by eutrophication, where algal blooms reduce the amount of oxygen available to flora and fauna. This can have a detrimental impact on the ecological status of a waterbody. Removing phosphorous from our WwTW continuous discharges will reduce the environmental impact on riverine habitats by reducing the nutrient load available on which algal blooms depend. This in turn will encourage the return of a more diverse range of species to thrive in a waterbody. For example, the arrival of salmon in the River Don, a key indicator species reliant on good levels of oxygen especially for their spawning grounds, illustrates how improvements in wastewater treatment are encouraging wildlife to return.

The AMP8 phosphorus removal programme will build upon our FairShare load of phosphorus removed in previous AMPs. This, together with other measures we are undertaking such as fish passes, will continue to encourage ecological improvements in Yorkshire. Decreasing the risk of algal blooms and improving ecology in Yorkshire's waterbodies will have an overall benefit to areas used for recreation and amenity and provide a more enjoyable environment all round.

## 16.8 Our long-term ambitions

As set out in the LTDS, we will continue our program of WwTW improvements for removal of phosphorus to achieve the EnvAct_IMP1 target of 80% of the 2020 baseline by 2038.

## 16.9 Our plans to deliver this commitment

In AMP8 there will be a further 107 phosphorus removal obligations (via the various limits defined by the Water Framework Directive, Urban Wastewater Directive and the Environment Act) to be delivered at 87 waste treatment sites by March 2030. We will continue to work with stakeholders to deliver the obligations using the totex hierarchy principles of no build to build smart. We will continue to develop catchment-based solutions, optimising existing permits and delivering maximum river water quality benefits within expenditure allowances. We will develop a view on - nature-based solutions and other biological nutrient removal techniques before building any standard processes based on chemical dosing.

There are significant costs associated with P removal both for new obligations as well as maintaining compliance with our AMP7 programme. We set out our cases for these costs in our enhancement cases and in a proposed cost adjustment claim for the ongoing base requirements on our AMP7 obligations.

More detail on this subject can be found in **P Removal Enhancement Case Appendix**

More detail on this subject can be found in **Cost Adjustment Claim Appendix – CWW01 (chapter 2)**

## 16.10 Our incentive to deliver

### Table 61: River Water Quality PC Incentives

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Underperformance and outperformance |
| **Price control allocation** | 100% wastewater network plus |
| **ODI rate** | **£0.000661m** per kg of P removed from 2020 baseline |
| **Outperformance payment- standard** | **£0.000661m** per kg of P removed from 2020 baseline |
| **Underperformance payment - standard** | **£0.000661m** per kg of P removed from 2020 baseline |
| **Timing of underperformance and outperformance payments** | In-period |

## 16.11 Performance Possibilities

Please see the risk and return chapter and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 16.12 Deadbands

Deadbands do not apply to this PC.

### 16.13 Cap/Collars

The guidance published by Ofwat on the development of business plans for PR24 indicates that a cap and collar of +/- 0.5% of RoRE will apply to this PC.

# 17. Biodiversity

## 17.1 PC Type

Environmental outcomes

## 17.2 Performance targets

These performance targets represent a forecast against expected biodiversity outcomes arising from relevant elements of the WINEP programme. We note that under the Ofwat definition against this commitment, absolute numbers will only be produced once nominated land is confirmed by an external steering group during AMP8 and once appropriate baseline and post works surveys have been undertaken. The forecast is an estimate of outcomes and the annual breakdown nominal until the nominated land is confirmed.

### Table 62: Committed performance levels

| Biodiversity Performance Commitment | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | Biodiversity units per 100 km2 | 0.17 | 0.34 | 0.51 | 0.68 | 0.85 |

## 17.3 Summary

This Performance Commitment incentivises Yorkshire Water to deliver activities leading to a gain in biodiversity and penalises negative impacts. It is a new PC for AMP8 with a bespoke definition formulated by Ofwat, though drawing heavily from the Natural England Biodiversity Metric[26].

The PC allows land within a water company's operational area, via being nominated and agreed with an external stakeholder panel, to fall under the PC. Land can be nominated at any time during an AMP cycle. A baseline survey will be completed aligning with Version 4 of the biodiversity metric, before repeat baseline surveys every 4 years are completed and changes in biodiversity unit value reported upon. The ecology surveys define the distinctiveness of a habitat type, and also its condition and strategic significance. The condition is defined by Natural England specified checklists, and like the Water Framework Directive, an improvement in biodiversity may not result in a change in categorised condition. The Metric then allows a calculation of biodiversity unit value. The Metric is habitat focused and does not automatically 'value' activity focused at species conservation. Whilst data on the three different biodiversity unit types (area, hedgerow and watercourse) should be collected, PC forecasting and top-level reporting are against an amalgamation of these unit types. Whilst these unit types can reflect a large amount of differing biodiversity outcomes, they are to be reported in a single line to allow comparison across the industry. To increase the ability to compare across company, biodiversity units are to be reported per 100 $km^2$ of land in a water company's operational area. This commitment explicitly excludes any biodiversity unit value being generated to support Biodiversity Net Gain commitments required to achieve planning permission.

Yorkshire Water have welcomed this new PC and alongside members from NGOs, regulatory bodies and other water companies, were involved in helping Ofwat define the PC. Whilst as a new PC there will likely be scope to improve how it measures outcomes for customers, Yorkshire Water feel strongly for the need for a biodiversity focused commitment, given our reliance on biodiversity to be able to provide our statutory duties and our desire to create greater environmental value through our activities in line with Ofwat's Public Value Principles.

We rely on healthy rivers to abstract water and discharge wastewater, and we recognise we have both acute and diffuse impacts on them. Rivers should be a thriving functional ecosystem, embedded within their surrounding catchment and landscape, and visited and enjoyed by the people around them. We believe a healthy river needs a diverse biological assemblage, with

[26] Natural England Joint Publication JP039

macrophytes, invertebrates, fish and mammals all as important as water quality statistics. It is not enough to focus on the river in isolation, and wetland habitats in particular all interconnect with the river ecosystem as well as provide supporting services like water quality remediation or carbon sequestration.

Yorkshire Water are investing to help build the resilience of these systems in a way that achieves a net gain to biodiversity as well as supporting the resilience of the groups and Partnerships with similar agendas. We want to make sure the value we gain from biodiversity is included in how we make decisions as a company and we are making the right level of investment given the impacts we have and the benefits we accrue.

As such, we have four Corporate Aspirations under our Biodiversity Strategy, with his Performance Commitment allowing customers a clear view against progression the first Aspiration:

- **Aspiration 1**: To achieve a net gain to biodiversity through our operations
- **Aspiration 2**: To improve the ecological resilience of our rivers and catchments
- **Aspiration 3**: To give a strong voice to nature in our decision making
- **Aspiration 4**: To help customers engage with their river and surrounding natural ecosystems

## 17.4 Customer and Stakeholder Engagement

We carry out extensive engagement with our customers, communities and stakeholders. Information on our engagement approach can be found in Chapter 6, but specific customer engagement related to biodiversity can be found below.


More detail on this subject can be found in **Chapter 6: Customer and Stakeholder priorities**

We know, using the Ofwat/CCWater customer preferences research that biodiversity is of medium importance to customers, when considering it within a wider list of performance commitment areas. Essentially, people reported this area to be of some importance, but struggled to link biodiversity with impacts on their everyday lives. The research also found there was a lack of awareness of the concept of biodiversity as a performance area for water companies across household and non-household customers. Nevertheless, this was included in the independent affordability and acceptability testing of our plan (outside of Ofwat guidance) as was the target to achieve in 2025-2030. 79% of our customers found the plan acceptable including this target. Here are a few quotes from customers about biodiversity in our plan:

> *I like that it covers the needs of all stakeholders addressing pollution, sustainability, affordability, customer services, biodiversity etc. I think the targets are very specific and measurable too. Household Customer, Yorkshire Water Independent Affordability and Acceptability Testing Research, September 2023.*
>
> *I like that it had a stated target to increase/ protect biodiversity as this is sometimes overlooked. Yorkshire Water Independent Affordability and Acceptability Testing Research, September 2023.*


Read more about this in **Ofwat/CCWater customer preferences research**

With this being a new PC, we have had close engagement with key stakeholders in order to formulate both the investment underpinning activities measured by the commitment, and also our ambition and assurance processes.

The company benefits from an external Biodiversity Advisory Group. This group comprises Rivers Trusts, Wildlife Trusts and CaBA Catchment Partnerships within our operational area (Yorkshire Wildlife Trust, Sheffield & Rotherham Wildlife Trust, Don Catchment Rivers Trust, East Yorkshire Rivers Trust, Yorkshire Dales Rivers Trust, Aire Rivers Trust, Calder Rivers Trust, Esk & Coastal Streams Catchment Partnership, Derwent Catchment Partnership, Dales to Vales

Rivers Network, Aire Catchment Partnership, Calder Catchment Partnership, Don, Dearne & Rother Catchment Partnership) – all of whom represent thousands and tens of thousands of customers.

Additional consultation took place with other key stakeholders such as the four lead authorities for Local Nature Recovery Strategies in the Yorkshire area, representatives of the National Parks within our operational area and area offices of national NGO groups such as the RSPB and Freshwater Habitats Trusts.

Whilst this PC is not regulated by the Environment Agency or Natural England, we also took the opportunity of consultation with area technical officers from both organisations through our quarterly Biodiversity Steering Group.

Out external consultation began in October 2021 when we were first notified about the development of this new PC, to ensure we were able to represent not only our industry requirements but also the needs of nature across Yorkshire, as represented by the various eNGO groups. We have subsequently met repeatedly with the BAG and our regulatory biodiversity steering group to help refine the detail of our AMP8 plan. We recognise that biodiversity involves innately messy data and we appreciate the time, data and resource provided by these groups in helping ensure our plan is appropriate and reflects the needs of Yorkshire as well as our national commitments.

We were able to use these groups to develop the activities we will be delivering from AMP8, as well as ensuring they are appropriately targeted, reflect our best understanding of the needs of ecosystems across Yorkshire and are scaled against our reasonable contribution to helping mitigate loss and improve the condition of biodiversity across Yorkshire. Through discussions with the BAG, we were able to develop this PC forecast based on our current understanding of good practice and ensuring that we do not compromise our agreed outcomes for biodiversity through chasing category changes under the metric. We all welcome the measurements and transparency provided by the new commitment but recognise that it only measures limited aspects of biodiversity, and in particular does not provide a reasonable measurement of biodiversity outcomes for species conservation and for aquatic habitat improvements, both of which are significant elements of our planned investment.

With this being a new commitment, we have also endeavoured to share our learning and mistakes, with representatives of the wider industry. We have been able to share the benefits of having an external advisory group targeted specifically on biodiversity, as well as learning from our experiences in different ecological survey techniques and the benefits arising from the provision to customers and others, of transparent, freely accessible ecological data.

Overall, the process of co-designing the programme took over a year, involved 6 iterations of the plan with 26 major stakeholders and many minor ones, as well as Environment Agency and Natural England staff. This gives confidence that the programme is robust, appropriate and meets both legislative needs and stakeholder priorities.

### 17.5 Our performance to date

This is a new performance commitment with no AMP7 equivalent to report against.

However, Yorkshire Water have been undertaking extensive field-based habitat mapping surveys as part of an AMP7 project to understand the biodiversity value of our estate. These surveys have been occurring to the same standards required by this PC, with UK Hab classification surveys occurring and condition assessments following the Natural England biodiversity metric methodology.

Results of these surveys are used within the company to allow us to make more informed cost – benefit decisions, as well as being sent to Local Ecological Records Centres across Yorkshire for onward dissemination and are made publicly available via a GIS on our website[27]. We feel strongly that it is important to allow customers and stakeholders to see the biodiversity value we hold so we are transparent about our positive and negative impacts.

[27] https://storymaps.arcgis.com/stories/73f5f5bfd3d3419b921061c0d309afd7

For example, Figure 56 illustrates the biodiversity value across our land at Esholt wastewater treatment works in Bradford, improving the process by which construction work at the site minimises its impacts on biodiversity, as well as helping provide a baseline for measuring change on non-operational land. Each habitat unit can be interrogated to determine how the condition and habitat type was defined and what condition criteria were applicable.

## Figure 56. Esholt WwTW

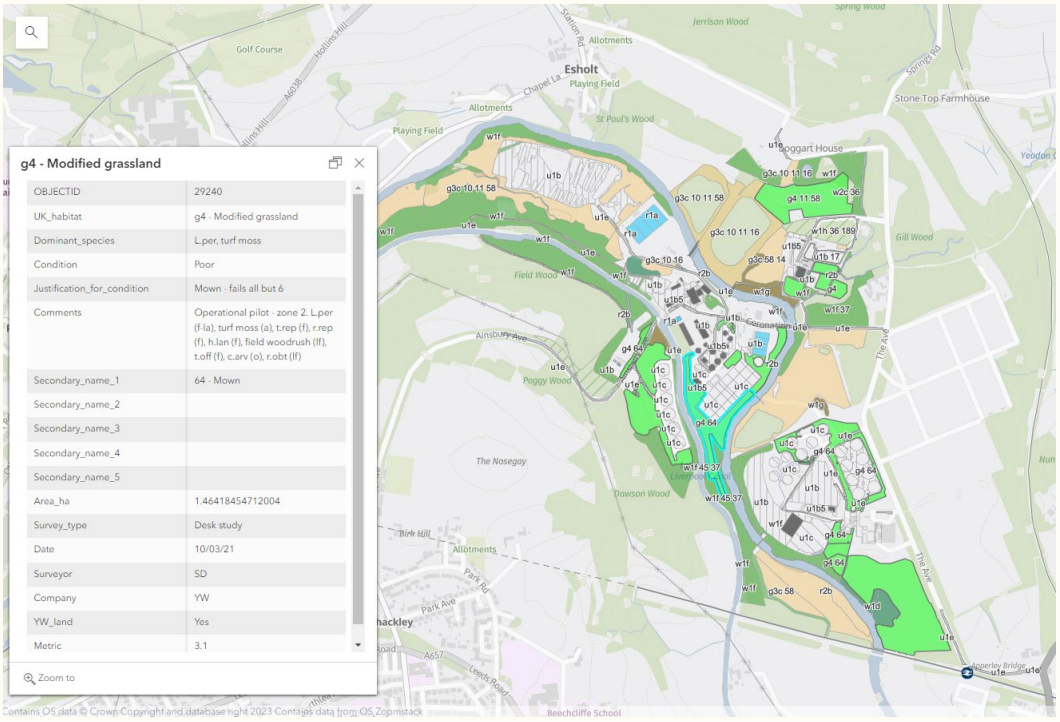
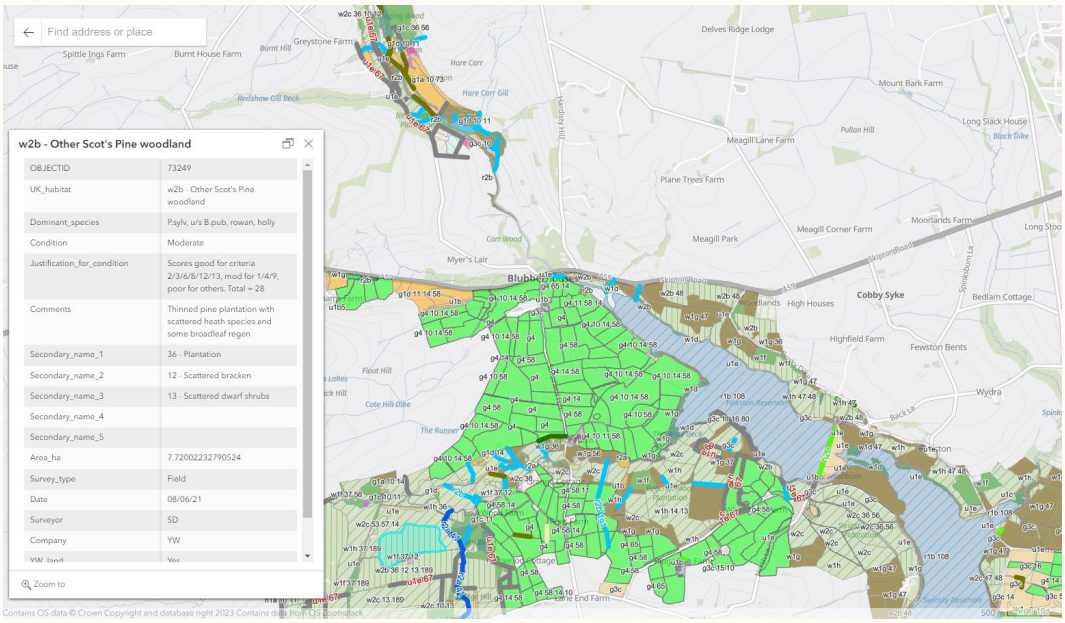



Figure 57 illustrates an area of non-operational land that is also designated a Site of Importance for Nature Conservation by North Yorkshire Council. The biodiversity unit baseline allows us to target conservation interventions in appropriate locations as well as providing a baseline to measure and report on change.

## Figure 57. Washburn Valley baseline




One of the opportunities arising from this commitment is to enable the industry to play a greater role in helping support the conservation work of other partners through the contribution of additional data and evidence. Already during AMP7, we have been able to share our developing habitat dataset with external partners, to help them deliver more efficient and evidence-based outcomes. For example, we have been able to share habitat datasets with River Holme

Connections[28] who are working on a DEFRA funded Landscape Recovery Scheme delivering environmental benefits by working with landowners across the Holme catchment. Using our data has helped them save survey costs, as well as identify key intervention locations. The data has also been shared with other partners such as the Sheffield & Rotherham Wildlife Trust who we work with closely on land management along the Rivelin and Little Don valleys, and Nidderdale AONB to help them conduct habitat suitability modelling in their area. Potentially most significantly, it has been shared with the various Local Authority teams developing their respective Local Nature Recovery Strategies, where our data is helping identify key areas of high distinctiveness habitat and opportunity corridors to be protected under the developing strategies.

## 17.6 Setting the target

With this PC being new across the industry, there is likely to be significant refinement in our approach as the AMP begins and when land is formally nominated to fall under the PC. The current forecast is based on expected outcomes against planned investment, but the mechanism behind the PC means land is only formally added to the PC when agreed through an external stakeholder panel, meaning the exact land areas, habitat baseline and forecast outcomes are still to be determined. The forecast is an estimate of outcomes and the annual breakdown nominal until the nominated land is confirmed.

The approach taken for producing the baseline biodiversity data and forecast biodiversity data has been to use the predicted AMP8 programme to identify the likely amount of biodiversity units generated, to assume a baseline of zero and a forecast outcome of the predicted units. We recognise this is based on various assumptions, but the nature of the PC, where land is nominated to fall under the PC at any time once agreed with external stakeholders, means we wanted to ensure we can deliver a joined up programme of action co-created with these stakeholders, rather than focusing effort on optimising outcomes under this PC that would likely have perverse incentives for biodiversity (for example the current Statutory Government Credit value for a unit of modified grassland (for example, football pitches) is £42,000 whereas it is £230,000 for watercourses, but neither ourselves nor our external advisory groups agree that progressing an approach of focusing on unit values over biodiversity outcomes is acceptable.

For example, we will be delivering significant investment in helping restore chalk streams in East Yorkshire. We have agreed with external partners such as the Yorkshire Wildlife Trust, the types of activity and likely locations where the activity will occur. As such, we have been able to forecast an expected outcome, that we will be able to provide absolute baseline and actual numbers for once AMP8 begins and we can confirm with the Trust and local landowners the exact locations where river restoration interventions will take place.

The nature of the data (where the baseline reflects survey data at the time of survey) means that this estimate will not be updated until AMP8 or when the land can be surveyed if done in advance of that. Once AMP8 starts, YW will work with its external Biodiversity Advisory Group to confirm the nominated land falling under this commitment, undertake baseline surveys, identify required interventions and update these data lines via the APR process with measured rather than estimated data. Once the correct baseline is known, detailed management interventions can be identified to allow accurate forecasting of baseline and future biodiversity change. Once subsequent surveys are undertaken to assess the impacts of the intervention, the baseline can then be updated and reported to Ofwat. All the activities underlying this commitment, have been judged to be appropriate actions to benefit biodiversity by both regulatory steering groups and our external stakeholder advisory group.

### 17.6.1 How past company and industry performance have influenced PCLs set

This is a new performance commitment for AMP8. As such, it is not possible to provide a historical comparison of our performance against previous targets or our industry peers.

Table 64Table 64: Overview of our proposed performance commitment levels for biodiversity sets out the proposed performance commitment levels for this PC.

[28] https://www.riverholmeconnections.org/project/natures-holme/

**Table 63: Overview of our proposed performance commitment levels for biodiversity**

| Biodiversity units per 100km2 of land | AMP8 | | | | |
|---|---|---|---|---|---|
| | 2025/26 | 2026/27 | 2027/28 | 2028/29 | 2029/20 |
| Business plan proposed targets | 0.17 | 0.34 | 0.51 | 0.68 | 0.85 |

Table 64 shows that we will deliver 0.17 biodiversity units per 100 km2 of land in year 1 of AMP8, rising to 0.85 biodiversity units per 100 km2 by the end of AMP8. The forecast is an estimate of outcomes and the annual breakdown nominal until the nominated land is confirmed. We will achieve this through the delivery of our WINEP programme, via our planned investment across our chalk streams, wetland habitat creation and through our SSSI management programme.

## 17.7 Our long-term ambitions

Whilst engaging with stakeholders during the development of our AMP8 plan, one key theme that clearly came across was for us to recognise that in our role as a water company, we have a disproportionate ability to impact on certain key habitats and species, particularly wetland and aquatic ones. The Environment Agency, amongst others, note that as well as over 90% already being lost, over 10% of our freshwater and wetland species are threatened with extinction, with two thirds of our existing wetland species being in decline and note that wetlands make up only 3 percent of the UK but are home to at least 10 percent of our species. Through their work analysing habitat and species data cross Yorkshire for their forthcoming State of Nature for Yorkshire Report, the Yorkshire Wildlife Trust have confirmed to us that they see wetland habitats as one of, if not the most critical habitat types where improvements will see a marked benefit for existing biodiversity, helping stem future loss and safeguarding against regional species extinction.

Through Yorkshire Water's own data reviews we recognise that there are key wetland habitats such as chalk streams, protected sites such as the Derwent Special Area of Conservation, or key aquatic species such as Freshwater Pearl Mussel that whilst we would address any acute issues via using permitting and licensing processes, our participation alongside partners is key to help drive positive biodiversity outcomes above a basic holding the line.

As such, we recognise that given the scales of the issues threatening biodiversity, AMP8 is only a step, though a significant one. Future AMP cycles will see a greater use of Nature Based Solutions, and our Long Term Delivery Strategy targets for biodiversity through to 2050 reflect this, as well as continued investment in mitigating our direct pressures on biodiversity as well as increasing biodiversity habitat outcomes from our business as usual land and tenancy management. We would note as stated above, these are at present forecasts which will be continually refined once more data becomes available. We believe that once locations for planned NBS are known and should external stakeholders agree they should fall under this commitment and appropriate baselines collected, then the forecast outcomes for AMP8 onwards will increase significantly.

## 17.8 Social and environmental benefits

YW relies on healthy rivers to abstract water and discharge wastewater and we recognise we have both acute and diffuse impacts on them. Rivers should be a thriving, biodiverse ecosystem, embedded within their surrounding catchment and landscape, and visited and enjoyed by the people around them. A healthy river needs a diverse biological assemblage, with macrophytes, invertebrates, fish and mammals all as important as water quality statistics. It is not enough to focus on the river in isolation, and wetland habitats in particular all interconnect with the river ecosystem as well as provide supporting services like water quality remediation or carbon sequestration. As measured by this commitment, having biodiverse habitats provides a wide range of ecosystem services, for example improving flood protection, pollination, carbon sequestration and water purification.

More widely however, as well as services provided by healthy ecosystems, social value is generated through improved access to nature and with the planned WINEP programme

delivering this PC being Partnership led with close collaboration with eNGO partners, health and wellbeing benefits through the associated volunteering elements of delivery of the PC.

## 17.9 Our plans to deliver this commitment

As stated, the forecast for this commitment is against expected outcomes for biodiversity arising from planned AMP8 WINEP investment, but it remains a forecast until the land is agreed with our external review panel and baseline surveys have taken place to appropriate standards.

The core programme against which this forecast is generated is delivered via our planned investment across our Chalk stream restoration programme, our Wetland habitat creation programme and our SSSI management programme. There will likely be additional biodiversity value also generated across our wider biodiversity programme, through general management of our land and through our investment in Nature Based Solutions to mitigate wastewater pressures.

We have been working to include biodiversity units within our decision-making framework, and they are now embedded within the 6 capitals models we use for optioneering and decision making, as well as having been integrated within our construction processes.

As such, by following the processes set out in the Ofwat definition and below, subject to stakeholder approval, we will be able to draw from not only our planned biodiversity investment, but our construction activities and base land management programmes. We are also aware of the Governmental and societal pressure on delivering outcomes for biodiversity which together with the new requirements on Biodiversity Net Gain specified in the Environment Act (2021) is leading to high demand in the market for ecologists and are planning and recruiting accordingly to ensure deliverability of the programme.

### 17.9.1 Biodiversity Performance Commitment Specific Assurance

We recognise that with this being a new common PC, Ofwat has specified a number of elements where assurance specific to this PC is required, over and above the general external assurance provided across the whole Periodic Review and Annual Performance Report process. We have worked in consultation with stakeholders and our Biodiversity Advisory Group to propose the following specific assurance related to company land outside of this PC, the process by which we have confidence in ecological data quality, and the process by which land is nominated.

### 17.9.2 Assurance on how land is nominated to fall under this commitment

The definition of the commitment specifies that we should provide confidence that "*the company has identified, engaged with and conscientiously taken into account the views of those stakeholders whom it is reasonable to consider would want to be involved in selecting the sites it has surveyed for the first time in the reporting year and that management interventions have been guided by appropriate expert ecological advice".*

To ensure that land is nominated appropriately, and that the company is not simply selecting land where it believes there will be a favourable outcome, we will be using our existing Biodiversity Advisory Group as the appropriate stakeholder body to consult on which land is able to fall under this PC. The BAG will be able to both nominate land and holds a gatekeeper role in determining what will fall under the commitment. Members of the BAG not only represent organisations comprising of tens of thousands of our customers, but are organisations whose respective strategies and ambitions are focused on biodiversity, and whose officers understand the specific needs of biodiversity across Yorkshire. It comprises of senior members from the Wildlife Trusts and Rivers Trusts across Yorkshire, as well as the Catchment Partnerships in which we operate (who in turn, represent large bodies of stakeholders and key organisations). We have productively worked with this group over the past decade and found their input and critical review of our performance invaluable.

Confirmation of the involvement of the BAG and minutes of relevant meetings will also be assured by our standard External Assurance provider through the APR process.

The company has implemented appropriate processes in selecting assessors that are appropriate to the habitat being surveyed. Assessors must have relevant professional accreditation or very substantial experience and particular experience and relevant training on the specific habitat types that they assess. The company must also have processes and collect relevant information to ensure that assessments are undertaken in as similar way as possible across a pair of surveys over time.

### 17.9.3 Assurance on ecological data collection

The definition of the commitment specifies that we should provide confidence that *"Assessors must have relevant professional accreditation or very substantial experience and particular experience and relevant training on the specific habitat types that they assess."* and that *"the company has implemented appropriate processes in selecting assessors that are appropriate to the habitat being surveyed".*

To ensure value for money for customers, we have explored a variety of options to collect the data required by this commitment. Whilst some forms of remote sensing or more novel techniques like artificial intelligence, will likely in time assist in this process, due to the nature of habitats across Yorkshire and the distribution of our land and operations largely within a discrete county, we have concluded the best value option to provide sufficient certainty in the data, is through predominately undertaking field surveys.

To ensure assessors are competent, as minimum standards we will require they:

- Are Full Members of the Chartered Institute of Ecology and Environmental Management (CIEEM)
- Maintain 30 Hrs of relevant CPD and are able to evidence a log of approved training relevant to the commitment, for example UK Hab courses, CIEEM validated BNG courses etc.,
- Hold at least 5 years experience in using UK Hab and undertaking BNG Condition Assessments (the relatively new definition of these two methods mean it is largely impossible to have longer term experience).
- Are Accomplished (as defined by CIEEM) practitioners in elements A4 (Ecological Assessment), S1 (Habitat survey design) and S3 (Habitat identification and evaluation) of the CIEEM Competency Framework.
- Abide by the CIEEM Code of Professional Conduct

The definition of the commitment also specifies that we should provide confidence that *the company has implemented appropriate processes to collect relevant information so that assessments on each site can be undertaken in as similar way as possible across a pair of surveys over time;*

This is managed via our data collection standards being explicit about the methodology followed (e.g V3.1 of the biodiversity metric or V4) as well as the criteria by which a decision is made against the habitat condition assessment criteria.

Read more about this at
**Our conclusions**

The use of an online GIS for data management ensures consistency of collection via standard templates, and a clear data flow between data input on tables during field visits through to mappable results. It also allows rapid summary's to be generated to compare changes between paired sampling methodologies, to take into account the evolving nature of the Natural England BNG metric meaning there will likely be multiple versions being used across an AMP cycle.

By using field ecologists who have previously visited a site, we can ensure consistency between 4 yearly surveys and between independent sites. Ensuring these ecologists are Accomplished in ecological data collection under the CIEEM framework, and having External Assurance on their conclusions and data management through the APR gives even greater confidence on the data.

### 17.9.4 Assurance on biodiversity changes on land outside of the commitment.

The definition of the commitment specifies that we should provide confidence that *"overall biodiversity across all other company owned sites which are not included in the performance commitment is not deteriorating."*

We recognise that we are guardians of a large amount of land which may not fall under this commitment, and that it would not be reasonable or right, to claim for positive biodiversity outcomes from the commitment should biodiversity be degrading across our wider estate.

Therefore, we will take a risk-based approach to assurance change on land not nominated within the commitment, focusing on ensuring that higher value biodiversity sites do not lose their value.

- All land that is not within the PC but is either legally protected (e.g SSSI/SAC/SPA/NNR) or designated for its conservation value (e.g SINC/LWS sites)) will be visited every 4 years by field ecologists to report on any changes in line with the process by which nominated land will be surveyed and reported.
- High distinctiveness habitats will be visited every 4 years by field ecologists to report on changes in line with the process by which nominated land will be surveyed and reported. Existing AMP7 mapping is identifying these sites prior to AMP8.
- Land where a Nature Based Solution has been developed, where biodiversity was one of the drivers for the solution will be visited every 4 years by field ecologists to report on changes in line with the process by which nominated land will be surveyed and reported (for example, Integrated Constructed Wetlands).
- For other sites, there will be a 1 ha minimum site size, under which it is not proportionate to automatically conduct field surveys if there is no evidence of higher biodiversity value.
- Across a rolling 4 year cycle, 5% of operational sites not falling under the above criteria, will be assured. These sites will include the twenty sites with the highest biodiversity unit value as shown by our ongoing AMP7 baseline mapping programme, alongside the remaining sites being selected at random. Assurance on these sites will comprise of a desk study using remote sensing data, where applicable construction surveys submitted to the company and a ground truthing field survey by a competent ecologist (as defined previously). As per nominated land, the outcome will be confirmation of the UK Hab habitat type and the condition as specified by the biodiversity metric. Results will be incorporated in YW's online public map of habitat type and condition.
- Across a rolling 4-year cycle, 5% of non-operational land where YW retain management control, and not falling under the above criteria, will be assured. This land will be split between sites with the highest existing biodiversity unit value and a random selection of sites. Assurance will comprise of a desk study using remote sensing data and a ground truthing field survey by a competent ecologist (as defined previously). As per nominated land, the outcome will be confirmation of the UK Hab habitat type and the condition as specified by the biodiversity metric. Results will be incorporated in YW's online public map of habitat type and condition.
- Across a rolling 4 year cycle, 5% of non-operational land where due to leases or external rights, YW are not able to influence management, will be assured. Sites will be selected randomly. Assurance will comprise of a desk study using remote sensing data. With minimal company control in this area, the outcome will be assessment of change from previous cycles, with significant changes being brought to the BAG for discussion and reported to the area of the business managing external tenancies to ensure the tenancy conditions are being abided by.

To ensure full transparency, in alignment with the APR cycle, YW will continue to update its online public GIS to allow public interrogation of the data. In addition, all field survey results will be submitted to Local Ecological Records Centers under existing Service Level Agreements YW hold with the respective centers in its area, which allow information to flow through to the Lead Authorities developing the four respective Local Nature Recovery Strategies in Yorkshire.

Data will be reviewed by the company's external Biodiversity Advisory Group and detailed assurance will take place through the company's standard APR assurance process.

## 17.10 AMP8 Delivery Plan

### Table 64: AMP8 Delivery Plan

| Intervention | Base £m | Enhancement £m | Totex £m (AMP8) |
|---|---|---|---|
| Baseline based on relevant WINEP interventions.<br>*Please note the Totex is in relation to the wider WINEP action, not just elements contributing towards this PC (e.g it includes the entire SSSI management programme with only a small proportion of this likely to result in a change of biodiversity units, as opposed to the required change in SSSI condition for which the WINEP action is raised).* | - | 15.134 | 15.134 |

## 17.11 Our incentive to deliver

### Table 65: Biodiversity Performance Commitment Incentives

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Outperformance and underperformance payments |
| **Price control allocation** | Split equally across water resources, water network plus and wastewater network plus |
| **ODI rate** | TBC |
| **Outperformance payment- standard** | TBC |
| **Underperformance payment - standard** | TBC |
| **Timing of underperformance and outperformance payments** | In-period |

## 17.12 Performance Probabilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 17.13 Deadbands

Deadbands do not apply to this PC.

## 17.14 Cap/Collars

The methodology for developing business plans for PR24 suggests that Ofwat will apply a cap and collar for biodiversity of +/- 0.5% of RoRE.

# 18. Operational greenhouse gas emissions water

## 18.1 PC Type

Environmental outcomes

## 18.2 Performance targets

### Table 66: Performance targets for operational GHG emissions - water

| PR24_OGW | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | Percentage reduction from 2021/22 baseline | -6.9% | -8.7% | -10.4% | -12.2% | -13.9% |

## 18.3 Summary

This performance commitment measures the emission reduction in tonnes of carbon dioxide equivalent (tCO2e) reported to two decimal places and the percentage reduction since 2021-22 using net location-based emissions. These emissions include additional scope 3 (indirect emissions) associated with purchase of chemicals and fuel and energy related emissions (well to tank emissions) not previously reported in AMP 7. The shift to location-based emissions places emphasis on absolute reduction of Scope 1 and 2 emissions from purchased gas and electricity respectively. These have previously and will continue to be net-off by green energy purchase (backed by REGOs/RGGOs), and it is important to also view emission reduction in the context of the market-based emissions, and actual emissions for purchased electricity as the grid will decarbonise significantly over the period to 2030, despite the common performance commitments being measured using fixed 2022 emission factors, that will increasingly overstate emissions over time. Delivery of this performance commitment will create both environmental value (in the form of mitigating our impact on climate change) and social value (in the form of wider benefits to society resulting from a reduction in physical climate risks).

## 18.4 Customer and Stakeholder Engagement

We carry out extensive engagement with our customers, communities and stakeholders. Information on our engagement approach can be found in Chapter 6, but customer engagement related to greenhouse gas emissions can be found below.

More detail on this subject can be found in **Chapter 6: Customer and Stakeholder priorities**

We know, using the Ofwat/CCWater customer preferences research that reduction in carbon is of lower importance to customers, when considering it within a wider list of performance commitment areas. This was also triangulated with our Valuing Water research strengthening the position of this service measure as a lower tier priority vs. other more immediate priorities.

However, when discussed and examined in isolation in our understanding climate change research and the research we undertook exploring customers thoughts on achieving net zero vs. paying for this whilst admits a cost of living crisis; it is clear that customers do not want to kick the climate change can down the road. Our customers believe climate change is a very real problem and something that will get worse should action not be taken today.

Our customers support the inclusion of actions to reduce emissions in our plan, when testing the acceptability of our plan in our own affordability and acceptability testing research 83% support the inclusion of net zero as an outcome and overall, 79% of customers found our plan including this target to be acceptable.

*"Intentions are good to provide clean water, net zero, reliable supply." Household Customer, Yorkshire Water Independent Affordability and Acceptability Testing Research, September 2023.*

*"I like that you're going to be net zero." Household Customer, Yorkshire Water Independent Affordability and Acceptability Testing Research, September 2023.*

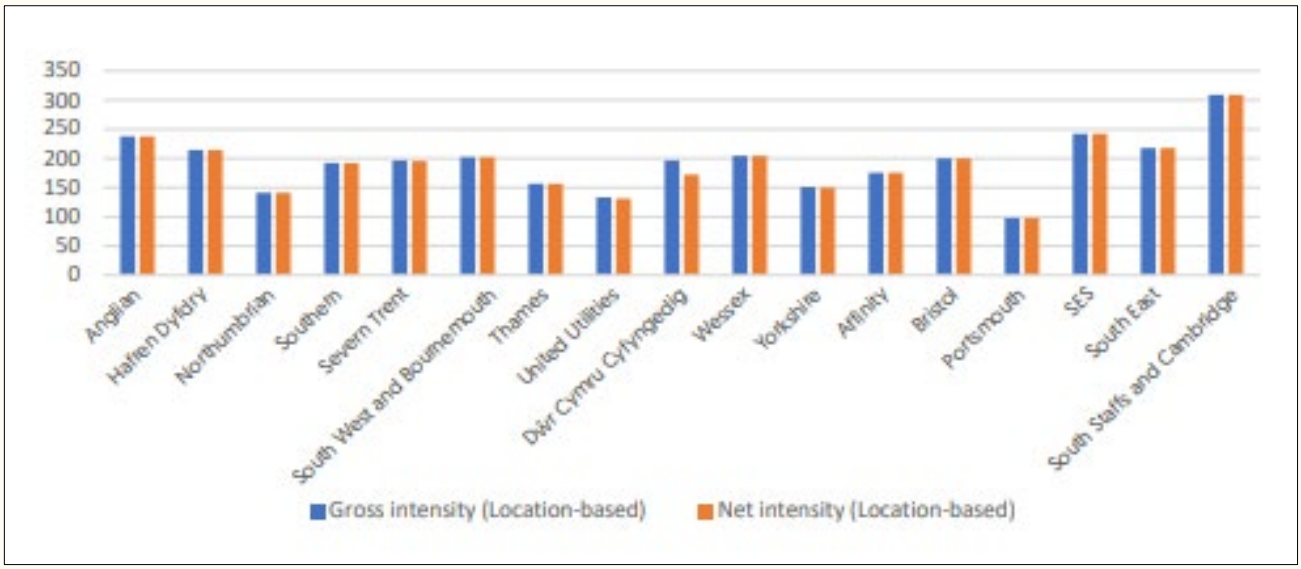
Read more about this in **Ofwat/CCWater customer preferences research**

## 18.5 Our performance to date

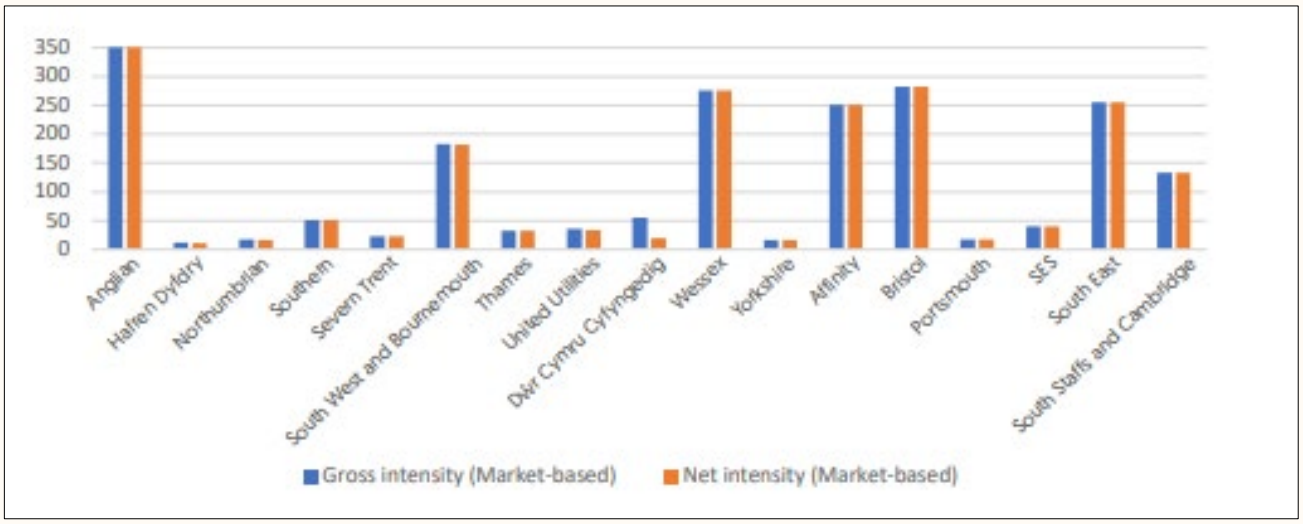
### 18.5.1 Performance comparison

Charts 1 and 2 below were sourced from Water UK's 2021 emission report and provide a comparison of emissions between the 11 regional water and wastewater companies and 6 water only companies in England and Wales as reported on a location and market basis, expressed as an intensity measure in kgCO2e per megalitre of water supplied. The charts show that Yorkshire water on gross location-based emissions performs better than average at 150kgCO2e/Ml whereas the worst performers emitted slightly over 300kgCO2e/Ml and the best performer among the WASCs close to 130kgCO2e/Ml. Performance using market-based intensity was notably better at close to 20kgCO2e/Ml and Yorkshire Water was one of the top performers on this basis.

**Table 67: 2020-21 location-based methodology for gross and new greenhouse gas intensity of water supplied (kgCO2e/Ml)**



### Table 68: 2020-21 market-based methodology for gross and net greenhouse gas intensity of water supplied (kgCO2e/Ml)




## 18.6 Setting the target

### 18.6.1 How past company and industry performance have influenced PCLs set

Table 70below provides the company actuals and forecasts for the operational greenhouse gas emissions (water) for both AMP7 and AMP8 using a 2021/22 baseline as the basis for the reduction in carbon emissions.

This is a new performance commitment for AMP8 (In AMP 7 we had a combined bespoke performance commitment for water and wastewater operational carbon emissions reported using market-based emissions) and therefore there is neither a PR19 determination of industry upper quartile and averages against which to compare our company's performance, and proposed targets. The target has been set based on our known base investments in AMP 7 (fleet transition to electric vehicles, energy and chemical optimisation, renewable energy generation) and forecast through AMP 8 taking into account our net zero enhancement case to expand our deployment of on-site renewable energy that will reduce our need for purchased electricity.

### Table 69: Company actuals and forecasts and PR19 final determination for operational greenhouse gas emissions (water)

| Tonnes (CO2e) | AMP7 | | | | AMP8 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2021/22 | 2022/23 | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | 2028/29 | 2029/30 |
| **Company actuals, *arithmetic forecast and business plan proposed targets*** | 117,590 | 122,667 | ***113,474*** | ***111,475*** | ***109,476*** | ***107,360*** | ***105,361*** | ***103,244*** | ***101,245*** |
| **Proposed cumulative reduction in operational greenhouse gas emissions (water) against a 2021/22 baseline** arising from a combination of base and enhancement | | | | | ***-6.9%*** | ***-8.7%*** | ***-10.4%*** | ***-12.2%*** | ***-13.9%*** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| activity across AMP7 and AMP8 | | | | | | | | | |

Table 70 above provides our carbon emissions forecast from a 2021/22 baseline. This shows a reduction from 109,476 tonnes of carbon in year 1 of AMP8, to 101,245 tonnes of carbon by the end of AMP8. In total, this represents a carbon emissions reduction of 13.9% against the 2020/21 baseline. It should be noted that due to use of fixed emission factors in the forecast for performance commitments these numbers are higher than are actual emissions will be when using the Government's annually updated emission factors. These will result in lower emissions on a location basis, and our market-based emissions from a combination of renewable power purchase agreements and green energy purchase will be significantly lower again.

We will achieve the stretching targets that we are proposing through our planned reduction in our use of chemicals, our plans to increase energy efficiency and through the roll-out of renewable energy generation across our estate. There will also be a focus on the development of low carbon assets (both embedded and operational carbon) and on addressing the emissions from other goods and services.

The proposed carbon emissions reduction proposed in Table 3 will put Yorkshire Water on a glidepath to zero carbon emissions by 2050.

## 18.7 Our long-term ambitions

Our long-term ambitions are to align to the UK Government's glide path to net zero emissions by 2050. This will require us to continue investments in addressing scope 1 emissions and make additional investments to address our wider scope 3 emissions including chemicals and other purchased goods and services and capital goods. The scale of all scopes of emissions is around three times greater than our operational emissions.

Key forward challenges include the scale of the required capital programme to deliver future compliance programmes and the additional embedded and operational emissions consequential to this, in particular the use of chemicals for water treatment.

Our plans to deliver our goals include on-going investment in energy efficiency, fleet transitions to net zero vehicles, energy self-generation out to 2040, and new investment to address emissions consequential to chemical use and those wider purchased and capital goods and services out to 2050. This may include differential costs for low carbon chemicals, no dosing solutions (including alternative technology or nature-based solutions) and for the capital programme for low carbon materials and construction methodologies etc.

Future carbon reduction is in part dependent on tailwind reduction of both the electricity grid in the UK and the actions of supply chain companies to reduce their scope 1 and 2 emissions. To model our forward emissions, we have assumed decarbonisation pathways as currently publicly available. Progress against these pathways will need to be reviewed over time and our models refined to reflect any significant changes.

## 18.8 Social and Environmental Benefits

The operational greenhouse gas commitment is aimed at supporting plans for decarbonisation of operational emissions – there are a wide range of short- and long-term benefits associated with a transition to net zero emissions. Mitigation of climate change is both a local and a global imperative, and there are many ways in which reducing emissions support both communities and the environment e.g., by supporting flood and drought resilience (through tree planting and peatland restoration that provide carbon insets), reducing local air pollution (via shift to green vehicles, expanding the base of UK renewable energy and supporting affordable green energy for all, creating jobs in the green economy, and efficient use of carbon intensive resources (particularly chemicals).

## 18.9 Our plans to deliver this commitment

Our plans will be led by our Manager of Net Zero Carbon to ensure that a delivery programme aligned to the base and enhancement is established and implemented according to the interventions put forwards per table 3 below. The net zero lead will be supported in implementation by the bio-resources, commercial and costs and modelling teams to ensure that the projects defined with high level costs can be brought in within the budgets forecast.
Our commercial team will lead on defining the contracts, site approvals etc for renewables planning with implementation overseen by an appointed project manager with support from wider teams in lands and planning, procurement, cost and modelling, and health and safety etc as required.

Monitoring the performance of interventions will be a key element that will include carbon and energy reporting systems drawing on historic baseline and forward data capture.
We will also draw on existing date available from across the business including data from the Energy team used to report associated energy generation from installed systems e.g., linkage into energy reporting system (Optima), data related to methane and nitrous oxide interventions e.g., Pi/Scada system, SAP procurement data for chemicals etc., and our wider carbon accounting and energy data used for annual APR reporting.

In terms of governance, delivery of our plan will be overseen by our Net Zero Carbon Committee which reports into our Board's Public Value Committee.

### Table 70: interventions planned to via enhancement investment to reduce operational carbon emissions from water treatment

| Interventions | Sites | Description |
|---|---|---|
| **Investment roof and ground-mounted solar** | Suitable sites to be defined | £17.58m investment in to deliver self-generation – at current pricing delivers 1MW per £1m investment, which would give a gross benefit of 3500tCO2e in annual emission reduction at a cost of £201/tCO2e reduction over a 25-year life. |

## 18.10 Our incentive to deliver

### Table 71: Operational Greenhouse Gas Incentives (Water)

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Underperformance and outperformance |
| **Price control allocation** | 15% water resources and 85% water network plus |
| **ODI rate** | £0.24m per percentage reduction in emissions (tCO2e) against a 2021/22 baseline |
| **Outperformance payment- standard** | £0.24m per percentage reduction in emissions (tCO2e) against a 2021/22 baseline |
| **Underperformance payment - standard** | £0.24m per percentage reduction in emissions (tCO2e) against a 2021/22 baseline |
| **Timing of underperformance and outperformance payments** | In-period or end of AMP |

## 18.11 Performance Possibilities

Please see the risk and return chapter and uncertainty mechanisms and RoRE risk analysis appendix for details for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in found in **Uncertainty mechanisms and RoRE risk analysis**

## 18.12 Dead bands

Dead bands do not apply to this PC.

## 18.13 Cap/Collars

The guidance published by Ofwat on the development of business plans for PR24 suggests that a cap and collar of +/- 0.5% RoRE will apply to this PC.

# 19. Operational greenhouse gas emissions

## 19.1 PC Type

Environmental outcomes

## 19.2 Performance targets

**Table 72: Performance targets for operational GHG emissions - wastewater**

| PR24_OGWW | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | Percentage reduction from 2021/22 baseline | +9.6% | +12.0% | +14.3% | +16.8% | +19.4% |

## 19.3 Summary

This performance commitment is defined as the emission reduction in tonnes of carbon dioxide equivalent (tCO2e) reported to two decimal places and the percentage reduction since 2021-22 using net location-based emissions. These emissions include additional scope 3 (indirect emissions) associated with purchase of chemicals and fuel and energy related emissions (well to tank emissions) not previously reported in AMP 7. The shift to location-based emissions places emphasis on absolute reduction of Scope 1 and 2 emissions from purchased gas and electricity respectively. These have previously, and will continue to be net-off by green energy purchase (backed by REGOs/RGGOs), and it is important to also view emission reduction in the context of the market-based emissions, and actual emissions for purchased electricity as the grid will decarbonise significantly over the period to 2030, despite the common performance commitments being measured using fixed 2022 emission factors, that will increasingly overstate emissions over time. Delivery of this performance commitment will create both environmental value (in the form of mitigating our impact on climate change) and social value (in the form of wider benefits to society resulting from a reduction in physical climate risks).

## 19.4 Customer and Stakeholder Engagement

We carry out extensive engagement with our customers, communities, and stakeholders. Information on our engagement approach can be found in Chapter 6, but customer engagement related to greenhouse gas emissions can be found below.

More detail on this subject can be found in **Chapter 6: Customer and Stakeholder priorities**

We know, using the Ofwat/CCWater customer preferences research that reduction in carbon is of lower importance to customers, when considering it within a wider list of performance commitment areas. This was also triangulated with our Valuing Water research strengthening the position of this service measure as a lower tier priority vs. other more immediate priorities.

However, when discussed and examined in isolation in our understanding climate change research and the research we undertook exploring customers thoughts on achieving net zero vs. paying for this whilst admits a cost of living crisis; it is clear that customers do not want to kick the climate change can down the road. Our customers believe climate change is a very real problem and something that will get worse should action not be taken today.

Our customers support the inclusion of actions to reduce emissions in our plan, when testing the acceptability of our plan in our own affordability and acceptability testing research 83% support

the inclusion of net zero as an outcome and overall, 79% of customers found our plan including this target to be acceptable.

> *"Intentions are good to provide clean water, net zero, reliable supply." Household Customer, Yorkshire Water Independent Affordability and Acceptability Testing Research, September 2023.*

> *"I like that you're going to be net zero." Household Customer, Yorkshire Water Independent Affordability and Acceptability Testing Research, September 2023.*

Read more about this in **Ofwat/CCWater customer preferences research**

## 19.5 Our performance to date

Charts 3 and 4 below were sourced from Water UK's 2021 emission report and provide a comparison of emissions between companies on a location and market basis. The emissions are expressed as an intensity measure in kgCO2e per megalitre of wastewater treated showing both the GHG emission intensity per megalitre of wastewater using both location and market-based emission calculations, The charts show that Yorkshire water on gross location-based emissions performs better than average at 200kgCO2e/Ml whereas the worst performers emitted 300kgCO2e/Ml and the best performer 160kgCO2e/Ml. Performance using market-based intensity was notably better at 120kgCO2e/Ml and Yorkshire Water was the fourth best performer overall on this basis in 2020/21.

**Figure 58: 2020-21 location-based methodology for gross and net greenhouse gas intensity of wastewater treated (kgCO2e/Ml)**

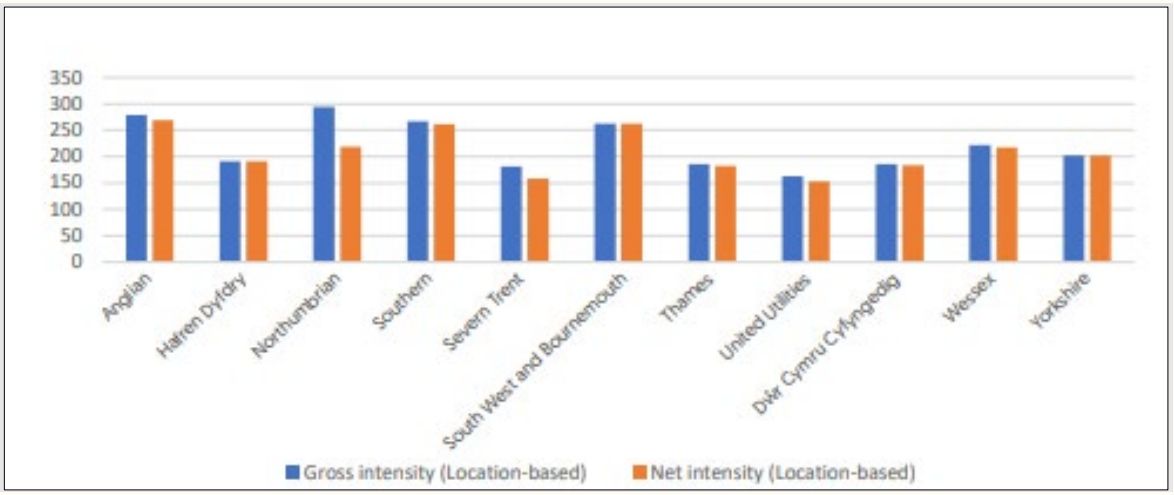
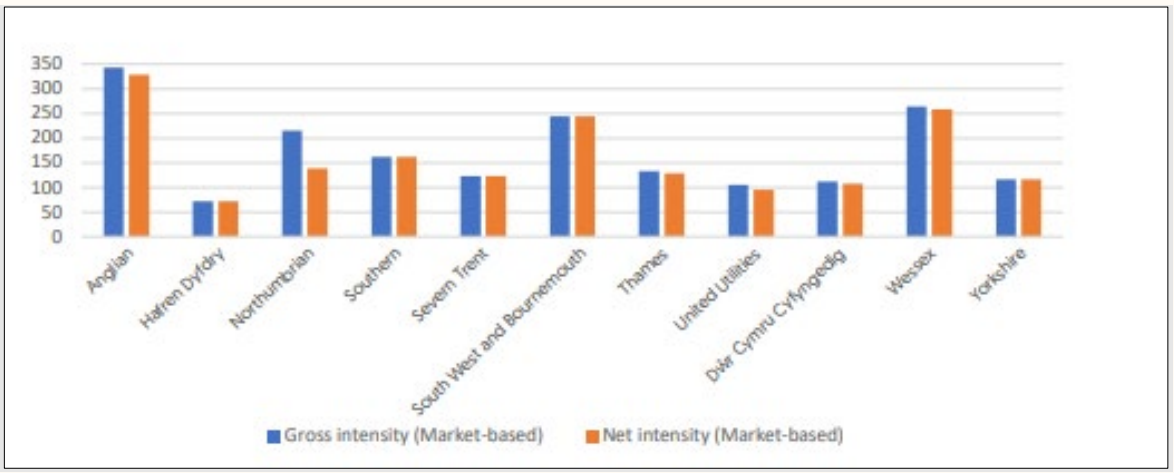



**Figure 59: 2020-21 Market-based methodology for gross and net greenhouse gas intensity of wastewater treated (kgCO2e/Ml)**



Sector differentiators and how this impacts Yorkshire Water Performance

- YW serves a large population across a significant area of land with a hilly topography, and we project population growth on-going across the next and subsequent investment periods that will influence demand and associated emissions
- YW has one of the largest WINEP programmes that will also drive increased emissions in AMP 7 and 8 particularly if we require chemical dosing solutions to deliver compliance programmes. We've estimated additional emissions across AMP 7 and 8 at 70-80,000tCO2e/year that will be a key driver for increase in emissions overall for our wastewater treatment.

Our past performance has been measured against our bespoke performance commitment using market-based emissions and we are on track in AMP 7 to deliver our planned 12% overall emission reduction (combined water and wastewater business).

Looking ahead our wastewater emissions will include significant additional reportable scope 3 emissions related to purchase of chemicals and related to fuel and energy use that we have not been required to report previously. These are significant additions that will increase further as highlighted above as a result of our large WINEP programme, and for wastewater lead to a net increase in our forecast emissions despite the base and enhancement plans we have put forward. This is explained in more detail in the following section.

## 19.6 Setting the target

### 19.6.1 How past company and industry performance have influenced PCLs set

This is a new performance commitment for AMP8 (there was previously a single performance commitment for combined water and wastewater operational carbon) and therefore there is neither a PR19 determination of industry upper quartile and averages against which to compare our company's performance, and proposed targets.

**Table 73: Company actuals and forecasts and PR24 final determination for operational greenhouse gas emissions (wastewater)**

| Tonnes (CO2e) | AMP7 | | | | AMP8 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2021/22 | 2022/23 | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | 2028/29 | 2029/30 |
| **Company actuals, *arithmetic forecast and business plan proposed targets*** | 164,147 | 159,524 | 173,175 | 177,607 | 182,203 | 186,635 | 191,231 | 195,663 | 200,259 |
| **Proposed cumulative change in operational greenhouse gas emissions (water) against a 2021/22 baseline** arising from a combination of base and enhancement activity across AMP7 and AMP8 | | | | | ***9.6%*** | ***12.0%*** | ***14.3%*** | ***16.8%*** | ***19.4%*** |

Table 74 above provides our carbon emissions forecast from a 2021/22 baseline. This shows emissions of 182,203 (an increase of 9.6% from the 2021/22 baseline) tonnes of carbon in year 1 of AMP8, rising to 200,259 (an increase of 19.4% from the 2021/22 baseline) tonnes of carbon by the end of AMP8.

We will achieve the stretching targets that we are proposing through our planned reduction in our use of chemicals, our plans to increase energy efficiency and through the roll-out of renewable energy generation across our estate. There will also be a focus on the development of low carbon assets (both embedded and operational carbon) and on addressing the emissions

from other goods and services. It should be noted that the increase shown above is in part due to the application of fixed emission factors in the forecast used for performance commitments, and our actual emissions using the Government's annually updated emission factors will be significantly lower on a location basis, and our market-based emissions from a combination of renewable power purchase agreements and green energy purchase will be significantly lower again.

The proposed carbon emissions reduction proposed in Table 2 will help Yorkshire Water on a glidepath to net zero carbon emissions by 2050, however additional investment will be required in sub-sequent AMPs to further address Scope 1 process emissions and wider Scope 3 emissions particularly those associated with purchased goods and services (including chemicals) and capital goods.

## 19.7 Our long-term ambitions

Our long-term targets are to align to the UK Government's glide path to net zero emissions by 2050. This will require us to continue investments in addressing scope 1 emissions and make additional investments to address our wider scope 3 emissions including chemicals and other purchased goods and services and capital goods. The scale of all scope of emissions is around three times greater than our operational emissions.

Key forward challenges include the scale of the required capital programme to deliver future compliance programmes and the additional embedded and operational emissions consequential to this.

Our plans to deliver our goals include on-going investment to address process emissions, drive energy self-generation, and new investment to address emissions consequential to chemical use and those wider purchased and capital goods and services. This may include differential costs for low carbon chemicals, no dosing solutions (including alternative technology or nature-based solutions) and for the capital programme for low carbon materials and construction methodologies etc.

Future carbon reduction is in part dependent on tailwind reduction of both the electricity grid in the UK and the actions of supply chain companies to reduce their scope 1 and 2 emissions. To model our forward emissions, we have assumed decarbonisation pathways as currently publicly available. Progress against these pathways will need to be reviewed over time and our models refined to reflect any significant changes.

## 19.8 Social and Environmental Benefits

The operational greenhouse gas commitment is aimed at supporting plans for decarbonisation of operational emissions – there are a wide range of short- and long-term benefits associated with a transition to net zero emissions. Mitigation of climate change is both a local and a global imperative, and there are many ways in which reducing emissions support both communities and the environment e.g., by supporting flood and drought resilience (through tree planting and peatland restoration that provide carbon insets), reducing local air pollution (via shift to green vehicles and reduction in industrial emissions, expanding the base of UK renewable energy and supporting affordable green energy for all, creating jobs in the green economy, and efficient use of carbon intensive resources (particularly chemicals and capital goods by shift to low chemical and nature based solutions).

## 19.9 Our plans to deliver this commitment

Our plans will be led by our Manager of Net Zero Carbon to ensure that a delivery programme aligned to the base and enhancement is established and implemented according to the interventions put forwards per table 3 below. The net zero lead will be supported in implementation by the bio-resources, commercial and costs and modelling teams to ensure that the projects defined with high level costs can be brought in within the budgets forecast. The bioresources and wastewater networks teams will lead on implementation of methane interventions and nitrous oxide interventions respectively with support from procurement, commercial, cost and modelling, and health and safety teams as required. A key element will be to bring on board contract partners for the delivery of the interventions according to the phased

plan we have outlined in our cost tables. Our commercial team will lead defining the contracts, site approvals etc for renewables planning with implementation overseen by an appointed project manager with support from wider teams in lands and planning, procurement, cost and modelling, and health and safety etc as required.

Monitoring of performance will of interventions will be a key element that will include carbon and energy reporting systems drawing on historic baseline and forward data capture. For process emissions additional monitoring and leak detection has been incorporated as part of investment plans and will be used to validate reductions delivered.

We will also draw on existing date available from across the business including data from the Energy team used to report associated energy generation from installed systems e.g., linkage into energy reporting system (Optima), data related to methane and nitrous oxide interventions e.g., Pi/Scada system, SAP procurement data for chemicals etc., and our wider carbon accounting and energy data used for annual APR reporting. In terms of governance, delivery of our plan will be overseen by our Net Zero Carbon Committee which reports into our Board's Public Value Committee.

### Table 74: interventions planned to via enhancement investment to reduce operational carbon emissions from wastewater treatment

| Interventions | Sites | Description |
|---|---|---|
| **Investment roof and ground-mounted solar** | Suitable wastewater sites to be defined | £17.58m investment in to deliver self-generation – at current pricing delivers 1MW per £1m investment, which would give a gross benefit of 3500tCO2e in annual emission reduction at a cost of £201/tCO2e reduction over a 25-year life. |
| **Nitrous Oxide (N2O) Control through installation of Real Time Controls (RTC) for Activated Sludge Plant and additional liquor buffering (2 sites only), and installing N2O monitoring equipment** | Investment at the following sites: Knostrop, Blackburn Meadows, Esholt, Dewsbury, Hull, York, Halifax, Woodhouse Mill, Calder vale, Old Whittington, Aldwarke and Sandall | £12.58m Investment to reduce N2O process emissions by 5480 tco2e per year at an average cost/tCO2e reduction of £350 (£87 if process emission factor uplifted) |
| **Methane control through - Upgrading digesters at 3 sites, installing vacuum degassing equipment, and using leak detection** | Investment at the following sites: Knostrop, Blackburn Meadows, Esholt, Huddersfield, Hull, Dewsbury, Woodhouse Mill, Old Whittington, Sandall | £19.24m investment to reduce methane process emission by 18322 tco2e per year at an average cost/tCO2e reduction of £43. |

## 19.10 Our incentive to deliver

### Table 75: Proposed Operational Greenhouse Gas Incentives (Waste Water)

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Underperformance and outperformance |
| **Price control allocation** | 85% wastewater network plus and 15% bioresources |
| **ODI rate** | £0.24m per percentage reduction in carbon emissions (tCO2e) |
| **Outperformance payment- standard** | £0.24m per percentage reduction in carbon emissions (tCO2e) |
| **Underperformance payment - standard** | £0.24m per percentage reduction in carbon emissions (tCO2e) |
| **Timing of underperformance and outperformance payments** | In-period |

## 19.11 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 19.12 Deadbands

Deadbands do not apply to this PC.

## 19.13 Cap/Collars

The methodology published by Ofwat setting out guidance for the development of the PR24 business plan indicates that Ofwat will set a cap and collar for this PC of +/- 0.5% of RoRE.

# 20. Mains repairs

## 20.1 PC Type:

Asset health

## 20.2 Performance targets

### Table 76: Committed performance levels

| PR24_MRP | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | Number of mains repairs per 1,000 km of mains | 204.1 | 202.9 | 201.7 | 200.5 | 199.3 |

## 20.3 Summary

Mains repairs is a clean water network Asset Health-related Performance Commitment, and Yorkshire Water's performance on this measure demonstrates its commitment to asset stewardship responsibility. Asset Health has been defined as the property of an asset that reflects its ability to perform its function, by considering modes of failure that would affect the value [the asset provides][29]. This highlights that asset health impacts the system it operates in as well as outcomes for Yorkshire Water's current and future customers. For example, the health of Yorkshire Water's clean water network is likely to impact on outcomes such as leakage and water supply interruptions.

Mains repairs is already a common PC in AMP7 with company specific targets and is measured as the number of mains repairs per thousand (1,000) kilometres of the entire treated water mains network (excluding communication and supply pipes). Within AMP7, Yorkshire Water has consistently been the 2nd worst performer in the industry after Thames Water. For PR24, the AMP7 measure for this PC is retained and there are no exclusions.

We have proposed a targeted allowance for asset health in the form of a cost adjustment claim to increase the length of mains renewal comparative to renewal rates in previous AMPs. We feel a renewal rate of 3.3% (0.66% p.a.) across AMP8 will help improve the health of the asset base and provide an improvement in this performance commitment.

More detail on this subject can be found in **Cost Adjustment Claim Appendix**

The ODI rate for this PC is based on the calculated company specific ODI rate for Yorkshire Water as calculated by Ofwat. The value of this ODI is £0.28m (22/23 FY average CPIH) per repair per 1000 kms of mains.

## 20.4 Customer and Stakeholder Engagement

We are proud of the customer, community and stakeholder engagement we carry out, not only to support business planning processes, but on a day-to-day basis. For more information on our customer and stakeholder engagement approach, see Chapter 6, but more specific information on mains repair can be found below.

More detail on this subject can be found in **Chapter 6: Customer and Stakeholder priorities**

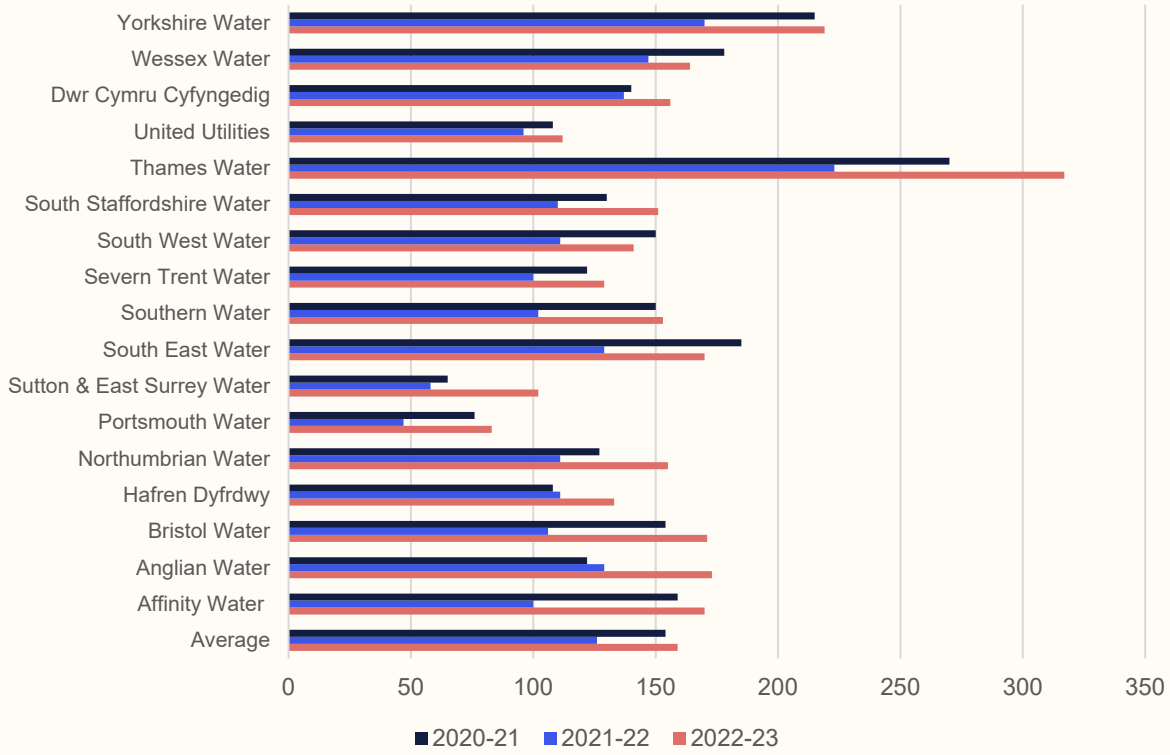
[29] UKWIR (2022), *Future Asset Planning – Scenarios, Frameworks and Measures: Final Report*, 22/RG/05/58. ISBN 978-1-84057-954-3.

While mains repairs as a potential performance commitment for AMP8 wasn't directly tested as part of the Ofwat CCWater customer preferences research, the report does note that it was only raised in conversations occasionally and low on individuals' radars, indicating that it was of low importance. This is unsurprising as customers may not link the activity of mains repairs to some of the more impactful consequences, which may be otherwise more highly prioritised. Indeed, we can see from our own Valuing Water research that preventing interruptions to the supply of water (e.g., through planned works, burst pipes, leaks and outages) was ranked as medium importance to both household and non-household customers, with 41% of those surveyed ranking it as a priority area.

In testing our business plan with customers, we put forward our target for this performance commitment in our own independent affordability and acceptability testing research study (outside of Ofwat guidelines) and 79% of customers found our plan to be acceptable overall including this target.

## 20.5 Our performance to date

**Figure 60: Number of mains repairs per 1,000km per year (Source - APR Data)**




Yorkshire Water has consistently been the second poorest performer against this measure, when it is normalised to mains repairs per 1,000km per year, behind only Thames Water. Due to the dominant material within our asset base being cast iron, weather events that lead to ground movement e.g., very cold winters (2020-21) or long hot summers (2022), result in an increase in the number of mains repairs carried out, mainly due to the lack of flexibility of the material within our asset base when there is ground movement.

Each company's leakage strategy can have an impact upon performance. When leakage is being driven down through Active Leakage Control, you invariably get an increase in the number of mains repairs carried out. As well as this, material type and age have an impact upon performance. Based upon calculations from companies' APR data (2022-23), we estimate that Yorkshire Water has an average water network age of 61.8 years, with the industry average being 57.9 years. The dominant material type within our network is cast iron, which we estimate makes up approximately 50% of the total network length. Based upon our asset deterioration modelling, the material types that have the highest mains repair rates are cast iron (50%) and asbestos cement (7%), which make up a large proportion of our network.

## 20.6 Setting the target

The AMP targets have been set based upon a small improvement in the number of mains repairs per 1,000km. The reason we are targeting a small improvement is due to the expansive network of mains that we have (over 32,300km of treated water mains) and the fact that it is not possible to either deliver (or would be affordable to promote) a larger mains renewal programme that would reduce the mains repair per 1,000km performance in a substantial way over such a short space of time. We would like to promote a programme of mains renewal, focussing on the poorest performing assets, as a multi-AMP programme of work so that performance can be improved through investment in asset health over the long term.

The targets have been set by using the outputs of our water infrastructure asset deterioration model where we have run a number of different scenarios, using different renewal rates, to understand what performance would look like. We feel that a 0.66% renewal rate per year would strike the balance between providing investment in asset health that shows improvement in this PC and provides benefits to other PCs, whilst also allowing investment in other assets to ensure we meet the needs of our customers priorities.

### 20.6.1 How past company and industry performance have influenced PCLs set

Table 78 below provides both the industry and company actuals and forecasts for the mains repairs performance commitment for both AMP7 and AMP8, as well as the PR19 final determination for this performance commitment.

**Table 77: Industry and company actuals and forecasts and PR19 final determination for mains repairs**

| Number of mains repairs per 1,000 km of mains | AMP7 | | | | | AMP8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 20/21 | 21/22 | 22/23 | 23/24 | 24/25 | 25/26 | 26/27 | 27/28 | 28/29 | 29/30 |
| PR19 final determination | 186.1 | 183.6 | 181.0 | 178.4 | 175.8 | | | | | |
| Industry upper quartile actuals **and *arithmetic forecast*** | 122.0 | 100.2 | 132.5 | ***134.3*** | ***131.8*** | ***133.3*** | ***133.6*** | ***126.4*** | ***119.1*** | ***112.7*** |
| Industry average actuals **and *arithmetic forecast*** | 144.6 | 116.5 | 158.6 | ***154.8*** | ***153.3*** | ***151.9*** | ***150.7*** | ***149.7*** | ***148.9*** | ***148.3*** |
| Company actuals, ***arithmetic forecast and business plan proposed targets*** | 215.8 | 169.8 | 219.3 | ***211.9*** | ***211.6*** | ***204.1*** | ***202.9*** | ***201.7*** | ***200.5*** | ***199.3*** |

As a company, we are currently underperforming against both the targets set by Ofwat in PR19, as well as the industry average and upper quartile. This is in part due to the high number of cast iron and asbestos cement mains in our network both of which are susceptible to impacts from extreme weather. Except for Thames and Anglian Water, the majority of combined water and sewerage companies have achieved or are forecast to achieve lower mains repairs outcomes in AMP7 compared with Yorkshire Water. We are forecast to improve our performance in the last two years of AMP7.

We are proposing a stretching target of 204.1 mains repairs per 1,000 km mains in the first year of AMP8, falling to 199.3 mains repairs per 1,000 km of mains network by the end of AMP8. This will be delivered through a programme of mains renewal, pressure management, the further development of innovative ways of repairing mains, and continuing to embed Smart Networks principles to our programme of renewals.

## 20.7 Social and Environmental Benefits

A proactive programme of mains renewal over the long term would provide the benefit of reducing unplanned interruption to supply of water to customers, alongside contributing to reduce levels of leakage within Yorkshire. Reactive mains repairs often cause wider societal

disruption to our customers in the form of traffic disruption (temporary traffic lights and road closures are common issues) and in some cases there is damage to property due to the consequential damage as a result of a catastrophic mains failure.

The environmental benefit of reducing mains repairs will be provided through sustainable methods of mains renewal where appropriate, including pipe bursting and directional drilling, as opposed to the traditional method of open-cut mains renewal. Mains renewal also sustainably reduces leakage which provides an environmental benefit as it can result in us abstracting less water from the environment, alongside reductions in pumping and chemical costs.

## 20.8 Our long-term ambitions

Our long-term ambition is to continue with a similar mains renewal programme that we are proposing in AMP8. The AMP8 programme consists of a renewal rate of 3.3% of our network. In order to reduce the number of mains repairs per 1,000km down to a level that is more in line with the industry average, this would result in a multi-AMP mains renewal programme of similar size. Although we expect to see a benefit to this PC from investment in AMP8, only a multi-AMP programme of mains renewal will enable us to improve to where we and our customers expect performance to be.

## 20.9 Our plans to deliver this commitment

Water mains renewal at 0.66% of the network per year, focussing on the poorest performing assets (the mains that fail the most frequently) will be the principal way to deliver this performance commitment. Using our asset deterioration model will show the assets that pose the biggest risk to this performance commitment, and then combining this with reviewing the outputs from a network engineering perspective will allow a programme to be promoted at sub-DMA level (30-40% of the entire DMA). We feel this approach will give us the biggest benefit as it allows the poorest performing mains to be targeted alongside those that have a high risk of failure due to them being laid at a similar time, in similar conditions. This will also drive cost efficiency through delivering a reasonably sized programme of work. This will build on work delivered in year 4 and 5 of AMP7 as part of our ‘turnaround plan’.

### 20.9.1 Pressure Management

Pressure Management has a significant effect of leakage due to the reduction of water lost from leaks / mains bursts but also by reducing the amount of water lost through background leakage. To date the Pressure Management activities through the enhancement funded Smart Pressure Projects have saved circa 16.6Mld. It is also widely accepted by engineers that a reduction in water pressure and calming of the Network will also reduce the amount of water mains bursts experienced.

We have done significant work to optimise pressure, particularly within AMP7 as part of our Smart Networks Programme. This helps to contribute to our AMP7 leakage targets and deliver sustainable leakage and mains burst reduction. As part of this work over 3500 additional pressure monitors have been installed. This ensures all DMA’s have a pressure monitor and are using real pressure information rather than default average values. This information is used to inform pressure management investigations. The detailed investigation informs us whether or not there is the opportunity to sustainably reduce pressure within a DMA, which reduces leakage levels and the frequency of mains failures. Various academic papers and industry studies have shown that pressure management is one of the most cost-efficient ways to reduce the number of mains bursts. However, we have found that pressure management is one of a suite of tools that will help reduce the frequency of mains failures. The conditions have to be right for a pressure management scheme to be implemented and the benefits are generally time limited, and the follow up solution to maintain a lower burst frequency is mains renewal.

### 20.9.2 Calm Networks

The way we operate the network can have an impact on the number of mains repairs that take place. The operation of valves in an incorrect manner can cause pressure surges on the network, which can lead to mains failure. The calm networks project is wide in scope, focussing on the improvement of network operation to reduce the mobilisation events caused by burst mains, that cause water quality complaints. All employees that are authorised to operate the network have to complete calm networks training as part of their ‘license to operate’. This training focusses on reducing the speed of valve closure which in turn, reduces the chance of

surge generate by sudden valve operation. Surge is a fluctuating pressure when a sudden change takes place in the network also known as a transient. Quick valve operations can lead to normal working pressure being exceeded. Surges can be very damaging to the network and can cause discolouration and mains bursts.

Activities to deliver proposed service levels across people, process and systems include:

- To alter structural mains replacement policy. The Asset Planning teams are currently working on 1% per annum renewal strategy which changes from a pipe level renewal to the Distribution Management Area (DMA) renewal programme
- Upgrading GIS system to enable better analysis and targeting of interventions
- Programme delivery and end-to-end process optimisation for efficiency/productivity
- Deterioration model, embedding of strategic asset model into operational practices
- Innovation e.g. e-pulse, triopsis photo evidence
- More efficient leakage detection and quantification processes

Summary of activities include:

- ~191km per year of mains renewal/reline
- Pressure management including continuation of ‘calm network strategy’ and pressure reduction, 10-15% burst frequency reduction in areas where implemented
- Decision making process optimisation including structural reline versus renewal

Activities to drive service levels across people, process and systems include:

- **People –** The Asset Planning team are currently working on a 1% per year renewal approach. A 3-year programme will be visible by October.
- **Process –** Mains renewal policy review will move away from the traditional policy of investing in ‘5 bursts in 5 years’ to a Distribution Management Area (DMA) based renewal strategy.
- **Systems –** an enhancement of the infrastructure asset deterioration model to help inform the most beneficial areas to invest with cost models to reflect current delivery prices.

Detailed description of key activities:

- The **mains renewal programme** will be delivered in a similar way to the ‘AMP7 Turnaround Plan’ (DMA level renewal targeting unlined cast iron and Asbestos Cement (AC) mains). We will focus on the worst performing DMAs from a mains repairs per 1000km perspective but will also look for a multi-benefit approach to deliver benefits to water quality contacts and interruptions to supply.
- The **mains relining programme** will be delivered where pipe condition is suitable
- **Pressure management** will be delivered where there are opportunities to do so as part of the leakage reduction programme.
- **Calm networks refresh training** will be delivered to all of Yorkshire Water and Partners
- We will continue to work with partners to develop **innovative ways of repairing mains** e.g internal repairs and other forms of trenchless technology to drive efficiency and productivity
- We will **embed smart network** principles

## 20.10 Our incentive to deliver

### Table 78: Mains Repairs PC Incentives

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Underperformance and outperformance |
| **Price control allocation** | 100% water network plus |
| **ODI rate** | £0.28m per average mains repair per 1,000 km of mains |
| **Outperformance payment- standard** | £0.28m per average mains repair per 1,000 km of mains |
| **Underperformance payment - standard** | £0.28m per average mains repair per 1,000 km of mains |
| **Timing of underperformance and outperformance payments** | In-period |

## 20.11 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 20.12 Deadbands

Deadbands do not apply to this PC.

## 20.13 Cap/Collars

The guidance published by Ofwat to inform the development of business plans for PR24 indicates that a cap of 0.25% of RoRE and a collar of 0.5% of RoRE will apply to this PC.

# 21. Unplanned outage

## 21.1 PC Type

Asset health

## 21.2 Performance targets

### Table 79: Committed performance levels

| PR24_UNO | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | % | 2.32 | 2.14 | 1.96 | 1.78 | 1.60 |

## 21.3 Summary

The unplanned loss of peak week production capacity and reports this loss as a percentage of the overall company peak week production capacity. The actual unplanned outage should be reported as the temporary loss of peak week production capacity (PWPC) in the reporting year weighted by the duration of the loss (in days).
This metric is calculated by:

$$\frac{(reduction\ in\ peak\ weak\ production\ capacity \times duration\ in\ days)}{365}$$

## 21.4 Customer and Stakeholder Engagement

We carry out extensive engagement with our customers, communities and stakeholders. Information on our engagement approach can be found in Chapter 6, but specific customer research and engagement related to unplanned outage can be found below.

Through the Ofwat/CCWater customer preferences research, we know that unplanned service water supply interruptions are considered a top priority for customers. Customers reported that any unplanned outage was considered highly inconvenient and that it could easily occur – even when the incident rate across the sector was provided to them, this did little to reduce the perception of importance. While the view was consistent across all demographics, there was some spike in sensitivity across businesses where water is essential / there was a large office-based workface to manage, and domestic customers who spend more time at home, for example empty nesters or vulnerable customer groups.

Read more about this in **Ofwat/CCWater customer preferences research**

Interestingly, our own Valuing Water customer priorities research found that preventing interruptions to the supply of water (e.g., planned works, burst pipes, leaks and outages) that cause problems ranging from low pressure to no water, was of medium importance to both household and non-household customers. However, the research didn't distinguish between planned or unplanned outages, and we know from the Ofwat CCWater research that customers feel the level of disruption to a supply interruption could be mitigated through it being planned.

In the process of testing our plan with customers through our own affordability and acceptability testing research (outside of Ofwat guidelines), we proposed our committed level of service in 2030 for unplanned outage to customers and 79% of customers found our plan to be acceptable overall including this target.

More detail on this subject can be found in **Chapter 6: Customer and stakeholder priorities**

## 21.5 Our performance to date

UPO is a relatively new ODI measure, coming into being for AMP7. Performance in AMP7 has been positive, improving from 5.25% in 19/20, to 3.87% in Year 1, 3.82% in Year 2 and 3.26% in Year 3. The current forecast for Year 4 is 3.03%.

YW has attained a penalty free position for AMP7 in Years 1 to 3 and is forecasting to maintain this performance level into Year 4. However, despite improving performance, a tightening deadband means a penalty is forecast for year 5.

Although a penalty-free position has been attained to date with performance improving, Yorkshire Water's performance is slightly behind the industry average of 2.26% in year 3. Improvements in AMP7 are a result of several initiatives including:

- Increasing identification, provision and management of critical spares combined with a closer relationship with Engineering to reduce time take to return assets to service.
- Creating the UPO Hub and associated dashboard to make us more proactive in response and intervention, and also increase our awareness of current outages and their root cause.
- Establishing a Filter Management Group as an expert panel to continuously monitor and review clean water filter performance and advise on remedial work to reduce reactive failure.

Despite the improvements attributed to the above, further work is required to ensure continuous improvement in AMP8. Operational improvements have contributed significantly in AMP7, but investment in assets to arrest deterioration in long-term asset health and increase resilience are required in AMP8.

## 21.6 Setting the target

### 21.6.1 How past company and industry performance have influenced PCLs set

Despite the good progress made to date and improvements in performance seen from shadow reporting towards the end of AMP6 to the middle of AMP7, further investment is needed if YW is to maintain pace with ever more stretching targets. One of the reasons for this is the double-sided nature of UPO, and the two pronged approached required for continuous improvement. On one hand, reaction to failures must be swift, in both identification and resolution of the cause of the outage. On the other hand, failures on larger or more complex assets often cannot be resolved within 24 hours, regardless of the amount of critical spares or engineers on hand to assist. As a result, additional capital maintenance investment is required to improve asset health on those systems known to significantly impact UPO, to reduce outage occurring in the first place.

Lessons learned from the UPO Hub and Filter Management Group show us that one such example is RGFs, DAFs and GACs which contribute around 20% of our overall UPO figure. Often, a failure associated with these assets requires a capital solution to get the asset back online and remove the PWPC deficit for the site. However, increasingly, filters are becoming fix on fail, as deteriorating asset health is diverting funding away from planned work and towards reactive repairs on filters that have already failed. Having the funding to focus on a more proactive approach forms the basis for an initiative for AMP8; a dedicated capital funding allocation for filter refurbishment, targeted at high risk and poorly performing filters, to reduce the amount of UPO impacting reactive failures, by refurbishing filters proactively, before a failure occurs. This approach will build on the outputs from the 'Filter Management Group' through AMP6 and AMP7, to aid in highlighting those sites/filters where performance is deteriorating, assist with prioritisation of schemes and record the benefits.

Table 81 below provides both the industry and company actuals and forecasts for the unplanned outage performance commitment for both AMP7 and AMP8, as well as the PR19 final determination for this performance commitment.

### Table 80: Industry and company actuals and forecasts and PR19 final determination for unplanned outage

| Percentage | AMP7 | | | | | AMP8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 20/21 | 21/22 | 22/23 | 23/24 | 24/25 | 25/26 | 26/27 | 27/28 | 28/29 | 29/30 |
| **PR19 final determination** | 5.12 | 4.42 | 3.73 | 3.03 | 2.34 | | | | | |
| **Industry upper quartile actuals and** *arithmetic forecast* | 0.95 | 1.01 | 0.70 | ***0.38*** | ***0.19*** | ***0.11*** | ***0.06*** | ***0.04*** | ***0.02*** | ***0.01*** |
| **Industry average actuals and** *arithmetic forecast* | 2.10 | 2.10 | 1.63 | ***1.31*** | ***1.08*** | ***0.90*** | ***0.76*** | ***0.65*** | ***0.56*** | ***0.49*** |
| Company actuals, ***arithmetic forecast and business plan proposed targets*** | 3.87 | 3.82 | 3.26 | ***3.03*** | ***2.50*** | ***2.32*** | ***2.14*** | ***1.96*** | ***1.78*** | ***1.60*** |

In AMP7, although we have or are forecast to outperform our targets in years 1 to 4 of the AMP period, we are forecast to underperform our target in year 5. We have also underperformed in AMP7 against the industry average and upper quartile. It is worth noting that while we have underperformed in AMP7, this is against an improving performance in AMP7 from 3.87 per cent in year 1 to 2.50 per cent in year 5.

We are proposing stretching yet achievable targets for AMP8, with an AMP8 year 1 target of 2.32 per cent, falling to 1.60 per cent by the end of AMP8. We are proposing that this will be achieved through a number of initiatives including better management of critical spares, creation of a UPO hub to identify outages and their route cause, an accelerated programme of refurbishments for assets such as filters and clarifiers, and the implementation of DWI enhancement schemes at five WTWs which will have a positive impact on unplanned outage.

## 21.7 Social and Environmental Benefits

Maintenance of a reliable potable water supply is consistently the top priority for our customers. Minimising UPO contributes directly to this by ensuring our Water Treatment Works are able to reliably treat and supply clean water into the network and ensure potable water is there on demand at the turn of a tap. Loss of supply, particularly to large areas or for prolonged periods significantly impacts individuals concerned. Clean water is a basic human requirement and is also critical for individuals with certain medical conditions. The loss of supply, even for a short period, can have significant negative impacts and cause undue stress. Loss of potable water supplies also impact schools and hospitals which has a knock-on effect on families, wellbeing, and health.

As discussed above, there is a balance between unplanned outage and resilience and this balance must be struck to ensure the constant delivery of clean potable water to customers is maintained in the most cost-effective way for customers.

Minimising UPO also has impacts for the environment. When WTWs shut down as a result of asset failure or power outages, at certain sites partially treated water which cannot be fed into the potable water system, is discharged to watercourse. Sites are generally permitted for these discharges and steps are in place to minimise the impact to the natural environment. Nevertheless, minimising these discharges by reducing UPO is likely to play a part in improving river health in the coming years.

## 21.8 Our long-term ambitions

Our long-term plan for UPO broadly centres on two points; moving to a more proactive rather than reactive mode of maintenance and repair and improving underlying asset health to reduce unplanned outages.

Firstly, improved servicing and maintenance of critical assets will reduce the number asset failures impacting treatment works performance and throughput. Furthermore, implementation of intelligent, real-time monitoring of assets (e.g., as part of our Dynamic Asset Maintenance and Samotics initiatives), will allow deterioration in asset performance prior to failure to be visible, allowing targeted, proactive intervention before a catastrophic failure occurs, that would otherwise have impacted site operation. This is a core principle of our modernisation drive in Engineering and Maintenance Services.

Secondly, increased investment in underlying asset health (such as WTW Filters), via a Cost Adjustment Claim, will begin to reduce asset health related outages. We know that certain asset types, like Rapid Gravity Filters, consistently score poorly in condition assessments and are also amongst the highest contributors to unplanned outage. Refurbishment of these assets will undoubtedly have a positive impact on UPO.

The two initiatives above, implemented in unison, should have a positive compound effect on UPO. As increased capital investment via a CAC improves underlying asset health issues and reactive asset failure reduces. This in turn reduces the burden on Engineering resources as reactive repairs become less, accelerating the move to proactive maintenance as more engineering resource is freed up.

Finally, there is a balance to be had between what is an acceptable level of unplanned outage. Diminishing returns suggests that as UPO performances increased to 2% and below, the unit rate for further improvements will increase. However, increased connectivity and resilience in distribution networks (e.g., via the YW Grid system) mean that low levels of UPO that don't impact customer supplies are likely to be acceptable. Understanding this balance to provide best value to customers will be key in the coming years.

In order to achieve the target UPO performance out turn for AMP8 of 1.6%, additional funding is required in the form of a targeted allowance. This relationship is likely to continue beyond AMP8, in that while Base funding is sufficient to maintain performance, continuous improvement in performance will require additional funds, resulting from either an increase to Base allowance, Enhancement, Cost Adjustment Claims or Direct Procurement for Customers. With this additional funding, it may be possible to achieve UPO performance of around 1% by Amp 12.

However, in line with the above, it should be questioned whether such stretching UPO performance is of real benefit to customers if it does not lead to improvements in service such as CML.

### 21.9 Our plans to deliver this commitment

A number of initiatives have been identified in order to deliver the required performance in AMP8.

The most significant is a proposed targeted allowance in the form of a Cost Adjustment Claim (CW02b) to improve underlying asset health, which includes Rapid Gravity Filters, Granular Activated Carbon filters and Clarifiers at WTWs.

More detail on this subject can be found in **Cost Adjustment Claim Appendix (Chapter 7)**

These assets are amongst the highest contributors to our UPO performance and improving the health and condition of these assets is forecast to improve UPO performance by up to 0.5% per year by the end of the Amp. This improvement is not affordable within the Base allocation and requires additional totex allowance as is part of the Water Asset Health cost adjustment claim.

A non-exhaustive list of schemes to be included is set out below:

- Rebuild/full refurbishment of Eccup No.1 Water Treatment Works (WTW) RGFs.
- Replacement of the temporary RGFs at Loftsome Bridge WTW
- Further refurbishments of RGFs blocks at Chellow WTW (cont. from AMP7), Elvington WTW, Acomb WTW, Albert WTW

- Enhanced block allocation for RGFs and GACs to allow these units to be taken out of service for proactive refurb/repair, which does not count towards UPO. In AMP7, reduced funding means these assets are 'sweated' for longer, increasing the likelihood of failure and reactive repair which then impacts UPO.

There will also be secondary benefits to UPO from the DWI enhancement schemes. Whilst the primary benefit is to WQ/CRI, there will also be a material benefit to UPO as during periods of heightened water quality risk, site throughput is often sacrificed to protect water quality.

Targeting our most urgent WQ risks at WTWs in AMP8, will lead to both improvements in the current UPO score but also prevent additional WQ risks (and thus UPO risks) emerging.

Other initiatives/innovation projects that will positively contribute to UPO performance include DAM (Dynamic Asset Maintenance) and 'Samotics' as these increase our ability to understand and identify asset failure before it occurs, allowing proactive intervention before UPO is impacted.

In terms of people and process, Asset Planning have recently (July 23) introduced the 'Senior Sponsor' role to allow a consistent approach to risk identification and prioritisation across the region, to ensure targeted, efficient solutions are delivered, where they can achieve the most benefit. The Filter Management Group which has been operational through AMP7 has been modified slightly in response to lessons learned in AMP7 as well as evolving challenges with filter performance. These modifications include more robust recording of recommendations and monitoring of what interventions are being made in response to these recommendations. Finally, UPO reporting will also be improved to allow increased understanding of the root causes of UPO as well as the monitoring of performance improvements resulting from the initiatives described above.

## 21.10 Our incentive to deliver

### Table 81: Proposed Unplanned Outage Incentives

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Underperformance and outperformance |
| **Price control allocation** | 100% water network plus |
| **ODI rate used** | £1.97m per percentage of peak week production capacity |
| **Outperformance payment- standard** | £1.97m per percentage of peak week production capacity |
| **Underperformance payment - standard** | £1.97m per percentage of peak week production capacity |
| **Timing of underperformance and outperformance payments** | In-period |

## 21.11 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 21.12 Deadbands

Deadbands do not apply to this PC.

### 21.13 Cap/Collars

The guidance published by Ofwat to inform the development of business plans for PR24 indicates that there will be a cap for this PC of 0.25% of RoRE and a collar of 0.5% of RoRE.

# 22. Sewer collapses

## 22.1 PC Type

Asset health.

## 22.2 Performance targets

### Table 82: Committed performance levels

| PR24_SCO | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | | 10.12 | 9.68 | 9.25 | 8.82 | 8.77 |

## 22.3 Summary

This performance commitment is defined as the number of sewer collapses per 1,000km of sewer impacting on customer service or the environment.

This is an existing measure and is the primary asset health measure for the sewerage network. In AMP7 it is incentivised through a penalty only mechanism; in AMP8 it will be incentivised by reward and penalty.

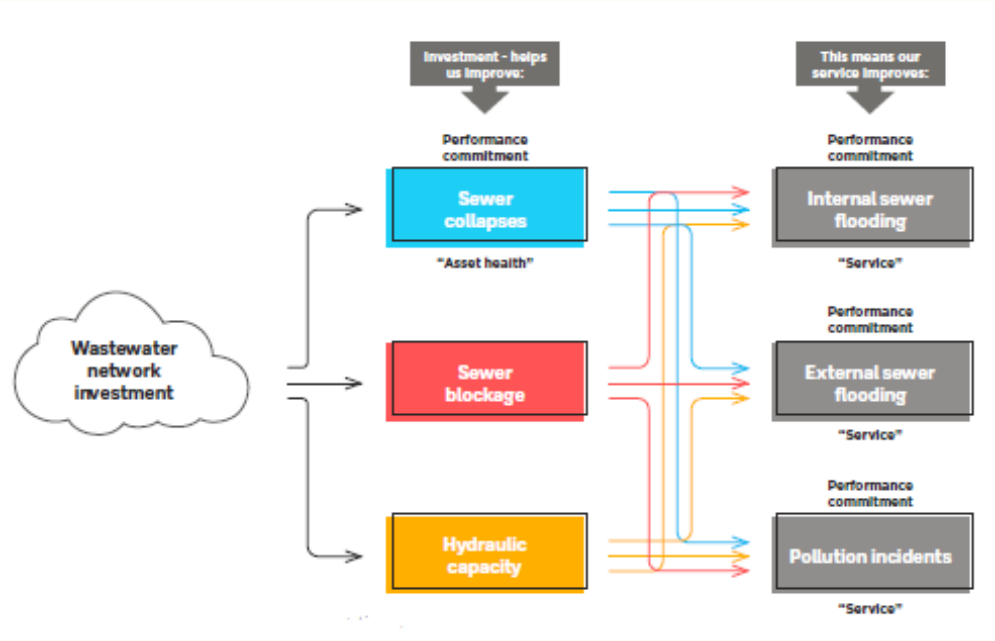
We are proposing a financial outperformance and underperformance incentive, to be recovered annually through revenue. We have set a stretching, but achievable target based on our recent performance levels which have continued to improve throughout AMP7, outperforming the PR19 FD and what can be achieved from an efficient level of funding.

The number of collapses is normalised by the total network length in the region, in reporting to Ofwat, to enable comparisons between companies' performance. The total number of reportable collapses is forecast to deteriorate to 687 collapses by 2024/25 and then significantly improve to moving to 464 collapses by 2029/30. This has been modelled in our investment planning model using a range of interventions and activities in a cost envelope to optimise the most cost effective way to drive improvement.

In the context of delivering further significant service improvements to internal sewer flooding and pollution incident performance, we are aiming to reduce our number of sewer collapses by 33% in AMP8 and a further 10% in AMP9, with significant focus on managing the collapse performance commitment through a range of operational measures including categorisation training, assignment of appropriate interventions and better use of CCTV and AI to classify defects. In addition, we propose a range of efficient capital measures within acceptable affordability constraints we are working towards for our overall business planning, including a programme of work on repairing rising mains, proactive sewer interventions including replacements and relining in hotspot risk areas and installation of sewer alarms to have faster response and prevent a customer impacting failure.

We consider the wastewater network as an integrated system. The combined effect of our activities on network-related causes of sewage escapes will also have a positive impact on pollution incidents and on internal and external sewer flooding, potentially contributing to up to 25% improvement of incidents in those categories. Our work in other areas, such as surface water removal and reducing spills on storm overflows, will also improve the overall performance of the network by reducing the stresses due to periodic surcharge and so reduce collapses. Figure 61 below shows the relationships and interdependencies across the wastewater network.

**Figure 61: Summary of interdependencies across the sewer network and between waste performance commitments**




## 22.4 Customer and Stakeholder Engagement

While this performance commitment was not specifically tested as part of the Ofwat/CCWater customer preferences research, we know that customers rated the performance commitments which may result from sewer collapses - for example internal and external sewer flooding and pollution incidents- from high to medium importance.

Read more about this at **Ofwat/CCWater customer preferences research**

Through our own valuing water research on customer priorities, we can see that preventing sewage entering gardens and public spaces from pipe collapses or blockages, was ranked 7th out of 20 tested priority areas, but again, performance commitments which may result from sewer collapses, were shown as top priorities for customers (e.g. internal sewer flooding and pollution).

Clearly, we need to recognise that addressing all of these priority areas in an integrated delivery will be the most efficient way of providing these related benefits, which customers have valued highly in our research, in both quantitative and qualitative terms.

We have also carried out research to support our Drainage and Wastewater Management Plan (DWMP) which identified that improving the condition of the sewers, e.g., by predicting blockages and/or preventing collapses along the network, is a priority area for customers. The research indicated that customers felt the current network was a 'system under strain' and that investment was needed to improve the condition of the sewerage network in the long term, but that hitting current performance targets should be considered a priority initially. This study also highlighted that addressing infrastructural needs and improving resilience overall will have knock-on effects on other measures.

> Stakeholder Quote: *"I think it needs to be designed in the context of actually making some real societal and major infrastructure changes. That's a multiple investment plan. So that might be four or five AMPs that you've got to continue to be committed on this*" Valuing Water Customer Priorities Research Final Report, pg83.

Following Ofwat guidelines, our affordability and acceptability testing research outlined a number of actions we will do to improve sewage escaping from our pipes under the pollution, internal sewer and external sewer flooding measures and many of these actions will address sewer collapses also e.g. pipe monitors, CCTV and conditioning of our pipes. The study

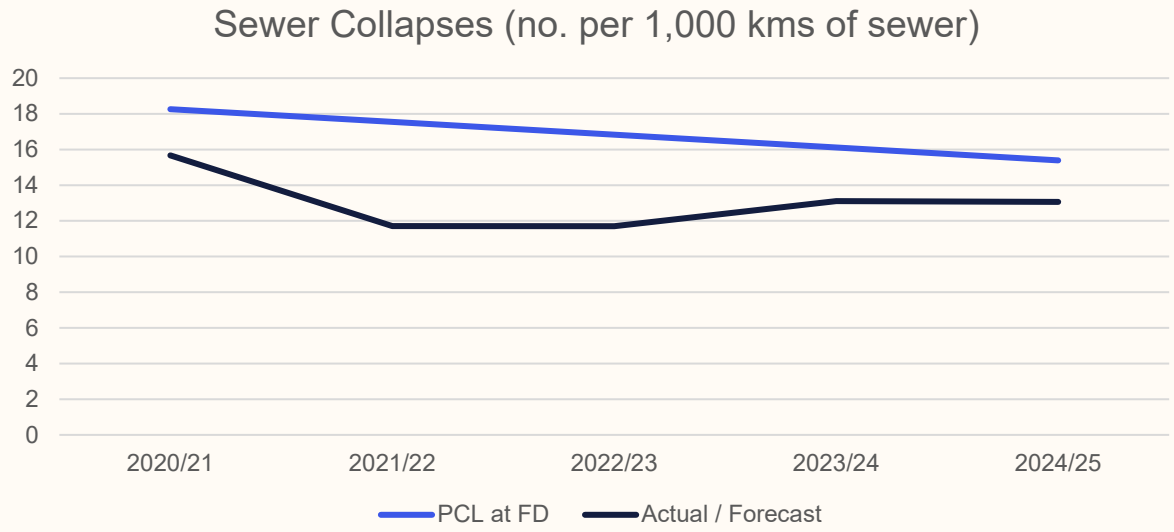
concluded that 78% of customers found our plan including the target for interruptions to supply to be acceptable, and in our own independent affordability and acceptability testing research, 79% of customers found our overall plan to be acceptable including this measure and target.

More detail on this subject can be found in **Chapter 6: Customer and Stakeholder priorities**

## 22.5 Our performance to date

Over the past 5 years we have made improvements in our sewer collapse rate and have exceeded the committed performance levels from 2020 and forecast to do so through to 2025. This is shown in Figure 62 below which shows our rate of sewer collapse (blue line) well below the FD position (black line).

**Figure 62: historical performance against PR19 final determination**




We do forecast a slight deterioration in performance in the remaining 2 years of AMP7 but are committed to improving asset health in sewers beyond 2025.

Improved performance is as a result of our proactive focus on sewer collapses to improve internal sewer flooding targets. In AMP7 our intervention rate has reduced to 0.03% pa; however our AMP7 delivery continues to see strong performance as we have consistently outperformed our PR19 target and forecast to continue to do so until 2025. The assets that were inherited as a result of the 2011 adoption were in significantly worse condition than the legacy assets. From then we have continued to see significant improvement in performance as we have focussed on the proactive identification of blockages and defects before the collapse has caused an impact to customers or the environment. We continue to focus our operational activities, including proactively identifying collapses using CCTV and sewer alarm technology coupled with a strong emphasis on report categorisation to ensure that only reportable collapses are included in the analysis.

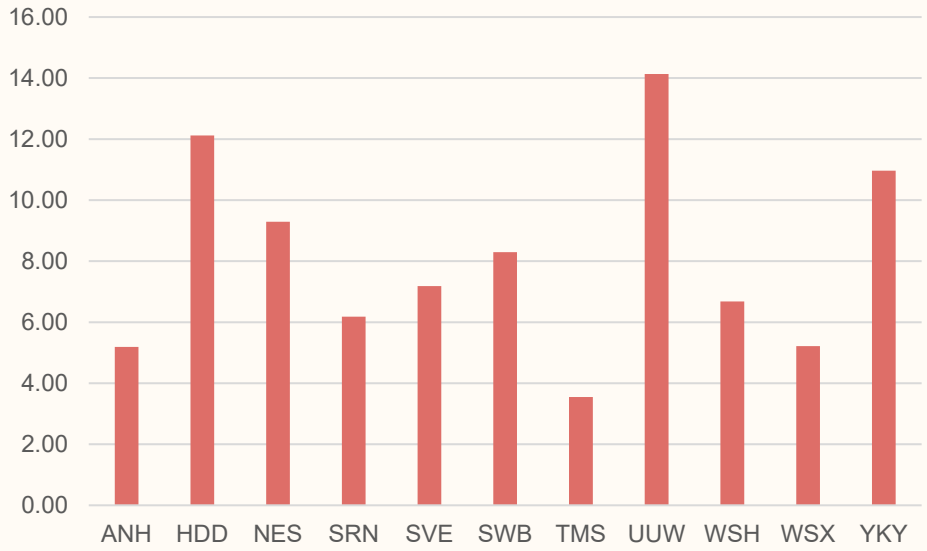
Historically, we have had very low sewer renewal rates but have continued to try and find ways to drive down our intervention costs through innovative use of structural lining where possible. Structural lining is an alternative to renewal and where possible to deploy can drive down costs by ~25% whilst achieving a similar asset life outcome. Our proposed levels of sewer renewals in the 2025-30 period will remain equivalent to AMP7, and along with the innovations in targeting and reporting, will deliver what we believe to be a stretching but achievable target. We have considered a case for Targeted investment to further increase our sewer replacement programme in AMP8 but consider this to be less of a priority than other areas such as Mains Renewals. We will revisit this for PR29, and in the longer-term, increased renewal rates to improve performance against this asset health measure will be given further emphasis.

The definition behind the trends shown above has changed as part of the convergence of reporting of sewer collapses to enable comparisons across companies. This has resulted in our

poor comparative position as shown in figure x below. However, we believe that there are a number of factors that influence our position, particularly rainfall in urban areas of West and South Yorkshire, length of combined sewer, propensity of food outlets all leading to increasing risks with blockages and structural collapses. Like YW, United Utilities, another northern company, has a similar set of exogenous characteristics, hence a similar comparative position. The impact of these characteristics is discussed in more detail in the Internal Sewer Flooding performance commitment.

More detail on this subject can be found in
**Section 22.14: Internal sewer flooding**

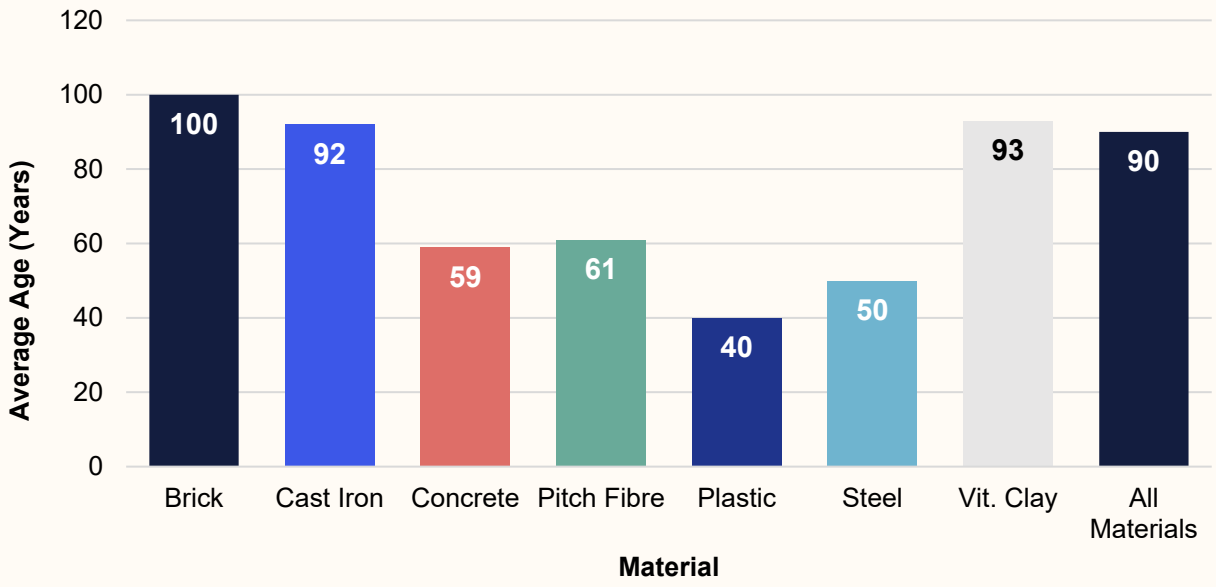
**Figure 63: Industry comparison of performance against the sewer collapses performance commitment 2022/23**




**The age profile of our sewers**

**Error! Reference source not found.** sets out the age profile of our sewers. Brick sewers show the oldest is the sewer cohort average age at 100 years whereas plastic is the sewer cohort with the lowest average age. We have one of the oldest age profiles in the industry which is a key contributor to our relative performance in the industry i.e. older sewers can have a higher probability of collapse especially when combined with other factors such as loading.

**Figure 64: Yorkshire Water profile of sewer age by material type**



## 22.6 Setting the target

In setting our performance commitment, we have used our wastewater network asset investment planning model in DMF to produce a balanced view of the overall requirement to achieve a sensible, stretching but achievable target for sewer collapses. The model has allowed us to predict future asset performance using an assumed level of funding associated with specific activity's and better quantify customer service impact through enhanced consequence mapping, as well as optimising investment for different service scenarios.

The investment planning model was used to model a range of scenarios. The overall objective of the wastewater programme is to create a balanced position using the funding that is available and some key assumptions on PCL benchmarks. In addition to the modelled base allowance for wastewater a number of additional investment assumptions have been made to maximise the available funding:

- The success of a cost adjustment claim to the base programme for Wastewater totex (£78m) was submitted on 31st May based on a number of exogenous variables that are specific to the region specifically urban rainfall, length of combined sewers, prevalence of food outlets and prevalence of cellared properties. This has been since updated to a revised value of £88m
- Assumptions on the level of efficiency that can be achieved through the programme.

In addition, YW will propose a number of performance adjustments specifically for ISF, ESF and Storm Overflows which indirectly influence sewer collapses which explain why YW performance cannot be commonly benchmarked against other companies in the industry due to regional specific variables.

These have been used to estimate a 2029/30 position for data entry into data table OUT5.

We believe we have set a stretching but achievable sewer collapse target which is around half the rate of improvement. In AMP7 our in AMP rate of improvement is 13% and in AMP8 our in AMP rate of improvement is forecast to be around 15%. We are committed to achieving improvements in asset health but expect the rate of improvement to decrease as the benefits of correct categorisation reduce and the unit cost of interventions increases as we move close to zero.

### 22.6.1 How past company and industry performance have influenced PCLs set

Table 84 below provides both the industry and company actuals and forecasts for the sewer collapses performance commitment for both AMP7 and AMP8, as well as the PR19 final determination for this performance commitment.

**Table 83: Industry and company actuals and forecasts and PR19 final determination for sewer collapses**

| Number of sewer collapses per 1,000 km of sewer network | AMP7 | | | | | AMP8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 20/21 | 21/22 | 22/23 | 23/24 | 24/25 | 25/26 | 26/27 | 27/28 | 28/29 | 29/20 |
| **PR19 final determination** | 18.26 | 17.55 | 16.83 | 16.11 | 15.39 | | | | | |
| **Industry upper quartile actuals and *arithmetic forecast*** | 6.91 | 6.31 | 5.70 | ***5.50*** | ***4.57*** | ***3.62*** | ***2.96*** | ***2.51*** | ***2.13*** | ***1.64*** |
| **Industry average actuals and arithmetic forecast** | 9.61 | 9.12 | 8.07 | ***6.99*** | ***6.15*** | ***5.50*** | ***4.97*** | ***4.55*** | ***4.21*** | ***3.92*** |
| **Company actuals, *arithmetic forecast* and business plan proposed targets** | 15.67 | 11.71 | 10.96 | ***13.11*** | ***13.06*** | **10.12** | **9.68** | **9.25** | **8.82** | **8.77** |

Our position for AMP7 is that we phased network maintenance early on in the period to ensure we made early improvements to the network performance measures (ISF, ESF and sewer collapses). As the rate of improvement is proportional to investment, Years 4 and 5 have reduced levels of network maintenance expenditure and therefore the resulting sewer collapse performance, whilst remaining ahead of our PR19 PCL, delivers the level of performance relative to investment.

## 22.7 Our long-term ambitions

Our investment planning model has also been utilised to provide information for notional investment in AMP9. We have used a 'relative rate of improvement' approach where we have constrained the model by assuming a higher unit cost and increased difficulty in achieving the commitment to estimate a further 10% improvement in collapses. Our DWMP predicted that there would be only modest improvements beyond AMP9, and our intention will be to further improve our innovations, technology and data to reduce impactful collapses further. Ultimately, we will need to invest significantly more in network renewals to reduce the overall age profile and improve asset health. We estimate this could be in the hundreds of millions of pounds in future AMPs and therefore will lead to significant capital investment and our intention is to develop business cases in the future to address this. We did consider a targeted allowance for sewer renewals in PR24 but consider that investment in mains renewals is a higher priority at this stage.

Our customers have told us that 5.3 collapses per 1,000km would be an appropriate level of performance in 2050. We have therefore matched our ambition as set out in our long-term strategy. We will further evaluate this in future Price reviews.

## 22.8 Social and Environmental Benefits

Reducing the sewer collapse rate provides a societal benefit by:

- Customers and the environment not experiencing the onset of external and internal flooding as a result of sewage spills after a collapse
- This means that customers do not go through a clean-up operation and the environment is not harmed as a result of a collapse
- The early identification and prevention of impact causing collapses means that customer impacts such as having to vacate the property and having the psychological concern that flooding won't happen again are minimised

## 22.9 Our plans to deliver this commitment

In delivering this performance commitment, we will ensure that we integrate with the related parts of the programme (as outlined above in the links between this area of performance and sewage escapes), which will provide multiple benefits for our customers and the region's environment.

The majority of expenditure in reducing sewer collapses is in targeted operational measures to proactively predict collapses before they impact on customers and the environment such as use of CCTV and sensors, targeting of hotspots (see **Error! Reference source not found.**) to ensure cost efficiency and multi benefit interventions and where we can target sewer rehabilitation to increase our renewal length and improve asset health. Many of the proposed interventions in improving sewer flooding and pollution incident performance are also relevant to delivery of this performance commitment and are fully outlined in the other PC long form appendices.

In addition to well-established asset renewal techniques, we are looking to deploy innovations both in targeting and delivery, such as:

- Using a smart networks approach to pre-empt failures through analysing performance to identify pre-failure indicators.
- Deploying innovative construction techniques - adapting spray-lining techniques for use on high risk rising mains. We plan to line over 36,000m of sewer in AMP8.
- Proactive maintenance including over 8,000m of sewer jetting in AMP8, CCTV surveys leading to activities such as root cutting to reduce collapse risk.
- First time repairs – upskilling field staff and augmenting the level of equipment to enable rapid, 'on the spot' repairs or to identify the need to rapidly escalate through the capital delivery process.

- Targeting expenditure planning to achieve the optimal level of service through our DMF tools.
- Installation of 165,000 sewer alarms to improve our proactive response
- Focussed team on reporting to ensure collapses are correctly categorised against the definition.

**Figure 65: Range of interventions we are planning to deploy on our network**

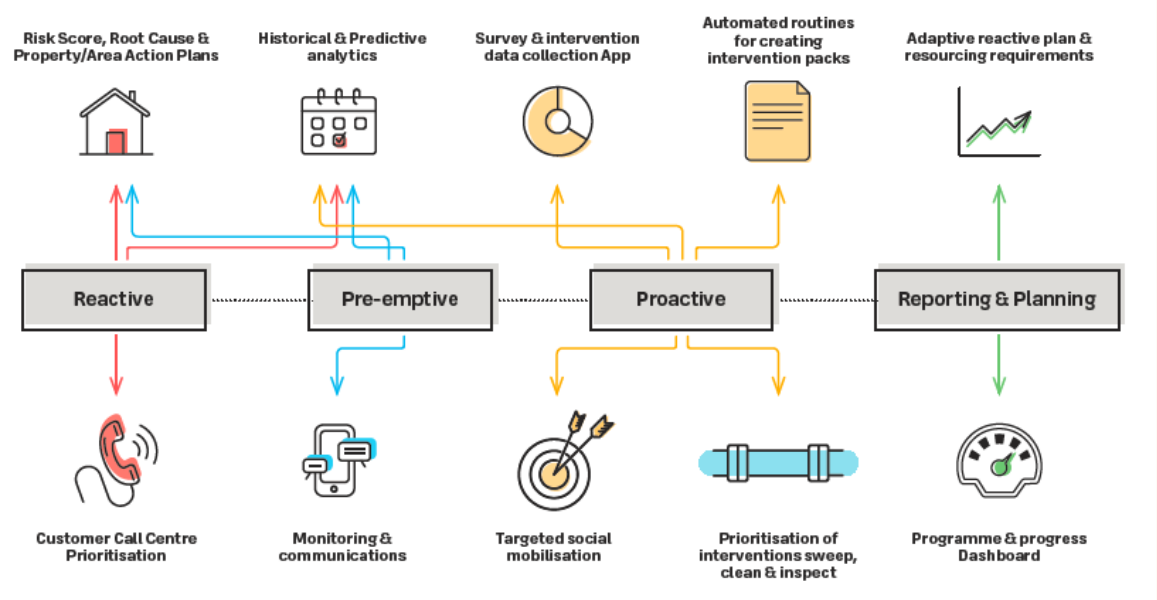
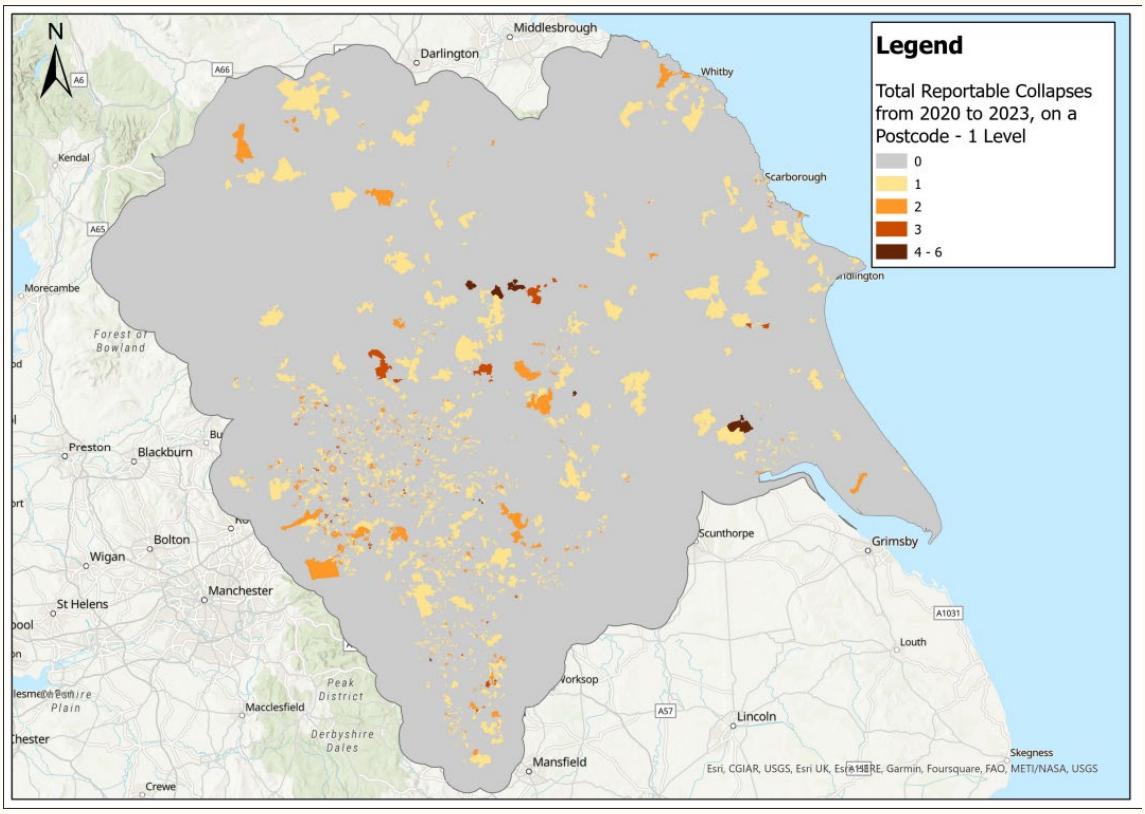



Figure 66 shows some of the hotspot areas we have mapped for sewer collapses.

We have renewed our emphasis on creating greater visibility and network understanding since Year 4 of AMP6. This has led to improved visualisation of blockages which we have been able to map as shown in the example below.

## Figure 66: Map of location of sewer collapses between 2020 to 2023




Greater visibility has been firstly through sensor trials and installations to gain greater insight into when blockages arise (which occur randomly across the region) and improving the operational response to an alert. Secondly, it has been through a greater understanding of the health of assets where we see the greatest problems (in and close to properties in section 24 and private to public sewers / laterals).

Our improvement relates to a number of activities set out below.

**Gaining visibility through customer sewer alarms**

During Year 4 and 5 of AMP6 and Year 1 of AMP7 we undertook trials to install sensors close to properties in combined sewer areas that have a higher likelihood of flooding. This was through undertaking field trials at one of our wastewater treatment works to simulate performance issues and test potential sensors as well development of technology with suppliers. Research was also undertaken with the University of Sheffield to evaluate the performance of small diameter sewer / lateral to different types of blockages and inflows. As a result of that we commenced installation of sensors in and close to the properties. Two sensors were utilised in earnest with circa 2000 sensors installed in total. This provided the basis for our first test of technology, overcoming installation issues and the analytics of the data to interpret alerts and when these should be turned into alarms with an incident response.

The result of our work has been to embark on a journey of customer sewer alarm (CSA) installations. We commenced installing the CSAs in Year 3 of AMP7, with over 20,000 installed by the end of Year 3 targeting internal and external sewer flooding. The locations have been driven from our CSA benefit model.  Our intent is to have 40,000 CSAs installed in AMP7.  The CSA is close to the property, with a greater focus being to install these in high likelihood of internal sewer flooding postcodes. Enabling works are undertaken to support installation.

The aim of the CSAs is to identify when a pre-emptive intervention is required and over what time period (the level of urgency). We know from our inspection data that blockages occur regularly in our high likelihood areas, but often self-clear. Using inspection by our teams supported by analytics (which will develop and improve overtime) we can start to identify where a blockage is forming and assign a response to the property. This may not be an instant response based on our understanding of the data. Using more sensors in the network is driving an organisational shift in how we deploy and react which is currently under review including how we triage and schedule interventions.

### Local sewer inspection, cleansing and rehabilitation programme

We commenced an inspection programme of local sewer inspection in and around our high likelihood internal sewer flooding properties. This targeted approach saw over 100,000 properties targeted in Year 3 of AMP7, with over 1,060km of sewer inspected. These sewers were predominantly section 24 or transferred assets (from 2011) close to properties. The inspection included:

- Recording details of the inspection including defects, sewer grade, sewer length
- identifying if a blockage was present and if so clearing it, typically through sewer cleansing

The defects were reviewed, and rehabilitation requirements determined and agreed, to form part of the ongoing rehabilitation programme. As part of our work, over the first three years of the AMP, we undertook 15,000 interventions which included dig-down repairs, gully replacement, lining (over 50% of works), root cutting and trap removal (to reduce internal and external sewer flooding).

To support local inspection, we have also been trialling and now mainstreaming the use of lateral cameras that to gain insight into the sewer network condition of laterals direct from the main sewer. This is an efficient way for us to inspect a large number of laterals that are on housing stock with a high likelihood to flood internally.

Along with local sewer inspection we have inspected mainline sewers in key areas, to understand if cleansing or repair is required. This targeted over 100km per year typically (across pollution, internal and external sewer flooding). This is a continual programme, which will be revised as we install more sensors in the sewer network.

### Evolving and improving our response to incidents

As part of our modernisation programme, we reviewed our operational response to incidents (blockages and flooding). As part of this organisational review we made the decision to bring the operational response inhouse. This gave us greater control to target and respond as required, e.g., to reduce our reactive times based on urgency and need. Our proactive and pre-emptive work is delivered by our in-house teams and supply chain. Our rehabilitation work is delivered by our supply chain.

A key focus of our recent work has been to reduce the likelihood of repeat incidents occurring at a single property, particularly within a short space of time. We applied a renewed focus, driven through our ‘repeat hubs’ that develop our thinking and learning through to resolving an incident in one visit, and organise follow on work as soon as possible. We continue to work in this area to strive for improvement.

Innovation will support our transformation to continue to drive efficiency along with reducing the likelihood of internal sewer flooding.  Our focus is on digitalisation, rehabilitation, smart control and analytics.

### Digitisation and field systems

We are testing new approaches that will digitalise, capture and share data and information back to our platform. For example, using the V scout to capture high precision data through to using an i-pad to undertake scans of inspection and manhole chamber.

We are trialling ESRI field maps to capture and update our systems automatically to provide greater knowledge of the local sewer network in and around properties (often not mapped). Such information is critical for our operational teams visiting site and critical to understand intervention choices, including at the customer contact centre as well as scheduling).

We will auto code CCTV data, including laterals, that are difficult and slow to camera (using the lateral camera). This approach reduces significant time in coding large amounts of data and will enable us to target with greater certainty where defects need to be addressed in the future, confirming long term investment needs and having the pipe history tagged and geolocated.

We are trialling the hybrid mapping of sewers to provide better insight on the location of drainage systems in and around properties (typically the transferred assets). Such information

will support our planners scheduling and operatives undertaking work. This information will also be of benefit as we update our hydraulic sewer models.

**Rehabilitation**

We are undertaking rehabilitation trials that will improve the speed, quality and cost of lining small diameter sewers. Our spray lining trials have the potential to swiftly improve asset health where structural lining is not required.

We are also supporting the work undertaken on major research programmes such as Pipebots (Pipebots). This research provides the potential for small robots to move autonomously through a network identifying issues to inform where an intervention may be required.

**Smart control of the sewer system**

We are trialling the use of smart water butts to optimise when the storage should be empty and when it is safe for the contents to be available for customer use. This technology is applicable to residential if we can drive the costs down and is particularly of value on non-residential premises where there is the potential for larger storage to manage runoff from larger roofs.

We are currently piloting approaches to maximise the use of storage in the drainage network to reduce hydraulic flooding and overflows. Our active system control pilot with Stantec and Siemens is determining the protocols of where to apply active system control to utilise our existing assets as well how us maximise the use of new assets (grey and blue-green). Successful desktop testing will lead to full scale trials.

**Analytics**

Having learnt from the roll out, data analysis and platform requirements from successful sensor trials earl in the AMP, we are continuing to develop the analytics and platforms to analyse sensors. For our sensors in the sewer and our customer sewer alarms where we currently analyse data on a daily basis we will be moving to automated analysis and in the future, automated scheduling. We plan to roll out a large programme of CSAs and main sewer sensors in AMP8, therefore being ready for this deployment is key. To that end we are also undertaking our Smart Wastewater Network Pilot, which is targeting a key internal sewer flooding hot spot in Leeds. Here along with sensor deployment, and understanding the condition of our assets to high detail, we are combining all the data together and working with our partners Stantec and Stormharverster to analyse and identify where interventions are required using machine learning approaches and data validation with neighbouring sensor data.

### 22.9.1 Interventions in the field to achieve the performance commitment

We will deliver this reduction in internal sewer flooding to properties through a combination of interventions, which build on the learning and application of work through this AMP. We summarise these interventions below.

We will deploy more customer sewer alarms, combined with our revised operational response to reduce internal sewer flooding in high-risk areas. In AMP7 we will have circa 40,000 CSAs deployed, and our intent in AMP8 is to increase this to circa 200,000 in total. This will provide visibility to some of our most high-risk locations. This will continue to be a gradual roll out year on year to continue to provide learning to how we prevent incidents and enable future structured replacement programmes for sensors. Along with the CSAs, we will be deploying main sewer sensors as well (circa 68,000 number), targeting locations where internal sewer flooding locations are as well as known operational issues that may contribute to internal sewer flooding.

Enabling the success of CSAs and main sewers sensors is the analytics outlined above to determine when to intervention. This may be proactive activities, cleansing the sewer to remove silt through to pre-emptive jetting to remove forming blockages. The insight from the CCTV inspection and coding, will provide the detailed evidence base for future rehabilitation decision making.

Critical to the success is the timely operational response as result of capacity reducing issues forming such as soft blockages and siltation. Our transformation activities are planned to provide us with the flexibility to adapt to pre-emptive, proactive and reactive interventions, based on the data received from our CSAs and main sewer sensor. Our work to improve how we schedule and manage crews and the basket workload will enable us to be agile in our future ways of

working and respond to sensor alerts -whether there are potentially several days to respond or whether a “blue-light” intervention is required within 2 hours. that

Where we respond and find more serious defects that require a swift intervention, we are putting in place the mechanisms to enable a first fix fast track civils repair intervention to further avoid repeat incidents.

In support of our inspection approaches we are using the wider breadth of inspection techniques such as CCTV and radar to undertake and record the sewer investigations in the high-risk areas.

We aim to build on the significant investment proposed in behavioural campaigns towards the end of this AMP focused on changing people’s habits of what they dispose of via the sewer system whilst learning from industry work (e.g. UKWIR’s Learning and recommendations from customer behaviour campaigns on blockage reduction project). Our campaigns will take a balanced approach targeting high likelihood of flooding areas along with regional campaigns. Critically we will look to understand and record the impact of these campaigns, along with other interventions to support future decision making.

We will continue and grow our partnership working to increase flood resilience. Whilst this will become a growing focus in AMP9, we are proposing partnership funded investment in Hull and Haltemprice using the knowledge of the Blue-Green Plan created this AMP. Furthermore, there is the potential through the overflow programme where we remove surface water to reduce flooding and create wider benefits.

## 22.10 Our incentive to deliver.

### Table 84: Our incentive to deliver

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Underperformance only, underperformance and outperformance, etc. |
| **Price control allocation** | 100% wastewater network plus |
| **ODI rate used** | £1.14m per sewer collapse per 1,000 km of sewer |
| **Outperformance payment- standard** | £1.14m per sewer collapse per 1,000 km of sewer |
| **Underperformance payment - standard** | £1.14m per sewer collapse per 1,000 km of sewer |
| **Timing of underperformance and outperformance payments** | In-period |

## 22.11 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk and Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 22.12 Deadbands

Deadbands do not apply to this PC.

### 22.13 Cap/Collars

The guidance published by Ofwat to inform the development of business plans for PR24 indicates that a cap of 0.25% of RoRE and a collar of 0.5% of RoRE will apply to this PC.

### 22.14 Supporting evidence to econometric modelling

## Appendix A: Financial consequences of our PAC

In this Appendix, we present the estimated financial consequences of Ofwat not recognising our claim; these financial consequences are material. Below, we present: (i) our approach to estimating the financial consequences of our claim; and (ii) the results of this estimation.

### Approach

We estimate the financial consequences of our claim as the financial penalties we would incur across PR24, if our unique circumstances in are not accounted for. This is calculated by multiplying our estimated PCL uplifts[30] (which are discussed in section **Error! Reference source not found.** and presented in 0) by the ODI rate that Ofwat have indicated for Yorkshire Water at PR24.[31] This rate is £ 10.31m per ISF incident per 10,000 properties. The fact that the ODI rate is symmetrical and linear means that the value of the claim is the same, regardless of our actual performance level.

### Results

The table below presents the estimated financial penalties we would incur over PR24, if we were to perform at the level suggested by each of the two adjustment methods discussed in section **Error! Reference source not found.**, but our target was the common PCL. These estimates are based on our preferred model specification (Model 7), for both OLS and RE. As can be seen, we would incur penalties (relative to our proposed adjustment) in the region of £56.3m to £110.7m across PR24, if our unique circumstances are not accounted for.

**Table 85: Estimated financial consequences of not adjusting performance over PR24**

| Year | Method 1 | Method 2 |
|---|---|---|
| **Model 7 (OLS)** | £57.4m | £110.7m |
| **Model 7 (RE)** | £56.3m | £109.0m |

*Source: Yorkshire Water*

## Appendix B: Calculating the percentage of combined sewers in each network

In this Appendix, we explain how we calculate the percentage of combined sewers in each network. This is required because Ofwat data does not break down formerly private sewers by sewer type. In addition, we set out a method of testing the sensitivity of our results to assumptions on the proportion of foul sewers that are also combined.
Existing Ofwat data on the length of sewers in each wastewater company's network includes the following elements.

- Length of foul (only) public sewers (in km).
- Length of surface water (only) public sewers (in km).
- Length of combined public sewers (in km).
- Length of rising mains (in km).
- Length of other wastewater network pipework (in km).
- Total length of legacy public sewers as at 31 March (in km).
- Length of formerly private sewers and lateral drains (s105A sewers) (in km).

Where items 1 to 5 sum to form item 6.

[30] The uplift is the difference between our forecast PCL for ISF and our adjusted PCL. The details of how the forecast PCL is calculated are presented in 0.
[31] These were shared with us by Ofwat.

However, we want to remove the total length of surface only sewers from the measure of total sewer length, because the vast majority of flooding incidents occur from the foul and combined sewer. In other words, we want to calculate the total percentage of combined sewers in each company's wastewater network as the following:

$$\frac{Total\ km\ of\ Combined\ Sewers\ (Private\ and\ Public)}{Total\ km\ of\ Sewers\ (Private\ and\ Public) - Total\ km\ of\ Surface\ Sewers\ (Private\ and\ Public)}$$

The Ofwat data, in its current form, is inadequate for the calculation above because it does not break down the length of formerly private sewers (item 7) by sewer type (foul, surface water, combined, etc.) in the same way that it does for public sewers (see items 1 to 5). Thus, we are unable to add the total length of private combined sewers to the denominator, and we are unable to subtract the total length of private surface sewers from the numerator. We therefore estimate the length of legacy private combined and surface sewers in the following way.

- Firstly, we calculate the ratio of lengths of sewer types for public sewers in the oldest year of data available (2011/12) for each wastewater company.
- Secondly, we multiply the length of legacy private sewers (which is fixed) by this ratio. This gives the estimated length of each legacy private sewer type for each wastewater company.

We also test the sensitivity of our Model 7 to also including a subset of foul sewers in the total length of combined sewers. We do this because some foul sewers also take surface water, often referred to as partially separate systems. These foul sewers carry a proportion of the runoff generated in the area, with the remaining carried by the surface water systems. We test the sensitivity of our results to assuming 25% or 50% of foul sewers are acting in a combined manner (the baseline model assumes 0%). We find that our results are not materially sensitive to these changes but do find that the models predict that combined sewers have a greater effect on ISF than they would if foul sewers were not included in the length of combined sewers.

## Appendix C: Forecasting the common PCL for ISF at PR24

In this Appendix, we explain how we forecast the common PCL for ISF at PR24. This is required because Ofwat have not yet provided an indication of the common PCL for ISF at PR24.[32]
In order to estimate the predicted PCL for ISF at PR24, we take the following steps:

- Gather data shared by companies in their Drainage and Waste Management Plan (DWMP tables. This data includes a prediction of each company's PCL for ISF over the PR24 period and beyond.
- Southern Water and Welsh Water have not published their DWMP tables. For these companies, we therefore take the following steps.
  - Gather data submitted in the App1 tables of each company's business plan. This data includes a prediction of each company's PCL for ISF over the PR24 period and beyond.
  - Where company predictions are not scaled by the number of connected wastewater properties, we scale the data using a linear forecast of connected wastewater properties over the relevant period.
- We then take the upper quartile of the companies' predicted PCLs for ISF for each year of the PR24 period. This gives us the predicted PCL for the PR24 period, which is the same for all companies.

## Appendix D: Model and adjusted PCL results

In this Appendix, we present the results from our econometric modelling and our estimated adjusted PCL, which are discussed in sections 23.6.4 and **Error! Reference source not found.**.

### Econometric model results

[32] Please see: https://www.ofwat.gov.uk/publication/pr24-final-methodology-appendix-7-performance-commitments/

Table 87 and Table 88 present the results from the seven model specifications discussed in section **Error! Reference source not found.**, for OLS and RE. We make the following observations on these results:

1. **Percentage of combined sewers.** The percentage of combined sewers in a wastewater company's network typically has a statistically insignificant but material relationship with the number of ISF incidents that wastewater companies' customers experience in any given year. The models show that a percentage point increase in the percentage of combined sewers is associated with a 0.0 % to 0.8% increase in normalised ISF incidences.[33]
2. **Annual urban rainfall.** Annual urban rainfall has a somewhat statistically significant but material relationship with the number of ISF incidents that wastewater companies' customers experience in any given year. The models show that a 1% increase in annual urban rainfall is associated with a 0.0% to 0.3% increase in normalised ISF incidences.[34] We note that it is unsurprising that this variable is sometimes not statistically significant, because, as explained in section 3.1, annual urban rainfall is not a perfect measure of this driver of ISF.
3. **Percentage of properties with cellars.** The percentage of properties with cellars in a wastewater company's network has a statistically significant and material relationship with the number of ISF incidents that wastewater companies' customers experience in any given year. The models show that a percentage point increase in the percentage of cellars is associated with a 7.6% to 16.3% increase in normalised ISF incidences.[35]
4. **FSEs.** The number of FSEs in a wastewater company's network has a significant and material relationship with the number of ISF incidents that their customers experience in any given year. The models show that a 1% increase in the number of FSEs is associated with a 1.3% to 1.8% increase in normalised ISF incidences.[36]
5. **Robustness and statistical tests.** We find that, with the exception of Model 5, the coefficients of our models are robust to changes in specification. The R-squared of our models is reasonably high but the RESET test (for correct functional form) pass rate is relatively low.

### Table 86: Econometric model results, OLS

| Normalised ISF incidences, natural log | Model 1 OLS | Model 2 OLS | Model 3 OLS | Model 4 OLS | Model 5 OLS | Model 6 OLS | Model 7 OLS |
|---|---|---|---|---|---|---|---|
| **Percentage of combined sewers** | 0.007 | | | | -0.002 | 0.006 | 0.006 |
| **Annual urban rainfall, natural log** | | 0.278 | | | -0.01 | 0.207 | 0.229 |
| **Percentage of properties with cellars** | | | 0.151*** | | 0.090** | 0.109** | 0.106** |
| **Normalised FSE, natural log** | | | | 1.449*** | 1.281** | | |
| **Time trend** | | | | | | | -0.078** |
| **Constant** | 0.429* | -1.419 | 0.307 | -3.601** | -3.171* | -1.439 | -1.296 |
| **R-squared** | 0.096 | 0.084 | 0.296 | 0.407 | 0.479 | 0.355 | 0.450 |
| **RESET test** | FAIL | PASS | FAIL | FAIL | FAIL | FAIL | FAIL |

33 The interpretation of the coefficient is calculated as 100*(EXP(B)-1)%.
34 The interpretation of the coefficient is simply taken as B%.
35 The interpretation of the coefficient is calculated as 100*(EXP(B)-1)%.
36 The interpretation of the coefficient is simply taken as B%.

Source: Economic Insight / Yorkshire Water. Notes: Asterisks indicate statistical significance: *** for 1%; ** for 5%; and * for 10%. Standard errors are robust and clustered at the company level, in line with Ofwat's base cost methodology. RESET pass or fail is assessed at 5% significance level.

### Table 87: Econometric model results, RE

| Normalised ISF incidences, natural log | Model 1 RE | Model 2 RE | Model 3 RE | Model 4 RE | Model 5 RE | Model 6 RE | Model 7 RE |
|---|---|---|---|---|---|---|---|
| **Percentage of combined sewers** | 0.008 | | | | -0.005 | 0.006 | 0.006 |
| **Annual urban rainfall, natural log** | | 0.163 | | | -0.038 | 0.128 | 0.252* |
| **Percentage of properties with cellars** | | | 0.151** | | 0.073** | 0.118*** | 0.103** |
| **Normalised FSE, natural log** | | | | 1.710*** | 1.805*** | | |
| **Time trend** | | | | | | | -0.079*** |
| **Constant** | 0.400* | -0.526 | 0.307* | -4.387*** | -4.361* | -0.838 | -1.48 |
| **R-squared** | 0.109 | 0.098 | 0.306 | 0.416 | 0.497 | 0.376 | 0.481 |
| **RESET test** | FAIL | PASS | FAIL | FAIL | FAIL | PASS | FAIL |

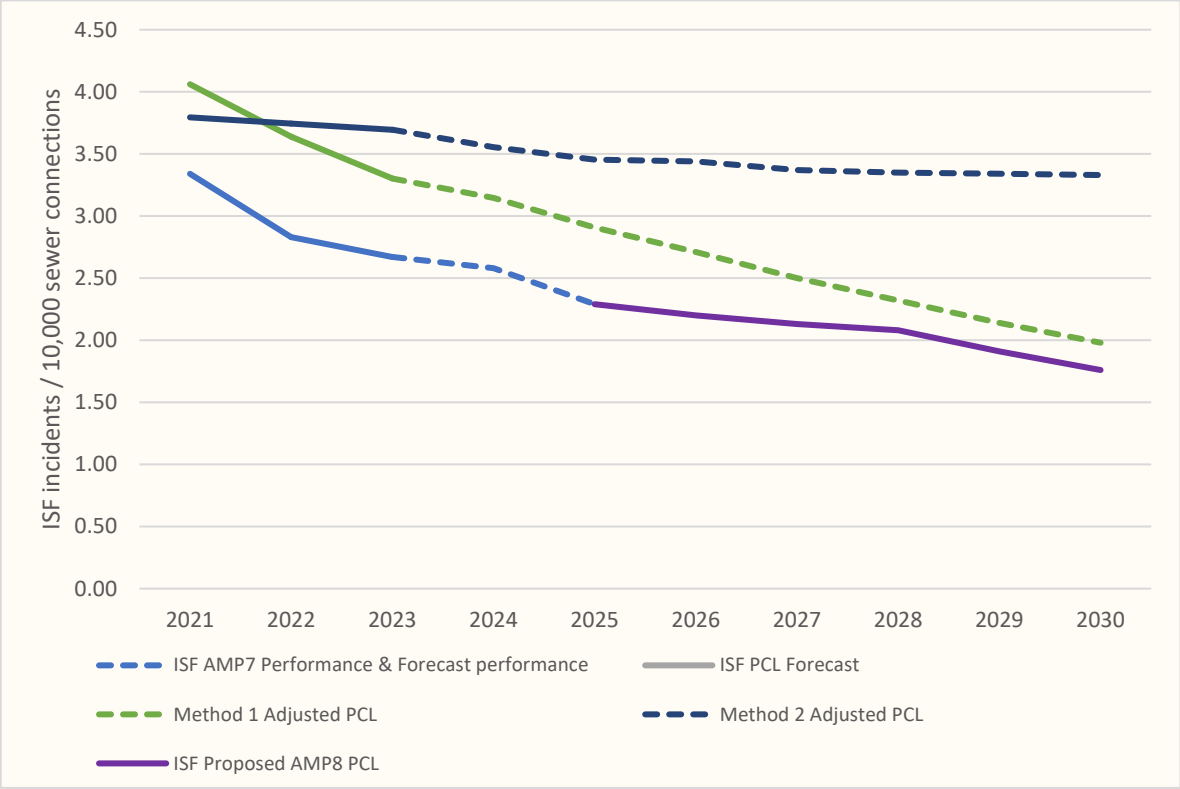
Source: Yorkshire Water. Notes: Asterisks indicate statistical significance: *** for 1%; ** for 5%; and * for 10%. Standard errors are robust and clustered at the company level, in line with Ofwat's base cost methodology. RESET pass or fail is assessed at 5% significance level.

### Adjusted PCL results

We apply the results from preferred model specification (Model 7) to the two adjustment methods discussed in section **Error! Reference source not found.**. The adjusted PCLs generated by the OLS model are shown in Figure 67 and in Table 89. The adjusted PCLs generated by the RE model are shown in

Figure 68 and Table 90. As can be seen, we calculate a range of adjusted PCLs between 1.96 and 3.44 ISF incidents per 10,000 properties per year.

## Figure 67: Model 7 (OLS) estimated adjusted PCLs for Yorkshire Water



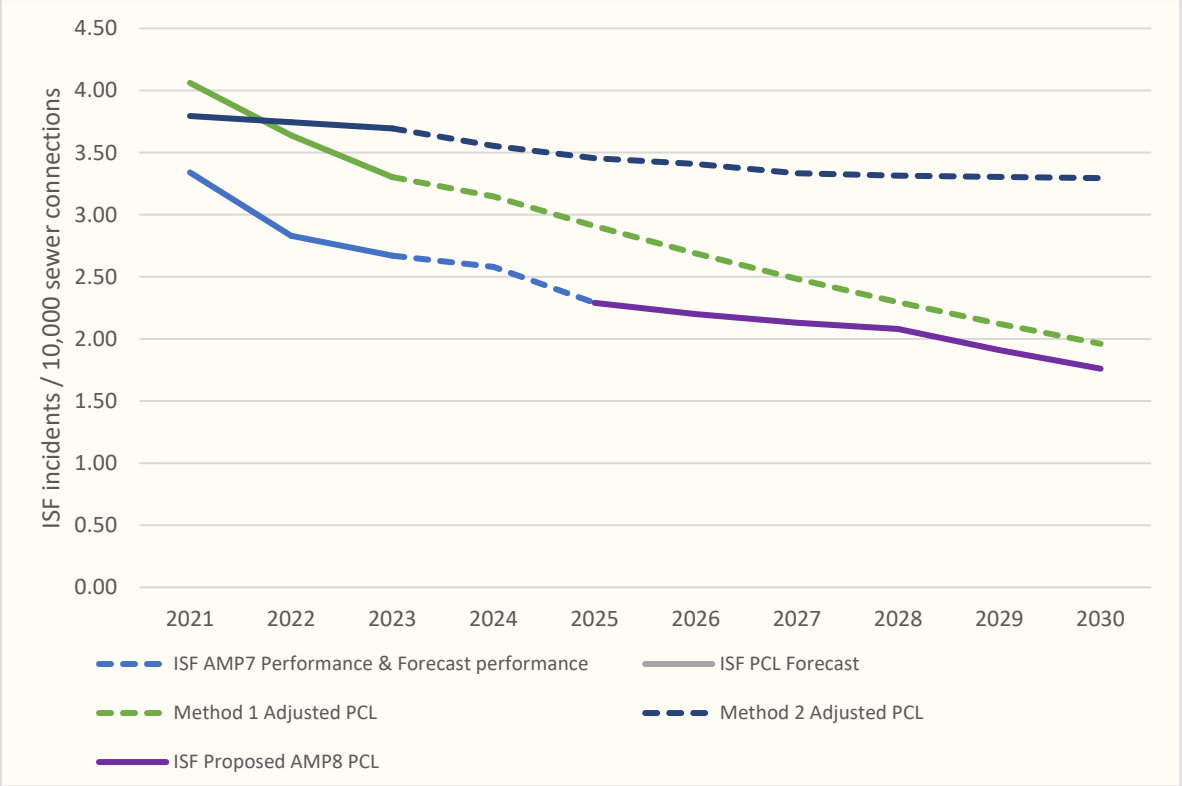

*Source: Economic Insight analysis*

## Table 88: Model 7 (OLS) estimated adjusted PCLs for Yorkshire Water

| Year | Method 1 | Method 2 |
|---|---|---|
| **2026** | 2.71 | 3.44 |
| **2027** | 2.50 | 3.37 |
| **2028** | 2.32 | 3.35 |
| **2029** | 2.14 | 3.34 |
| **2030** | 1.98 | 3.33 |

*Source: Economic Insight Analysis*

## Figure 68: Model 7 (RE) estimated adjusted PCLs for Yorkshire Water




*Source: Economic Insight analysis*

## Table 89: Model 7 (RE) estimated adjustments for Yorkshire Water

| Year | Method 1 | Method 2 |
|---|---|---|
| **2026** | 2.69 | 3.41 |
| **2027** | 2.48 | 3.33 |
| **2028** | 2.30 | 3.31 |
| **2029** | 2.12 | 3.30 |
| **2030** | 1.96 | 3.29 |

*Source: Economic Insight Analysis*

## Appendix E: Census Data from 2001 of properties with a cellar / basement

The 2001 Census data included a question of whether the property included a basement[1]. This information has been used to evaluate the proportion of cellars[2] in the Yorkshire Water (YW) region compared with other Water and Sewerage Company (WaSC) sewerage boundaries and England and Wales (excluding YW) as a whole. This indicates that YW has 6.2% of properties with cellars compared with 2.4% across England and Wales (Table 91). The basement data was reported at an Output Area level. Subsequent Census questionnaires did not ask if the property had a basement.

### Table 90: Summary of the 2001 Census data for number of properties and those a basement

| Company Name | Total Assessed Households - 2001 Census | Lowest Floor is Basement - 2001 Census | Percentage of Properties with Basements - 2001 Census |
|---|---|---|---|
| **Yorkshire Water** | 2053934 | 126865 | 6.2% |
| **Thames Water** | 5255204 | 183864 | 3.5% |
| **Southern Water** | 1775220 | 56380 | 3.2% |
| **South West Water** | 737761 | 20507 | 2.8% |
| **United Utilities** | 2964718 | 72685 | 2.5% |
| **Welsh Water** | 1351948 | 30001 | 2.2% |
| **Wessex Water** | 1143190 | 23516 | 2.1% |
| **Severn Trent** | 3580039 | 61500 | 1.7% |
| **Anglian Water** | 2515618 | 26788 | 1.1% |
| **Northumbrian Water** | 1135294 | 7490 | 0.7% |
| **England and Wales including Yorkshire Water** | **22512926** | **609596** | **2.7%** |
| **England and Wales excluding Yorkshire Water** | **20458992** | **482731** | **2.4%** |

# 23. External Sewer Flooding

## 23.1 PC Type

Customers receiving excellent service everyday

## 23.2 Performance targets

### Table 91: Committed performance levels

| PR24_ESF | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | Number of incidents per 10,000 sewer connections | 20.92 | 20.30 | 19.72 | 19.16 | 18.61 |

## 23.3 Summary

This Performance Commitment (PC) incentivises Yorkshire Water to reduce the number of sewer flooding incidents within the curtilage of a building normally used for residential, public, community and business purposes due to overloaded sewers (hydraulic flooding). Other causes including sewer flooding due to severe weather events is included, as well as external flooding due to third party action. In cases of an event where both internal and external sewer flooding occurs, this will be recorded as an internal sewer flooding incident.

Based on the regional factors we face, we recommend that Ofwat sets a target adjusted to reflect the regional differences between companies, rather than a simple average or upper quartile performance. Our proposed adjusted target is based on our strong engineering and economic rationale where the length of combined sewers significantly influences our performance. Whilst we investigate other factors, we recognise they have less influence e.g., food service establishments, rainfall. This reflects the engineering rationale where flooding predominately occurs in the smaller upstream diameter sewers and is blockage driven.

Our econometric modelling approach indicates an appropriate end of AMP8 target for a company with our characteristics of between 18.6 and 21.4 external sewer flooding incidents per 10,000 properties. Our proposed glidepath follows our lower range modelling estimate, an outturn in year 5 of 18.61 properties per 10,000 properties. We recognise that the entry point to AMP8 is greater than our stretching forecast exit point for AMP7. The primary reason is that the PCL should take into account the regional circumstances we face and be adjusted on that basis.

Incidences of external sewer flooding can cause damage and disruption to customers' property and therefore it is important for Yorkshire Water to continue to reduce these incidents. Compared to internal sewer flooding which was ranked 3rd by Yorkshire Water customers in our Valuing Water customer engagement, this service issue was ranked 7th in terms of priority. In the Ofwat and CC Water collaborative marginal benefit rates study, the service issue of ESF has the second highest customer willingness to accept value, implying customers place a high importance on avoiding ESF incidents.

Investments proposed in Yorkshire Water's PR24 Business Plan that contribute towards the performance level for this PC are also expected to affect the PCs of Internal Sewer Flooding and Sewer Collapses. We are targeting the continued improvement in our performance by using digital technologies, creating visibility and insight into the sewer network performance through sensors and inspection, creating the right response operational (e.g. quick response to a forming blockage) and capital response (e.g. sewer rehabilitation), and driving improvements in how we work as an organisation and with our supply chain.

## 23.4 Customer and Stakeholder Engagement

We carry out extensive engagement with our customers, communities and stakeholders. Information on engagement approach can be found in Chapter 6, but specific customer engagement related to internal sewer flooding is detailed below.

More detail on this subject can be found in **Chapter 6: Customer and Stakeholder priorities**

We know, through customer engagement carried out through the Ofwat and CCWater customer preference research that external sewer flooding is ranked as a high priority. While external sewer flooding is generally considered to be less emotive than internal sewer flooding, and generally considering slightly less important than internal sewer flooding, it is still recognised as being unacceptable. The engagement study found that external sewer flooding was inconvenient and unpleasant regardless of scale, due to the smell and health hazards. Customers also reported that they would feel more affected where there was external sewer flooding within their property boundary, for example on driveways, or in gardens, due to the financial cost and emotional repercussions. In contrast to internal sewer flooding, the engagement research found that people attributed external sewer flooding directly to water company practice, perceiving there to be a failure of prevention and/or poor maintenance of pipes.

Read more about this at **Ofwat/CCWater customer preference research**

When engaging with our own Yorkshire Water customers through our Valuing Water priorities research, external sewer flooding was considered an average priority, rather than within the top 6 highest priority areas. Out of 20 tested priority areas, both household and non-household customers ranked external sewer flooding as the seventh highest priority area. We can, however we can see from analysis of our complaints data from 1st April 2022 to 31st March 2023 (total of 24,363 complaints) that 11%, the joint second highest category after billing, were related to sewer flooding.

We've also carried out specific studies within our online community on keeping wastewater in pipes. An example of this is the customer engagement on wet wipes. Across 570 member surveys, we found that 85% of customers purchase wet wipes, with 20% viewing them as essential, but that the responsibility for proper use of these to avoid sewer blockages and external flooding lies with the water company, government, and manufacturers rather than the user. This supports the view that we need to be more proactive in our approach to sewer flooding if we want to perform well in this area.

Read more about this at **Wet wipes call for evidence research**

In addition, the engagement we carried out to build our drainage and wastewater management plan (DWMP) indicates that when customers are presented with information on performance associated with sewer flooding, whether that be internal or external, there are expectations that longer-term improvements to the sewer network should be addressed, as maintenance would not go far enough considering the future challenges, including climate change and population growth.

Finally, in our affordability and acceptability research conducted following Ofwat guidelines we showcased our planned target for external sewer flooding - 78% of customers found the plan to be acceptable and in our own independent affordability and acceptability testing research, 79% of customers found our overall plan to be acceptable including this target.

More detail on this subject can be found in **Chapter 6: Customer and Stakeholder priorities**

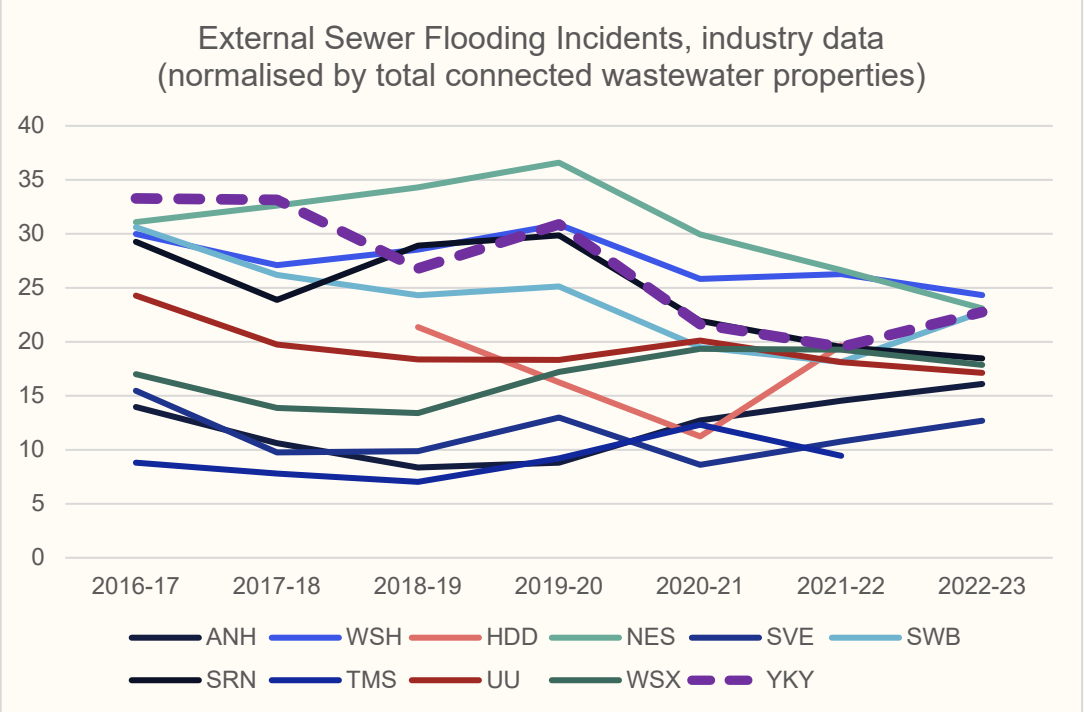
## 23.5 Our performance to date

### 23.5.1 Our performance and position

Over the last seven years, the number of external sewer flooding incidents has been on an improving trend. We have seen variations year-on-year as also seen with many other water companies. **Error! Reference source not found.** shows our performance in comparison with other water companies on a normalised basis. Our improvement overall has been as a result of increased expenditure and targeting our work in catchments more prone to external sewer flooding. The slight increase in 2022/23 was a result of slight shift in prioritisation to internal sewer flooding given the need to continually drive performance in area which has a high customer preference.

We have outperformed our AMP7 final determination PCL for Years 1-3. Our interventions since the end of AMP6 have focused on increased operational activity in targeting blockage and silt removal, and targeted rehabilitation where required. We recognise our relative performance is below the industry average, however this does not consider a normalisation to company specific factors that unduly impact YW in comparison to many others. We discuss the impact of these in the remainder of this document.

**Figure 69 Our comparable performance over the last 7 years**




Source: Ofwat Historical Performance Trends for PR24 v2.0 and Annual Performance Report 2022/23

We anticipate a gradual reduction to continue. Our blind forecasts for Year 4 and 5 are 18.75 and 18.07 per 10,000 connections respectively. Our current focus remains on the programmes of work to inspect, clear blockages (proactively) and rehabilitate major defects, along with main sewer CCTV and cleansing, along with using customer sewer alarms.

Our performance over the last five years has benefited from minimal severe rainfall events falling in urban areas which can lead to 100s of properties flooding.

### 23.5.2 Understanding factors that influence our performance

Our performance is influenced by factors including:

- Number of repeat properties flooding
- The source of flooding predominantly being from the combined sewer system
- High proportion of flooding from transferred assets and small local diameter.

Key to improving performance has been reducing the number of repeat flooding occurrences. Since 2019 we have reduced by circa 25% the number of repeat occurrences, as indicated in

Table 93. The majority of external sewer flooding is driven by newly occurring incidents with circa 84% of incidents since 2019 only occurring once.

### Table 92 Number of (In year) repeat external sewer flooding incidents per year

| Financial Year | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|
| **Number of repeat incidents per year** | 405 | 509 | 300 | 277 | 324 |

For external sewer flooding, the source of flooding is predominantly from the combined and foul sewer (circa 96%). In our region we have one of the highest combined sewer percentages of all water companies at 55% (Table 94). We also have one of the highest combined sewers to foul sewers ratios 3:1 (Table 94).

For external sewer flooding, the type of sewer related to the flooding is circa 3.6:1 (combined sewer to Foul sewer). This indicates we are circa 20% more likely to see external sewer flooding from the combined sewer rather than the foul sewer. This is compared with our expected ratio of (3:1) based on the combined sewers to foul sewers ratio. Based on our evidence this demonstrates that combined sewers are more likely to lead to flooding than separate systems hence influencing our performance.

### Table 93 Data taken from the 2022/23 APR indicating the percentage of combined sewers Yorkshire Water have and the high ratio of combined to foul sewers.

| Company | Length of "public" sewer (km) | | | Percentage of company "public" sewer by type | | | Ratio of Combined to Foul Sewer |
|---|---|---|---|---|---|---|---|
| | Combined Sewer | Surface Water Sewer | Foul Sewer | Combined Sewer | Surface Water Sewer | Foul Sewer | |
| Untied Utilities | 22,809 | 10,722 | 7,354 | 55.8% | 26.2% | 18.0% | 3.10 |
| South West Water | 5,879 | 2,552 | 2,128 | 55.7% | 24.2% | 20.2% | 2.76 |
| Yorkshire Water | 16,266 | 7,624 | 5,438 | 55.5% | 26.0% | 18.5% | 2.99 |
| Northumbrian Water | 8,408 | 4,560 | 3,123 | 52.3% | 28.3% | 19.4% | 2.69 |
| Dwy Cymru | 8,899 | 3,674 | 5,612 | 48.9% | 20.2% | 30.9% | 1.59 |
| Anglian Water | 10,320 | 11,677 | 19,237 | 25.0% | 28.3% | 46.7% | 0.54 |
| Severn Trent Water | 12,078 | 16,772 | 24,324 | 22.7% | 31.5% | 45.7% | 0.50 |
| Wessex Water | 3,121 | 4,479 | 9,237 | 18.5% | 26.6% | 54.9% | 0.34 |
| Southern Water | 2,513 | 5,157 | 13,123 | 12.1% | 24.8% | 63.1% | 0.19 |
| Thames Water | 5,816 | 22,812 | 38,250 | 8.7% | 34.1% | 57.2% | 0.15 |
| Total | 96,109 | 90,029 | 127,826 | 30.6% | 28.7% | 40.7% | 0.75 |

Over 98% of external sewer flooding is attributed to other causes (typically a blockage, circa 92%). The majority of the flooding occurs in the small diameter 100 and 150mm diameters sewers (circa 94%), with over 52% from the transferred 2011 assets. These assets have only been in water company ownership for just over 10 years, therefore represents limited time to enable rehabilitation where required in such assets.

Our annual rainfall may also be a contributing factor to the flooding. Where rain occurs more frequently and when combined with the combined sewers, there is a greater chance of surcharge behind a blockage (than just dry weather flow). Higher annual rainfall occurs in the west of the region where we have the predominance of combined sewers. There is the potential though that annual rainfall can help to clear blockages that start to form as well, therefore its influence may not be as significant as other factors. This may typically be due to having a greater depth of surcharge that helps to clear a blockage and prevent external sewer flooding, compared with internal sewer flooding in cellars, that have a limited surcharge depth before flooding occurs. Hence it is difficult to conclude the effect that annual rainfall has on external sewer flooding.

Our performance over the last 5 years has benefited from minimal severe rainfall events falling in urban areas which can lead to 100s of properties flooding externally.

### 23.5.3 Previous investment that influences our current performance

We have driven our approach and investment in external sewer flooding by also learning, adapting and adopting our work to deliver internal sewer flooding improvements. For example, adopting the principles we apply in our 'repeat hubs' that focuses on how we reduce repeat incidents. Our focus has been on creating visibility through sensors and inspection, improving our reaction times, sewer cleansing and targeted rehabilitation and reducing repeats.

**Gaining visibility through customer sewer alarms**

Based on the learning from research and pilot trials initially undertaken to drive a reduction in internal sewer flooding incidents, we are installing customer sewer alarms (CSA) in hotspot areas, driven by our CSA benefit model. By the end of this AMP, we will have 40,000 devices installed to reduce internal (where there is the greater focus due to it being a customer priority) and external sewer flooding.

The aim of the CSAs is to identify when a pre-emptive intervention is required and over what time period (the level of urgency). We know from our inspection data that blockages occur regularly in our high likelihood areas, but often self-clear. Using inspection by our teams supported by analytics (which will develop and improve overtime) we can start to identify where a blockage is forming and assign a response to the property. This may not be an instant response based on our understanding of the data. Using more sensors in the network is driving an organisational shift in how we deploy and react which is currently under review including how we triage, schedule.

**Local sewer inspection, cleansing and rehabilitation programme**

We commenced an inspection programme of local sewer inspection in and around our high likelihood external sewer flooding properties. These sewers were predominantly section 24 or transferred assets (from 2011) close to properties (over 50% of our external sewer flooding comes from 100 and 150mm mm diameter transferred assets). The inspection included:

- Recording details of the inspection including defects, sewer grade, sewer length,
- identifying if a blockage was present and if so clearing it, typically through sewer cleansing.

The defects were reviewed, and rehabilitation requirements determined and agreed, to form part of the ongoing rehabilitation programme. As part of our work, over the first three years of the AMP, we undertook 15,000 interventions which included dig-down repairs, gully replacement, lining (over 50% of works), root cutting and trap removal (to reduce internal and external sewer flooding).

To support local inspection, we have also been trialling and now mainstreaming the use of lateral cameras that to gain insight into the sewer network condition of laterals direct from the main sewer.

Along with local sewer inspection we have inspected mainline sewers in key areas, to understand if cleansing or repair is required. This targeted over 100km per year typically (across pollution, internal and external sewer flooding). This is a continual programme, which will be revised as we install more sensors in the sewer network.

**Evolving and improving our response to incidents**

As part of our modernisation programme, we reviewed our operational response to incidents (blockages and flooding). As part of this organisational review, we made the decision to bring the operational response inhouse. This gave us greater control to target and respond as required, e.g., to reduce our reactive times based on urgency and need. Our proactive and pre-emptive work is delivered by our in-house teams and supply chain. Our rehabilitation work is delivered by our supply chain.

A key focus of our recent work has been to reduce the likelihood of repeat incidents occurring at a single property, particularly within a short space of time. We applied a renewed focus, driven through our 'repeat hubs' that develop our thinking and learning through to resolving an incident in one visit, and organise follow on work as soon as possible. We continue to work in this area to

strive for improvement. The number of repeat flooding incidents have reduced significantly already as outlined in section 23.5.2.

## 23.6 Setting the target

### 23.6.1 Our approach to setting the target

The 2024/25 (end of AMP7) bespoke target for this Performance Commitment is 5675 incidents equating to 24.37 external sewer flooding incidents per 10,000 sewerage connections. Yorkshire Water is forecasting to perform better than this, with our performance expected to be at 18.07 incidents per 10,000 sewerage connections.

Ofwat intends to set a common performance commitment level (PCL) for companies in relation to ESF at PR24.[37] However, the Yorkshire region faces unique regional circumstances that mean we are in a more difficult position to meet the same target as other companies, with Ofwat's expected cost allowances. Given that Ofwat have not yet set out the common PCL for ESF at PR24, we are not able propose an adjustment to this common level. Instead, we are proposing an ESF target for Yorkshire Water of 18.61 incidents per 10,000 sewer connections, which reflects the unique challenges that our network faces.

Our target has been set by carefully considering:

- the stretch achievable by investment proposed within our base plan,
- our current performance, the industry comparative levels of performance and
- the outcome of econometric modelling activity that accounts for exogenous variables that impact on our performance levels.

Our approach to reduce external sewer flooding is based on creating enhanced visibility of system performance, response, customer engagement and continual improvement in asset health. There will be a focus on transferred assets which form over 50% of our flooding problems. A glide path is shown in our forecast numbers as we roll out the interventions in a sustainable programme during the AMP. There is benefit in this approach also to adopt learning as it arises and adapt appropriately. We outline how we will achieve this target in “Our plans to deliver this commitment” below.

Interventions will take time to roll out, which is reflected in the glide path from our AMP8 entry point. Firstly, through a significant sensor programme (which also requires enabling works where access is poor) in and around properties and in the main sewer. Secondly through inspection and rehabilitation of sewers in poor condition, along with targeted operational management e.g., removal of silt through the visibility programme. The impact of this approach will result in a decline in our customers experiencing sewer flooding over time.

Ofwat identifies practicality, affordability or customer support as valid reasons that a common level of performance is not justified. Activity to make our exogenous factors align with the industry average would not be practical or affordable. Replacing our combined sewers with separate systems would cost billions and not be achievable in any reasonable timescale. We therefore believe that it is in customers interests to adjust the target which is demonstrably stretching for a company with our characteristics.

### 23.6.2 Defining the need for a adjusted PCL for external sewer flooding based on econometric modelling

As set out in our main document “*Adjustments to Common Performance Commitment Levels (PCLs)*”, we recognise the benefits to Ofwat and customers in being able to directly compare company performance, and support this where a fair comparison between companies can be made. However, we remain concerned that setting some PCLs at a common level does not allow this fair comparison. Ofwat recognises in its econometric cost models that not all companies are the same, reflecting this in some of the variables, but not when setting common PCLs. Without accounting for these in setting PCLs some companies are benefitting from a favourable set of factors and others are being overly stretched.

[37] ‘Appendix 9: Setting expenditure allowances.’ Ofwat (December 2022); Table 4.1.

If Ofwat uses its PR19 approach to set common comparative PCs at an UQ level, our interventions set out in our plan will not be sufficient. This is down to the effect of key exogenous drivers that make us different to the majority of companies driving this UQ. We engaged our economic advisors (Economic Insight) to explore these drivers using an econometric modelling framework. This activity demonstrates that the percentage of Combined Sewers significantly impacts relative performance across the industry and allows us to estimate the expected performance level of a company with our unique regional circumstances. As explained below, our analysis indicates a normalised target for a company with YW's characteristics would be between 18.6 and 21.4 ESF incidents per 10,000 properties per year at the end of AMP8.

Whilst it may intuitively look like there is an overlap with this claim and the evidence provided for adjusting our costs related to percentage of combined sewers, we do not consider this to be the case.

The cost models are built on historic expenditure data which is independent of relative company performance and therefore solely reflect the cost differences between companies at current (and historic) performance levels. Companies with high percentages of combined sewers see higher costs (accounted for in the cost models) as well as poorer performance (not reflected in the cost models).

The performance models adjustment therefore solely accounts for the observed performance differences between companies, independent of cost allowances.

Our econometric modelling is designed to fulfil four criteria:

- The model is founded on engineering and economic rationale.
- The input data accurately describes the determinants of performance.
- The model is robustly estimated.
- The results are appropriately applied to the regulatory issue.

The specific model detail is set out in the Appendices to this document (Section 23.15). We demonstrate that our modelling meets each criteria in turn below.

### 23.6.3 Founding the model on engineering and economic rationale

Our econometric models are based on solid engineering and economic rationale. This allows us to estimate the relative impact of key exogenous drivers on ESF performance. In particular:

- The model includes the key potential exogenous drivers of ESF discussed in section 23.5.2. These are: (i) combined sewers; (ii) rainfall; and (iii) FSE.[38]
- The model includes a linear time trend. As can be seen in **Error! Reference source not found.** the evidence indicates a slight downwards trend in ESF incidents across companies over time. We do not consider that this downwards trend is driven by the three exogenous factors, because these variables do not follow a trend over time. For example, the annual rainfall experienced by each company fluctuates from year to year, but does not clearly trend upwards or downwards over time. Hence, our model includes a linear time trend to capture this effect.

### 23.6.4 The input data accurately describes the determinants of performance

The input data employed in our modelling accurately describes the drivers in question. This allows us to robustly estimate their impact on ESF performance. Below, we discuss the data used in our analysis and the structure of our final data set.

[38] We do not include population density, terrain and surface water interactions or asset health (we consider that the drivers of external sewer flooding are similar to the drivers of internal sewer flooding) in our models. This is because: (i) population density is highly colinear with the percentage of combined sewers and is already included as a driver in Ofwat's cost modelling, leading to a risk of 'double counting; (ii) we do not have access to data on terrain and surface water in each wastewater region in each year; and (iii) asset health may be endogenous.

## Data sources

sources presents the data employed in our econometric models. It sets out: (i) the name of the variable; (ii) its purpose in the modelling; (iii) the source of this data; and (iv) any further calculation notes.

### Table 94 Econometric model data sources

| Variable | Purpose | Source | Notes |
|---|---|---|---|
| **Number of ESF incidents** | Dependent variable | Ofwat Historical Performance Trends for PR24 v2.0<br><br>Annual Performance Report 2022/23 | This variable is normalised by the number of connected wastewater properties (10,000s).<br><br>We take the natural logarithm of this variable for the econometric models. |
| **Length of combined sewers** | Independent variable | PR24 Cost Assessment Master Dataset, Wholesale Wastewater Base Costs<br><br>Annual Performance Report 2022/23 | This variable is normalised by the total length of sewers in the network and presented as a percentage.<br>We describe our method of calculating this in 0. |
| **Annual urban rainfall** | Independent variable | CEDA HadUK-Grid - Gridded Climate Observations on a 1km grid over the UK, which is created by the MetOffice | Annual urban rainfall was calculated for each Middle Super Output Area (and if it has an urban runoff component using the methodology taken by Ofwat[39]) to give more representative reflection of where annual urban rainfall occurs and the impact it has in our region. |
| **Number of FSEs** | Independent variable | Density of fast food outlets in England, PHE | This variable is normalised by the number of connected wastewater properties (10,000s). |
| **Length of sewer network** | Normalisation factor | PR24 Cost Assessment Master Dataset, Wholesale Wastewater Base Costs<br><br>Annual Performance Report 2022/23 | |
| **Number of connected wastewater properties** | Normalisation factor | PR24 Cost Assessment Master Dataset, Wholesale Wastewater Base Costs<br><br>Annual Performance Report 2022/23 | |
| **PCL of ESF at PR19** | Charts | Yorkshire Water | This variable is normalised by the number of connected wastewater properties (10,000s). |

[39] Urban rainfall calculations - Ofwat

| | | | |
|---|---|---|---|
| **Forecast PCL of ESF at PR24** | Charts | Yorkshire Water | This variable is normalised by the forecast number of connected wastewater properties (10,000s). Our method of forecasting the PCL is set out in 0. |

*Source: Yorkshire Water.*

### Data structure

We construct an industry wide panel data set of 10 wastewater companies over the period 2016/17 to 2022/23. We combine data for Severn Trent and Hafren Dyfrdwy in line with Ofwat's base cost model methodology at PR24.[40] ESF data is not yet available for Thames Water in 2022/23 (only up to 2021/22). This yields a total of 69 data points in our econometric models.

### 23.6.5 The model is robustly estimated

We have tested the robustness of our models to different specifications and find that they pass relevant statistical tests. This allows us to have confidence in our modelling results. Below, we discuss: (i) the specification of our econometric models; and (ii) the results of our modelling.

### Specification

We have created seven model specifications and estimate each using both Ordinary Least Squares (OLS) and Random Effects (RE). The seven model specifications use the natural logarithm of ESF incidents per 10,000 connected properties as the dependent variable. The independent variables of each of the seven model specification are as follows:

- **Model 1:** Percentage of combined sewers.
- **Model 2:** The natural logarithm of annual urban rainfall.
- **Model 3:** The natural logarithm of normalised FSEs.
- **Model 4:** Percentage of combined sewers, the natural logarithm of annual urban rainfall, and the natural logarithm of normalised FSEs. This encapsulates all variables included individually in models 1 to 3.
- **Model 5:** Percentage of combined sewers and a linear time trend. This is equivalent to model 1, with the addition of a linear time trend.

We do not have a strong preference between the OLS and RE modelling approaches (and, as shown in 0, they yield very similar results in any case). Of the five model specifications set out above, our preferred model is Model 5, which excludes FSE and annual urban rainfall but includes the time trend. This is because:

- **The inclusion of FSE in the model is problematic for the robust estimation of the effect of the other variables of interest.** The number of FSEs is highly colinear with the percentage of combined sewers. This means that it is hard for the model to disentangle the effect of this variable from the effect of FSE. This collinearity appears to be the cause of the stark change in coefficients in model 4 relative to models 1-3 (as shown in 0). We consider that it is more appropriate to include the percentage of combined sewers, rather than just FSE, because publicly available data on number of FSEs is only available for 2018. This means that our model assumes that FSEs are constant over time. Due to the negative impact of the Covid-19 pandemic on the hospitality industry, the robustness of this assumption is somewhat weakened. By contrast, we have data on the percentage of combined sewers for every year included in the analysis.
- **The statistical relationship between annual urban rainfall and ESF does not correlate and aligns with the uncertainty from an engineering perspective** We find that in line with engineering rationale, annual urban rainfall is negatively correlated with ESF (with a correlation coefficient of -0.34). Therefore we do not include annual urban rainfall in our preferred model.

[40] Please see: https://www.ofwat.gov.uk/wp-content/uploads/2023/04/Econometric_base_cost_models_for_PR24_final.pdf

- **It includes a time trend.** As described above, the evidence indicates a downward trend in ESF incidents across the industry, which is not captured by the other variables in the model (which do not trend over time). It is important that our models are able to explain this trend.

It is unclear whether the exclusion of FSE and annual urban rainfall from our preferred model results in an under- or over-estimation of our adjusted PCL. More specifically:

- The exclusion of FSE and annual urban rainfall from our preferred model may mean our estimated adjusted PCL is a conservative estimate. This is because Model 5 only captures the effect of one of the three exogenous factors which interact through the mechanisms set out in 23.5.2 to affect our ESF performance.
- The exclusion of this variable may also cause an omitted variable bias in the estimation of the remaining coefficients (i.e. the percentage of combined sewers). However, it is not clear how this bias would affect the estimation of our adjusted PCL.

**Results**

The results of our econometric modelling are presented and discussed in detail in 0. Our preferred model specification (Model 5) indicates that the proportion of cellared properties is a material driver of ESF performance. Our other models indicate that FSE is also an important driver of ESF performance.

### 23.6.6 The results are appropriately applied to the regulatory issue

We apply the results of our econometric models to estimate an adjusted PCL which reflects our unique regional circumstances. Below, we discuss: (i) our approach to calculating this adjustment; and (ii) the results of our calculations.

**Methods**

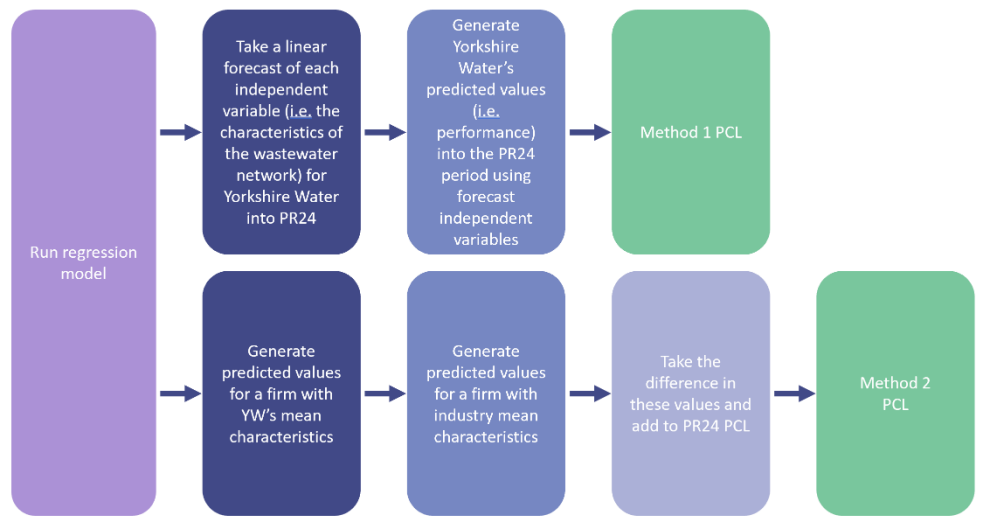
We employ two methods to estimate an adjusted PCL which reflects the unique regional challenges that our network faces.

- **Method 1:** Estimate a unique PCL for Yorkshire Water directly from the econometric model, using the model's predicted values for Yorkshire Water. In order to get model predicted values that continue through PR24 (as the data for the models' independent variables only exists up to 2022/23), we take a company-level linear forecast for each independent variable over the PR24 period.
- **Method 2:** Rather than estimating the PCL directly, this method estimates an adjustment or 'uplift' to the common PCL for Yorkshire Water. This uplift is calculated as the difference between the model's predicted values for Yorkshire Water's and the model's predicted values if we had the characteristics of the hypothetical average firm (in other words, if we had the average value of each of the model's independent variables). This uplift is added to the common PCL for ESF[41] to get the adjusted PCL for Yorkshire Water.

The figure below illustrates how these two methods stem from the regression model.

[41] The calculation of this forecast of the ESF PCL into PR24 is explained in 00

### Figure 70: Two methods for estimating adjusted PCLs for Yorkshire Water

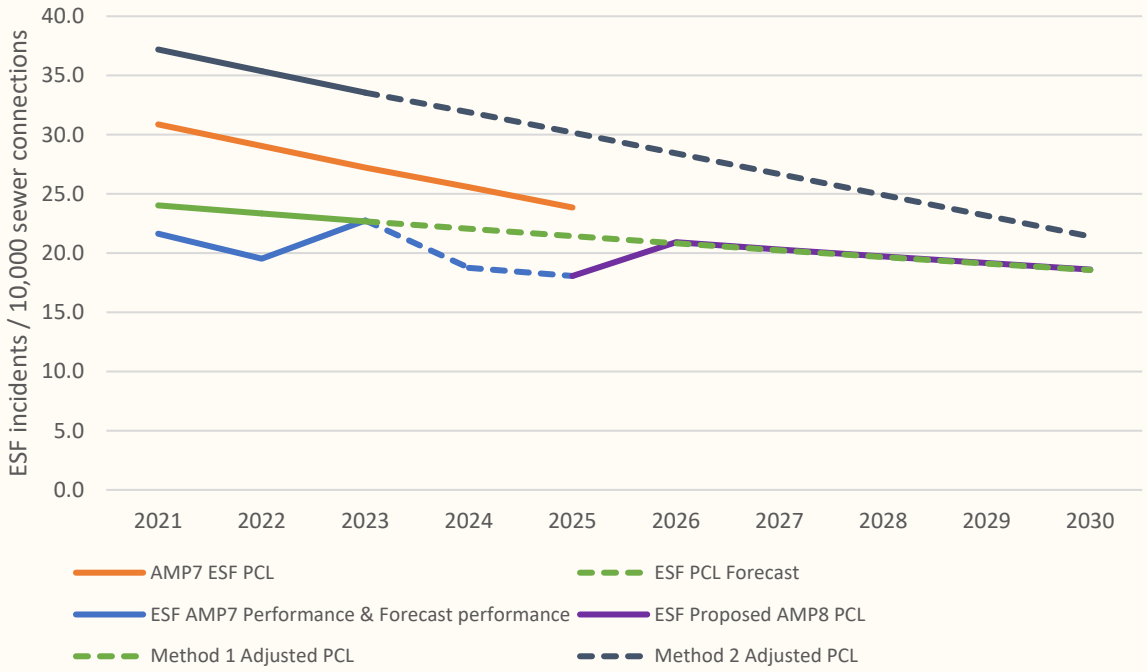



Source: Economic Insight Analysis / YW

## Results

The results of our adjustment calculations are presented and discussed in detail in 0. Using our preferred model specification (Model 5, for both OLS and RE), the results indicate that we should receive a PCL of between 18.6 and 28.4 ESF incidents per 10,000 properties per year by year 5, to account for our unique regional circumstances. These results can be seen in Figure 71.

### Figure 71: Model 5 (RE) estimated adjusted PCLs for Yorkshire Water




## 23.7 Setting our performance commitment level

Table 96 provides both the industry and company actuals and forecasts for the external sewer flooding performance commitment for both AMP7 and AMP8 , as well as the PR19 final determination for this performance commitment. Our AMP8 PCL is based on our econometric

modelling using Method 1, which determines an expected level of performance for a Company with our regional factors.

**Table 95: Industry and company actuals and forecasts and PR19 final determination for external sewer flooding**

| Number of external sewer flooding incidents per 10,000 sewer connections | AMP7 | | | | | AMP8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2020 /21 | 2021 /22 | 2022 /23 | 2023 /24 | 2024 /25 | 2025 /26 | 2026 /27 | 2027 /28 | 2028 /29 | 2029 /20 |
| **PR19 final determination** | 30.87 | 29.24 | 27.62 | 26.42 | 24.37 | | | | | |
| **Company actuals, *arithmetic forecast and business plan proposed targets*** | 21.63 | 19.52 | 22.75 | ***18.75*** | ***18.07*** | ***20.92*** | ***20.30*** | ***19.72*** | ***19.16*** | ***18.61*** |

For this performance commitment we propose to further improve through AMP8 when compared with our PR19 final determination target. We propose a starting level of 20.92 external sewer flooding incidents per 10,000 sewer connections in year 1 of AMP8, improving to 18.61 external sewer flooding incidents per 10,000 sewer connections by the end of AMP8. This would be a 9% in AMP improvement and a 20% improvement when compared to our Year 5 AMP7 PCL.

We recognise that our entry point to AMP8 is greater than our ambitious exit forecast for AMP7. This is primarily because it is fair and appropriate that our targets reflect the regional circumstances we face as outlined in sections 23.5.2 and 23.6.

## 23.8 Our long-term ambitions

Our LTDS is to continually reduce external sewer flooding, to no more than 8.61 in AMP12, which is an improvement AMP on AMP. This represents and recognises the difficulty currently in knowing where a blockage forms (even when asset health is good) and our regional circumstances. Our LTDS outlines the core and alternative adaptive pathways we are using to define our future strategy for delivery.

**Table 96: Our long-term ambitions**

| Units | AMP8 | AMP9 | AMP10 | AMP11 | AMP12 |
|---|---|---|---|---|---|
| **Number of incidents per 10,000 sewer connections by end of AMP** | 18.61 | 12.04 | 10.85 | 9.71 | 8.61 |

Our approach in AMP8 focusing on visibility, response, and asset health improvements, will continue through the AMPs. We anticipate that how this is achieved will evolve with innovation through major research programmes, our own research and learning from others through collaboration.

Our LTDS plans to target the reduction of modelled flood risk from AMP9 onwards, which will help to reduce the likelihood of external sewer flooding. To do this, in-line with our approach in the DWMP and other non-flooding drivers, e.g., storm overflows, we will need to remove surface water from our drainage networks. A key part to this approach being successful is our work in partnerships, which we are continuing to do in AMP8, and will grow in AMP9. Our work with Living with Water provides a more detailed blueprint of what is needed with our 25-year Blue-Green Plan in our highest flood risk area Hull and Haltemprice, where improving resilience is critical.

Against the current definition, there is the risk, that a severe rainfall event, could lead to 1000s of properties flooding in any given year (e.g. as seen in 2007). Whilst we have a long-term plan to

increase flood resilience in Hull through Living with Water for example, it is possible that our performance is affected by such rainfall events that could fall anywhere across the region, whereby it exceeds the capacity of the sewer system. The latest evidence points to greater extremes in rainfall which creates a greater risk of flooding. The paper highlights that extremes will become worse in the North of England.

Read more about this at
**New extreme rainfall projections for improved climate resilience of urban drainage systems**

## 23.9 Social and Environmental Benefits

Reducing external flooding provides a societal benefit by:

- Customers not experiencing the onset of flooding
- Not going through a clean up operation
- Not having to have a property repaired
- Not having to leave the property whilst repairs are made, potentially being out of the property for months
- Not having the psychological fear or concern of flooding happening again

Where water escapes on the highway, this can cause wider disruption (although this is not a measure in the performance commitment). Preventing external flooding also creates an environmental benefit by not creating a pollution risk by water running overland and either infiltrating into the ground or finding a pathway to enter a receiving water body.

## 23.10 Our plans to deliver this commitment

We are taking a blended approach of operational and capital interventions, reliant on building and creating ever better data to support decision making. Our overarching investment plan for external sewer flooding in AMP8 focuses on three key areas which are:

- Visibility and inspection - understanding where the performance in the sewer network is impacted by customer disposal habits, asset health and rainfall to make capital and operational decisions, including the type and timing of response. We achieve this through our sensor roll out programme and insight work.
- Operational response – providing the appropriate response and decision making to the visibility required by the sensors installed. These may be physical interventions on the sewer e.g. to cleanse the sewer to remove a partial soft blockage or silt deposition through to our customer behavioural targeted campaigns.
- Rehabilitation – where the asset health is identified as requiring attention, taking a predominantly proactive approach to network improvements such as lining, robotic cutting and gully replacement.

We will deliver these through organisational improvements, data confidence, innovation and on the ground interventions:

### 23.10.1 Organisational delivery approaches

We launched our transformation approach, Wastewater Networks 2.0 in early 2023. The aim of this transformation is to make significant quality and productivity improvements to our end-to-end customer journey for wastewater. This includes how we plan and schedule our work baskets, both through validation of the work required and prioritisation, using informed and evolving triage processes. As part of this improvement, we are developing our Unified Operations Centre concept. Its aim is to provide a platform that brings multiple disparate systems together (e.g. telemetry, asset data in a spatial form, weather) and provide a user interface to view all critical information together in one view. Once the concept is proven and tested (currently ongoing) we plan to roll out across the region.

The journey for improvement is also factoring in how we plan and respond to the growing number of CSAs and main sewer sensors. This will evolve our service to shift more to pre-emptive interventions in a timely manner rather than reactionary which typically relies on the customer to inform an incident has occurred. As our analytics of the sensors and our

fundamental understanding evolves, we will evolve the service offering and how we are organised to deliver pre-emptive and operational intervention.

Our transformation applies throughout our end-to-end process for the customer, starting with our contact centre. We have a targeted up-skilling programme to provide greater content knowledge and awareness of the customer challenges to in turn drive the right level and type of response. This includes providing greater 'on-the-floor' support with experienced team members who can review and support our customer centre staff. We will also be more reliant on digital interaction with our customers, so we have greater evidence and also help direct what our first response needs to be (e.g. identifying the right machine and crew dependent on the problem, the access requirements etc).

Organisationally we are also targeting the reduction in "private" jobs to target those that we are directly responsible for. We see this as important to ensure our resources are addressing our customer needs. This starts in our customer centre but will be backed up more and more through innovation such as determining private vs public sewers and hybrid mapping of unknown assets.

### 23.10.2 Driving data confidence and visibility

Our success will in part be dependent on the data and analysis we perform on what we receive from the sensors we are planning to install. The data we have will provide us with a companywide situational awareness view, that we can build investment decisions on, prioritising based on a wide range of factors.

We are developing the platforms and protocol to provide us with the long-term situational awareness required. With so much data, and the need for validation of the data and insight to inform decision-making, this is critical. We will have the ability to analyse the data through a machine learning / artificial intelligence approach. We will critically align the data received from sensors to validate it with nearby sensors and other available data (e.g. weather) to improve the confidence and understanding. We have already developed approaches that enables us to identify blockages forming, and these will continue. We are currently trialling such approaches with our SMART pilot, working with partners (Stantec and StormHarvester) that is analysing multiple sensors in one of our internal sewer flooding hotspots in Leeds (along with other interventions in the trial) that will be transferrable to external sewer flooding.

Our sensors will provide the visibility in the main sewer and on the property level. The locations will be targeted based on risk of flooding (and recognising there is interaction between some internal and external sewer flooding locations). The analysis will derive when we need to attend site e.g. to remove silt, optimising our cleansing programmes to ensure they offer the maximum value.

### 23.10.3 Driving improvement through innovation

Innovation will support our transformation to continue to drive efficiency along with reducing the likelihood of external sewer flooding. Our focus is on digitalisation, rehabilitation, smart control and analytics.

**Digitisation and field systems**

We are testing new approaches that will digitalise, capture and share data and information back to our platform. For example, using the V scout to capture high precision data through to using an i-pad to undertake scans of inspection and manhole chamber.

We are trialling ESRI field maps to capture and update our systems automatically to provide greater knowledge of the local sewer network in and around properties (often not mapped). Such information is critical for our operational teams visiting site and critical to understand intervention choices, including at the customer contact centre as well as scheduling).

We will auto code CCTV data, including laterals, that are difficult and slow to camera (using the lateral camera). This approach reduces significant time in coding large amounts of data and will enable us to target with greater certainty where defects need to be addressed in the future, confirming long term investment needs and having the pipe history tagged and geolocated.

We are trialling the hybrid mapping of sewers to provide better insight on the location of drainage systems in and around properties (typically the transferred assets). Such information

will support our planners scheduling and operatives undertaking work. This information will also be of benefit as we update our hydraulic sewer models.

**Rehabilitation**

We are undertaking rehabilitation trials that will improve the speed, quality and cost of lining small diameter sewers. Our spray lining trials have the potential to swiftly improve asset health where structural lining is not required.

We are also supporting the work undertaken on major research programmes such as Pipebots (Pipebots). This research provides the potential for small robots to move autonomously through a network identifying issues to inform where an intervention may be required.

**Smart control of the sewer system**

We are trialling the use of smart water butts to optimise when the storage should be empty and when it is safe for the contents to be available for customer use. This technology is applicable to residential if we can drive the costs down and is particularly of value on non-residential premises where there is the potential for larger storage to manage runoff from larger roofs.

We are currently piloting approaches to maximise the use of storage in the drainage network to reduce hydraulic flooding and overflows. Our active system control pilot with Stantec and Siemens is determining the protocols of where to apply active system control to utilise our existing assets as well how us maximise the use of new assets (grey and blue-green). Successful desktop testing will lead to full scale trials.

**Analytics**

Having learnt from the roll out, data analysis and platform requirements from successful sensor trials earl in the AMP, we continuing to develop the analytics and platforms to analyse sensors.

For our sensors in the sewer and our customer sewer alarms where we currently analyse data on a daily basis we will be moving to automated analysis and in the future, automated scheduling. We plan to roll out a large programme of CSAs and main sewer sensors in AMP8, therefore being ready for this deployment is key. To that end we are also undertaking our Smart Wastewater Network Pilot, which is targeting a key external sewer flooding hot spot in Leeds.

Here along with sensor deployment, and understanding the condition of our assets to high detail, we are combining all the data together and working with our partners Stantec and Stormharverster to analyse and identify where interventions are required using machine learning approaches and data validation with neighbouring sensor data.

### 23.10.4 Interventions in the field to achieve the performance commitment

We will deliver this reduction in external sewer flooding to properties through a combination of interventions, which build on the learning and application of work through this AMP. We summarise these interventions below.

We will deploy more **customer sewer alarms**, combined with our revised operational response to reduce external sewer flooding in high-risk areas. In AMP7 we will have circa 40,000 CSAs deployed, and our intent in AMP8 is to increase this to circa 200,000 in total. This will provide visibility to some of our most high-risk locations. This will continue to be a gradual roll out year on year to continue to provide learning to how we prevent incidents and enable future structured replacement programmes for sensors. Along with the CSAs, we will be deploying **main sewer sensors** as well (circa 68,000), targeting locations where external sewer flooding locations are as well as known operational issues that may contribute to external sewer flooding.

Enabling the success of CSAs and main sewers sensors is the **analytics** outlined above to determine when to intervention. This may be proactive activities, cleansing the sewer to remove silt through to pre-emptive jetting to remove forming blockages. The insight from the CCTV inspection and coding, will provide the detailed evidence base for future rehabilitation decision making.

Critical to the success is the timely operational response as result of capacity reducing issues forming such as soft blockages and siltation. Our transformation activities are planned to provide us with the flexibility to adapt to pre-emptive, proactive and reactive interventions, based on the data received from our CSAs and main sewer sensor. Our work to improve how we schedule and manage crews and the basket workload will enable us to be agile in our future ways of working and respond to sensor alerts -whether there are potentially several days to respond or whether a “blue-light” intervention is required within 2 hours.

Where we respond and find more serious defects that require a swift intervention, we are putting in place the mechanisms to enable a first fix fast track civils repair intervention to further avoid repeat incidents.

In support of our inspection approaches we are using the wider breadth of inspection techniques such as CCTV and radar to undertake and record the sewer investigations in the high-risk areas.

We aim to build on the significant investment proposed in behavioural campaigns towards the end of this AMP focused on changing people’s habits of what they dispose of via the sewer system whilst learning from industry work (e.g. UKWIR’s Learning and recommendations from customer behaviour campaigns on blockage reduction project). Our campaigns will take a balanced approach targeting high likelihood of flooding areas along with regional campaigns. Critically we will look to understand and record the impact of these campaigns, along with other interventions to support future decision making.

We will continue and grow our partnership working to increase flood resilience. Whilst this will become a growing focus in AMP9, we are proposing partnership funded investment in Hull and Haltemprice using the knowledge of the Blue-Green Plan created this AMP. Furthermore, there is the potential through the overflow programme where we remove surface water to reduce flooding and create wider benefits.

#### 23.10.5 Risks to delivering this PC

The full implementation of our suite of interventions is based on the base TotEx in our plan being allowed, which includes the additional costs reflected in our Cost Adjustment Claim related to Combined Sewers.

Achieving the PC will also be dependent on the acceptance of our Performance Adjustment Claim which considers the regional circumstances we face.

The number of severe rainfall events are minimal, as these are no longer excluded in the definition of the PC (whereas in AMP6 and before they were). A severe rainfall event has the potential to cause more flooding in a single event than the performance commitment level set.

## 23.11 Our incentive to deliver

### Table 97: External Sewer Flooding Incentives

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Outperformance and underperformance payments |
| **Price control allocation** | 100% wastewater network plus |
| **ODI rate** | £4.62 million per incident per 10,000 sewerage connections |
| **Outperformance payment- standard** | £4.62 million per incident per 10,000 sewerage connections |
| **Outperformance payment- enhanced** | £9.24 million per incident per 10,000 sewerage connections |
| **Underperformance payment - standard** | £4.62 million per incident per 10,000 sewerage connections |
| **Timing of underperformance and outperformance payments** | In-period |

## 23.12 Performance Possibilities

Please see Chapter 9 of our main business plan: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9 of our main business plan: Risk & Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

## 23.13 Deadbands

Deadbands do not apply to this PC.

## 23.14 Cap/Collars

The PR24 methodology for developing the business plan suggests that Ofwat do not intend to set caps and collars for this PC.

## 23.15 Supporting evidence to econometric modelling

### Appendix A: Financial consequences of our PAC

In this Appendix, we present the estimated financial consequences of Ofwat not recognising our claim; these financial consequences are material. Below, we present: (i) our approach to estimating the financial consequences of our claim; and (ii) the results of this estimation.

#### Approach

We estimate the financial consequences of our claim as the financial penalties we would incur across PR24, if our unique circumstances in are not accounted for. This is calculated by multiplying our estimated PCL uplifts[42] (which are discussed in section 23.6.2 and presented in 0) by the ODI rate that Ofwat have indicated for Yorkshire Water at PR24.[43] This rate is £ 4.62m per ESF incident per 10,000 properties. The fact that the ODI rate is symmetrical and linear means that the value of the claim is the same, regardless of our actual performance level.

#### Results

[42] The uplift is the difference between our forecast PCL for ESF and our adjusted PCL. The details of how the forecast PCL is calculated are presented in 0.

[43] These were shared with us by Ofwat.

Table 99 presents the estimated financial penalties we would incur over PR24, if we were to perform at the level suggested by each of the two adjustment methods discussed in section 23.6.6, but our target was the common PCL. These estimates are based on our preferred model specification (Model 5), for both OLS and RE. As can be seen, we would incur penalties (relative to our proposed adjusted PCL) in the region of £25.4m to £146.1m across PR24, if our unique circumstances are not accounted for.

### Table 98:Estimated financial consequences of non-PC adjustment over PR24

| Year | Method 1 | Method 2 |
|---|---|---|
| **Model 5 (OLS)** | £38.5m | £142.0m |
| **Model 5 (RE)** | £25.4m | £146.1m |

*Source: Economic Insight / YWE.*

## Appendix B: Calculating the percentage of combined sewers in each network

In this Appendix, we explain how we calculate the percentage of combined sewers in each network. This is required because Ofwat data does not break down formerly private sewers by sewer type. In addition, we set out a method of testing the sensitivity of our results to assumptions on the proportion of foul sewers that are also combined.

Existing Ofwat data on the length of sewers in each wastewater company's network includes the following elements.

1. Length of foul (only) public sewers (in km).
2. Length of surface water (only) public sewers (in km).
3. Length of combined public sewers (in km).
4. Length of rising mains (in km).
5. Length of other wastewater network pipework (in km).
6. Total length of legacy public sewers as at 31 March (in km).
7. Length of formerly private sewers and lateral drains (s105A sewers) (in km).

Where items 1 to 5 sum to form item 6.

However, we want to remove the total length of surface only sewers from the measure of total sewer length, because the vast majority of flooding incidents occur from the foul and combined sewer. In other words, we want to calculate the total percentage of combined sewers in each company's wastewater network as the following:

$$\frac{Total\ km\ of\ Combined\ Sewers\ (Private\ and\ Public)}{Total\ km\ of\ Sewers\ (Private\ and\ Public) - Total\ km\ of\ Surface\ Sewers\ (Private\ and\ Public)}$$

The Ofwat data, in its current form, is inadequate for the calculation above because it does not break down the length of formerly private sewers (item 7) by sewer type (foul, surface water, combined, etc.) in the same way that it does for public sewers (see items 1 to 5). Thus, we are unable to add the total length of private combined sewers to the denominator, and we are unable to subtract the total length of private surface sewers from the numerator. We therefore estimate the length of legacy private combined and surface sewers in the following way.

- Firstly, we calculate the ratio of lengths of sewer types for public sewers in the oldest year of data available (2011/12) for each wastewater company.
- Secondly, we multiply the length of legacy private sewers (which is fixed) by this ratio. This gives the estimated length of each legacy private sewer type for each wastewater company.

We also test the sensitivity of our Model 5 to also including a subset of foul sewers in the total length of combined sewers. We do this because some foul sewers also take surface water, making them combined sewers. These foul sewers carry a proportion of the runoff generated in the area, with the remaining carried by the surface water systems, we test the sensitivity of our results to assuming 25% or 50% of foul sewers are combined (the baseline model assumes 0%). We find that our results are somewhat sensitive to these changes, finding that that

combined sewers have a greater effect on ESF than they would if foul sewers were not included in the length of combined sewers.

## Appendix C: Forecasting the common PCL for ESF at PR24

In this Appendix, we explain how we forecast the common PCL for ESF at PR24. This is required because Ofwat have not yet provided an indication of the common PCL for ESF at PR24.[44]

In order to estimate the predicted PCL for ESF at PR24, we calculate it as a linear continuation of our bespoke PCL for ESF at PR19.

## Appendix D: Model and adjusted PCL results

In this Appendix, we present the results from our econometric modelling and our estimated adjusted PCL, which are discussed in section 23.6.2 and 23.6.5.

**Econometric model results**
Table 100 and Table 101 present the results from the seven model specifications discussed in section 23.6.5, for OLS and RE. We make the following observations on these results:

- **Percentage of combined sewers.** The percentage of combined sewers in a wastewater company's network typically has a statistically insignificant but material relationship with the number of ESF incidents that wastewater companies' customers experience in any given year. The models show that a percentage point increase in the percentage of combined sewers is associated with a 0.8 % to 1.2% increase in normalised ESF incidences.[45]
- **Annual urban rainfall.** Annual urban rainfall has a somewhat statistically significant but material relationship with the number of ESF incidents that wastewater companies' customers experience in any given year. The models show that a 1% increase in annual urban rainfall is associated with a -0.3% to 0.0% change in normalised ESF incidences.[46] We note that the negative relationship that this variable has with ESF is not in line with the engineering rationale.
- **FSEs.** The number of FSEs in a wastewater company's network has a significant and material relationship with the number of ESF incidents that their customers experience in any given year. The models show that a 1% increase in the number of FSEs is associated with a 0.3% to 1.0% increase in normalised ESF incidences.[47]
- **Robustness and statistical tests.** We find that, with the exception of Model 4, the coefficients of our models are robust to changes in specification. The R-squared of our models is reasonably high and the RESET test (for correct functional form) pass rate is relatively high, especially in the RE models.

### Table 99:Econometric model results, OLS

| Normalised ESF incidences, natural log | Model 1 OLS | Model 2 OLS | Model 3 OLS | Model 4 OLS | Model 5 OLS |
|---|---|---|---|---|---|
| **Percentage of combined sewers** | 0.011** | | | 0.008 | 0.011** |
| **Annual urban rainfall, natural log** | | -0.293 | | -0.276* | |
| **Normalised FSE, natural log** | | | 0.637 | 0.353 | |
| **Time trend** | | | | -0.024 | |

[44] Please see: https://www.ofwat.gov.uk/publication/pr24-final-methodology-appendix-7-performance-commitments/
[45] The interpretation of the coefficient is calculated as 100*(EXP(B)-1)%.
[46] The interpretation of the coefficient is simply taken as B%.
[47] The interpretation of the coefficient is simply taken as B%.

| | | | | | |
|---|---|---|---|---|---|
| **Constant** | 2.410*** | 5.198*** | 1.013 | 3.650*** | 2.504*** |
| **R-squared** | 0.347 | 0.125 | 0.091 | 0.411 | 0.349 |
| **RESET test** | FAIL | PASS | FAIL | PASS | FAIL |

Source: Economic Insight Analysis /Yorkshire Water.
Notes: Asterisks indicate statistical significance: *** for 1%; ** for 5%; and * for 10%. Standard errors are robust and clustered at the company level, in line with Ofwat's base cost methodology. RESET pass or fail is assessed at 5% significance level.

### Table 100:Econometric model results, RE

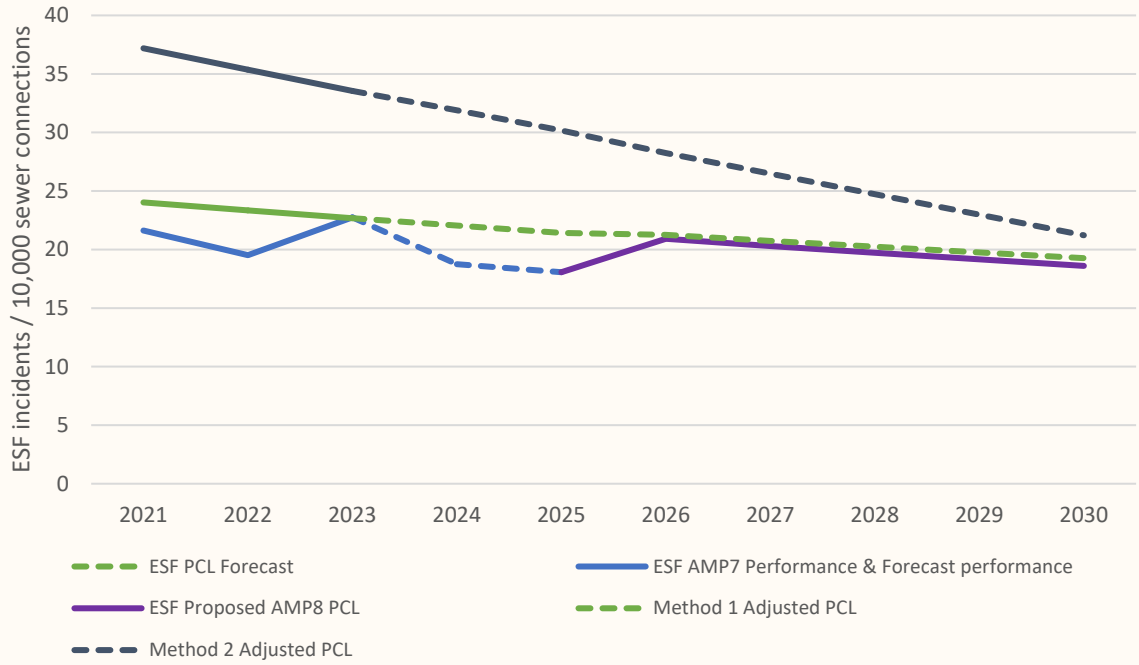
| Normalised ESF incidences, natural log | Model 1 RE | Model 2 RE | Model 3 RE | Model 4 RE | Model 5 RE |
|---|---|---|---|---|---|
| **Percentage of combined sewers** | 0.012** | | | 0.010 | 0.012** |
| **Annual urban rainfall, natural log** | | -0.027 | | -0.025 | |
| **Normalised FSE, natural log** | | | 0.962* | 0.304 | |
| **Time trend** | | | | | -0.028* |
| **Constant** | 2.380*** | 3.127*** | 0.027 | 1.749 | 2.499*** |
| **R-squared** | 0.356 | 0.138 | 0.104 | 0.348 | 0.368 |
| **RESET test** | PASS | PASS | FAIL | PASS | PASS |

Source: Yorkshire Water.
Notes: Asterisks indicate statistical significance: *** for 1%; ** for 5%; and * for 10%. Standard errors are robust and clustered at the company level, in line with Ofwat's base cost methodology. RESET pass or fail is assessed at 5% significance level.

## Adjusted PCL results

We apply the results from preferred model specification (Model 5) to the two adjustment methods discussed in section 23.6.6. The adjusted PCLs generated by the OLS model are shown in Figure 72 and in Table 101. The adjusted PCLs generated by the RE model are shown in Figure 73 and Table 102. As can be seen, we calculate a range of adjusted PCLs between 18.6 and 28.4 ESF incidents per 10,000 properties per year.

## Figure 72: Model 5 (OLS) estimated adjusted PCLs for Yorkshire Water



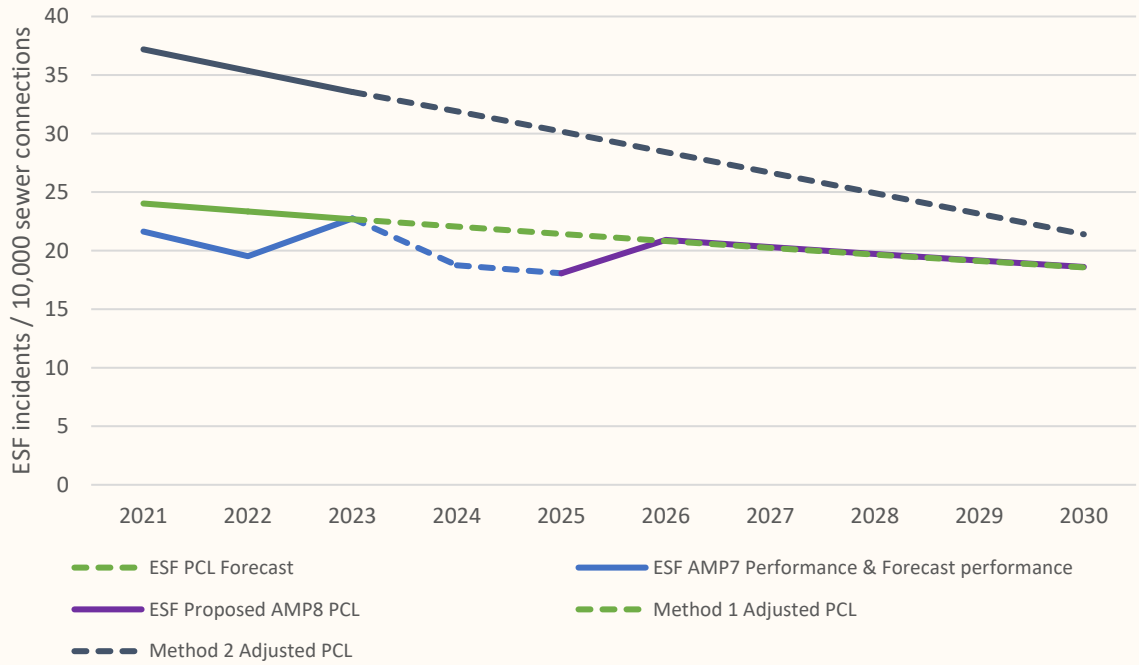

*Source: Economic Insight/Yorkshire Water.*

## Table 101: Model 5 (OLS) estimated adjusted PCLs for Yorkshire Water

| Year | Method 1 | Method 2 |
|---|---|---|
| **2026** | 21.3 | 28.2 |
| **2027** | 20.7 | 26.5 |
| **2028** | 20.2 | 24.7 |
| **2029** | 19.7 | 23.0 |
| **2030** | 19.3 | 21.2 |

*Source: Economic Insight/Yorkshire Water.*

## Figure 73: Model 5 (RE) estimated adjusted PCLs for Yorkshire Water



*Source: Economic Insight/Yorkshire Water.*

### Table 102: Model 5 (RE) estimated adjustments for Yorkshire Water

| Year | Method 1 | Method 2 |
|---|---|---|
| **2026** | 20.8 | 28.4 |
| **2027** | 20.2 | 26.7 |
| **2028** | 19.7 | 24.9 |
| **2029** | 19.1 | 23.2 |
| **2030** | 18.6 | 21.4 |

*Source: Economic Insight/Yorkshire Water.*

# 24. Internal sewer flooding

## 24.1 PC Type

Customers receiving excellent service everyday

## 24.2 Performance targets

**Table 103: Committed performance levels**

| PR24_ISF | Units | Committed performance levels | | | | |
|---|---|---|---|---|---|---|
| | | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 |
| **Proposed AMP8 PCL** | **Number of incidents per 10,000 sewer connections** | 2.20 | 2.13 | 2.08 | 1.91 | 1.76 |

## 24.3 Summary

This Performance Commitment (PC) focuses on how we are protecting our customers from internal sewer flooding, targeting a year-on-year reduction and improvement in service. It measures the number of sewer flooding incidents within customer properties due to other causes and overloaded sewers (hydraulic flooding) due to severe weather events. Any flooding events for which the responsibility lies outside the company's statutory functions are outside the parameters of the PC and thus are excluded, e.g., coastal flooding, fluvial flooding[48]. This Performance Commitment is normalised "per 10,000 sewerage connections".

This is a continuation into PR24/AMP8 from the Internal Sewer Flooding AMP7 common PC where a common upper quartile target was set requiring us to improve service by circa 70%. We have redirected significant proportions of our TotEx allowances since 2018 to drive improvements in this PC and have improved year on year. It is the regional differences between YW and other companies that now explain our relatively poor comparative position and we provide evidence to support this.

Based on the regional factors we face we are proposing an adjusted target which is based on our strong engineering and economic rationale. We have identified the key factors that influence performance including the percentage of combined sewers, the number of cellars and annual rainfall to develop the model. This model and engineering rationale clearly indicates why a PCL based on industry averages or upper quartile is not appropriate.

Our analysis indicates that an appropriate target for the end of AMP8 a company with our characteristics would be between 1.96 and 3.44 ISF incidents per 10,000 properties per year (depending upon the modelling approach taken). We recognise though the importance of internal sewer flooding to our customers, it being in their top three priorities. Therefore, we propose a stretching target of 1.76 at the end of AMP8.

Investments proposed in our PR24 Business Plan that contribute towards the performance level for this PC are also expected to affect the PCs of External Sewer Flooding and Sewer Collapses. We are targeting the continued improvement in our performance by using digital technologies, creating visibility and insight into the sewer network performance through sensors and inspection, creating the right response operational (e.g. quick response to a forming blockage) and capital response (e.g. sewer rehabilitation), and driving improvements in how we work as an organisation and with our supply chain.

[48] Further examples are provided in the PR24 definition document for this Performance Commitment: https://www.ofwat.gov.uk/publication/internal-sewer-flooding-pc-definition/

## 24.4 Customer & Stakeholder Engagement

We carry out extensive engagement with our customers, communities and stakeholders. Information on our engagement approach can be found in Chapter 6, but specific customer engagement related to internal sewer flooding is detailed below.

More detail on this subject can be found in **Chapter 6: Customer & Stakeholder priorities**

Customer's view internal sewer flooding as a high priority issue due to its very emotive nature. This was shown through the customer preferences research as carried out by Ofwat and CCWater, with internal sewer flooding ranked a high priority service area. Customers reported expectations that should internal sewer flooding arise, resolution of the issue should be as quick as possible. The research found that customers are particularly concerned with the public health risk of internal sewer flooding, with the presence of sewage in people's homes potentially causing individuals to fall ill, during the event, but also the subsequent clean up and repair. Addressing and reducing the likelihood of internal sewer flooding, not only supports improvement in performance at a company level but improves the societal impact in particular related to health and wellbeing. The Ofwat CCWwater report also stated that views associated with internal sewer flooding were consistent across customer groups, including people with young families, future bill payers, business customers with business premises or vulnerable customers.

Read more about this at **Ofwat/CCWater customer priorities research**

We can triangulate these customer views on internal sewer flooding through other customer engagement and analysis we have carried out. In our own Valuing Water priorities research, out of 20 tested priority areas, household customers ranked internal sewer flooding as the third highest priority area, with non-household customers ranking it as the second highest priority area. We can also see from analysis of our complaints data from 1st April 2022 to 31st March 2023 (total of 24,363 complaints) that 11%, the joint second highest category after billing, were related to sewage flooding.

These customer views are unsurprising, we know by our extensive engagement with customers on a day-to-day basis that internal sewer flooding is one of the worst things to happen to a customer. Interestingly, the customer preferences research undertaken by Ofwat indicated that customers don't necessarily link the issue with water company practice, or specific shortfalls such as insufficient storm overflows, but regardless, we understand our responsibility to be more proactive in this area. The engagement we carried out to build our drainage and wastewater management plan (DWMP) indicates that when customers are presented with information on performance associated with sewer flooding, whether that be internal or external, there are expectations that longer-term improvements to the sewer network should be addressed, as maintenance would not go far enough considering the future challenges, including climate change and population growth. Further information on our DWMP customer research can be found in Chapter 6.

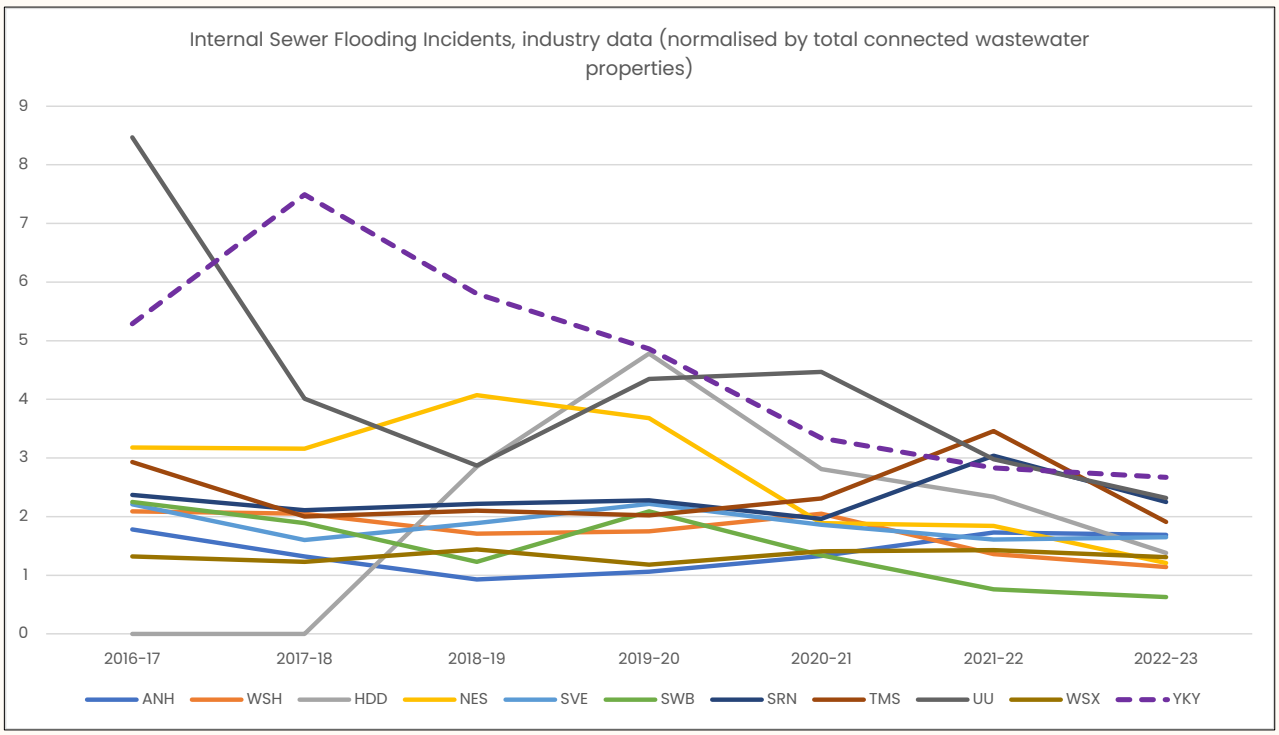
Finally, in our affordability and acceptability research conducted following Ofwat guidelines we showcased our planned target for internal sewer flooding - 78% of customers found the plan to be acceptable and in our own independent affordability and acceptability testing research, 79% of customers found our overall plan to be acceptable including this measure and target.

## 24.5 Our performance to date

### 24.5.1 Our performance and position

We have continually improved our performance year on year from the end of AMP6 as observed in Figure 1 despite the challenges that our outside of our control and summarised further in the section, Setting Our Target. As a result, the purple dotted line indicates we have significantly closed the gap in performance in comparison with other water companies (the majority who have remained stable), but still higher than the AMP7 performance commitment targets.

**Figure 74: Our comparable performance over the last 7 years**




(Source: Ofwat Historical Performance Trends for PR24 v2.0 and Annual Performance Report 2022/23).

However, we have not achieved our PR19 targets for this PC in the first three years in AMP7. In Year 3 AMP7 (2022/23) our performance commitment level was 2.67 incidents per 10,000 customers.

Our performance in Year 3 of AMP7 of 626 internal sewer flooding incidents or 2.67 incidents per 10,000 sewerage connections was driven by factors within our control (e.g., doing sewer investigations, campaigns against sewer misuse) and outside our control (e.g. prevalence of combined sewers, cellared properties, rainfall and customers disposing of material not suitable for the sewer).

Relative to other companies, our best performance was in 2021/22 where we were 8$^{th}$ out of 11 companies, however this does not consider a normalisation to company specific factors that unduly impact YW in comparison to many others.

Driving this reduction commenced in 2018-20 with the significant reinvestment of AMP6 efficiency gains to improve performance. In AMP7 we have continued to target properties that are more likely to flood internally, which in our regional case are combined sewer areas that have a high propensity of cellars (circa 69% of internal sewer flooding incidents occur in cellars (reviewing data from 2019 to date)). We anticipate the improving service to continue for the rest of the 2020-2025 period in line with our performance improvement plan. Our blind forecasts for Years 4 and 5 are 2.58 and 2.29 per 10,000 connections respectively.

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### 24.5.2 Understanding factors that influence our performance

Our performance is influenced by a number of factors including:

- Number of repeat properties flooding
- The condition of sewer assets
- The source of flooding predominantly being from the combined sewer system
- The high number of cellars

A key target in improving performance has been reducing the number of repeat flooding occurrences. Since 2019 we have reduced by circa 80% the number of repeat occurrences, as indicated in Table 2. The vast majority of internal sewer flooding is driven by newly occurring incidents with circa 85% of incidents since 2019 only occurring once.

### Table 104 Number of repeat internal sewer flooding incidents per year

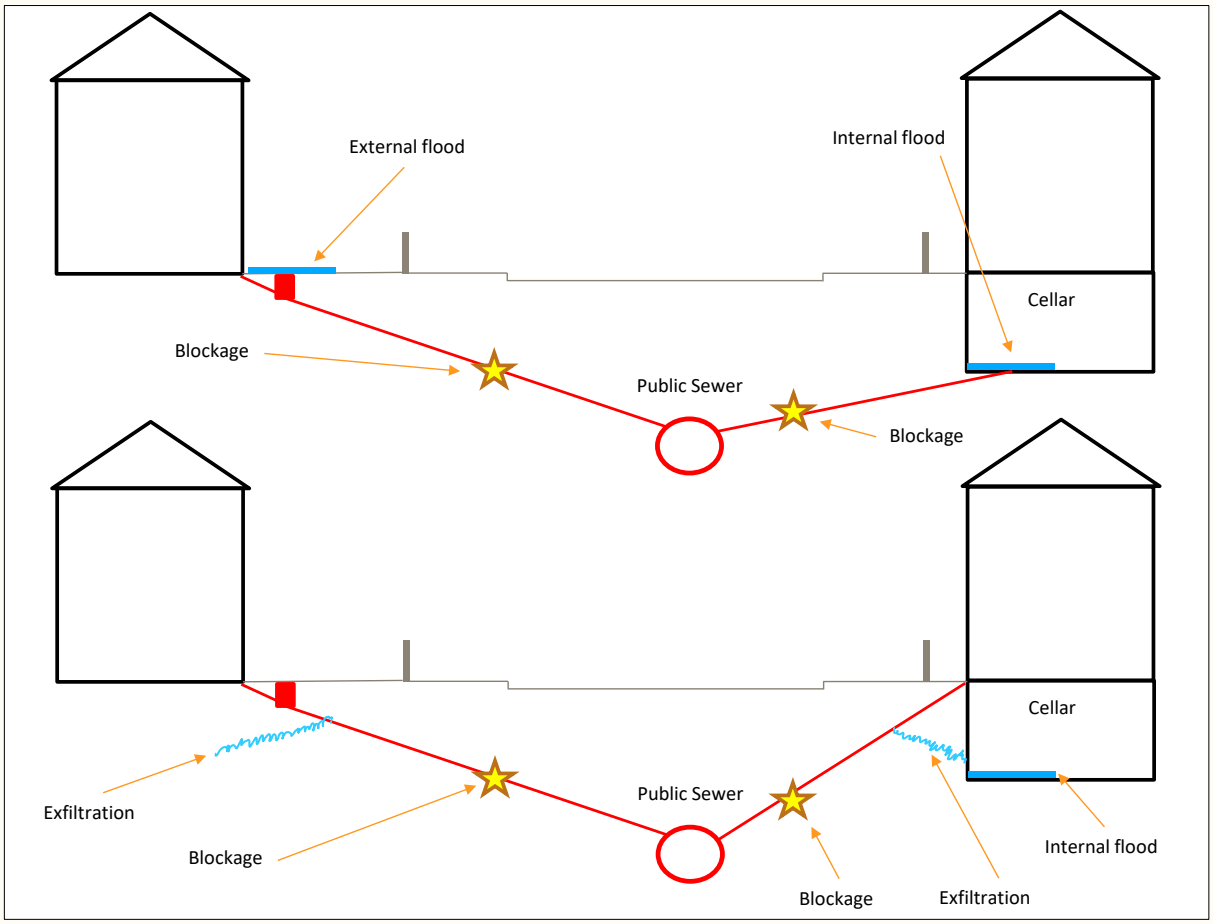
| Financial Year | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|
| **Number of repeat incidents per year** | 145 | 146 | 61 | 28 | 25 |

Our performance indicates we have a high proportion of new properties flooding over a long time frame and per year. Our work through inspecting the sewer network in and around our higher likelihood of flooding areas highlights the issue being faced on where to invest. In year 3 of AMP7, circa 100,000 properties have been inspected. During inspection, where defects were noted, these were assessed and those to be addressed form part of our rehabilitation programme.

During the inspection work a blockage was found (on the day of inspection) in 1 out of 50 properties. These occurred on sewers with and without defects. Our results indicate that over the last 5 years, reportable blockages were the cause of 57% of internal sewer flooding incidents with reportable collapses 42%, with circa only 1 % flooding because of equipment failure. The 'reportable collapses' is where the blockage forms and can be from a range of defects. For internal sewer flooding in cellar properties, blockages form 46% and collapses 54%. The condition of the sewer itself as a cause under a collapse category (for cellar flooding) is related to less than 1/3 of flooding incidents, with other issues such as gully or manhole chamber noted as defective.

Blockages occur in sewers of all conditions, and even minor imperfections can be enough to help a blockage form. With the potential for surface water to back up behind a blockage and with high proportion of cellars there is an easy route for minor surcharge to escape into a property. This creates a higher likelihood for internal sewer flooding to occur. This is explained in Figure 2. The frequency of internal sewer flooding is low when we compare the number of blockages, we found on a given day in high risk combined sewer areas.

### Figure 75 Example of how the same type of blockage creates a different consequence of internal, external or potentially no flooding based on whether the property has a cellar



Within our combined sewer areas, we have a high proportion of properties draining to the combined sewer that are cellared (as evidenced below). We have circa 260,000 cellared properties which we have identified previously by surveys in the field. Circa 69% of our internal sewer flooding occurs in cellared properties, with incidents driven in the gravity network (as blockage or collapse as noted above) and not via pumping station or rising main failure.

However, across England and Wales, there is no single dataset that provides a definitive count of the number and distribution of cellared properties. As a result, it is necessary to combine data from a number of different sources, building up a detailed picture of property numbers by property type (detached, semi-detached, terraced, flats etc.), age of property, and characteristics of property i.e. presence of a cellar or basement.

Edge Analytics developed a bespoke data estimation model to produce a cross-tabulation of evidence by type, age of property and characteristic of property. The objective of the data model is to illustrate the likely distribution of cellared properties based upon derived property details. Edge Analytics acquired a third-party data set (with 11,179,889 properties of which 366,882 properties are marked to have a cellars or basement) from an organisation that sources data from property listings. The data is updated daily from multiple portals with information on basements and cellars as one of the static variables for different types of properties.

Historical data for listing descriptions is available back to 2000, therefore providing a large sample of properties by type and age of property. The data estimation model has been developed for England and Wales, enabling a regional comparison and a comparison between Yorkshire Water and other water companies.

Figure 3 shows across England and Wales the percentage distribution of properties and properties with cellars/basements. These data indicate the disproportionate percentage of properties that have cellars are in our region compared other water companies. This helps to demonstrate that the types of properties we have, have the higher potential to flood internally (Figure 2) compared with other companies. Only United Utilities also has a percentage share of basement / cellars that is greater than it's property share.

Table 3 provides the values behind the graphs, the index vs national[49] and the proportion of cellars where an impact could occur. It demonstrates that the impact to Yorkshire Water is greater than any other company. We recognise that there are differences in the estimates of cellar properties compared with our knowledge of cellars in the Yorkshire Water region. The difference is substantial compared with our own records (circa 200k based on Edge work vs 260k from our own records) and highlights the challenge to get an accurate data set without each water company sharing the number of cellar / basement properties, which we would expect them to have. Other evidence from the 2001 census data (Annex D - Section 2.5) also points to Yorkshire Water having a significantly greater number of properties with cellars / basements, and in the round each water company is within circa +/- 1% point from the census data and that compiled by Edge Analytics. Therefore, the evidence highlights the magnitude of the difference between each company which is material in demonstrating that our region has a higher number of cellars than others, and this affects the likelihood of internal sewer flooding.

Using data from Table 3, we can understand company performance in relation to the % of cellared properties. The industry leader for ISF, South West Water have 2.7% of properties with cellars or basements. We can calculate that if in our region we had this percentage of properties with cellars, rather than the Edge Analytics 8%, or even if we had the industry mean cellar of 2.95%, our normalised performance would be in the region of **1.46 to 1.52 per 10,000 connected properties** (based on us experiencing 69% of our ISFs in cellars). This would be slightly better performance than the industry mean for 22/23, and in line with our AMP7 performance commitment level target.

Our internal cellar data suggests 10.4% (not 8%) of our regional properties have cellars, which if we had the leading performer average or the industry average, would result in a comparative performance of between **1.31 and 1.36 per 10,000 connected properties**, almost the industry upper quartile of 1.26 for 22/23, and ahead of our AMP7 performance commitment level target.

[49] The index vs national is calculated as follows: (basements modelled by company/national average)-1

We anticipate that most water companies do not see cellared properties being a key factor in driving internal sewer flooding performance. This is likely to be due to their lower cellar numbers and proportions of cellars overall, as indicated above if Yorkshire Water had a typical number of cellars close to the industry mean.

**Figure 76: Evidence from work undertaken by Edge Analytics to estimate the number of cellared or basement properties across England and Wales Water Companies.**

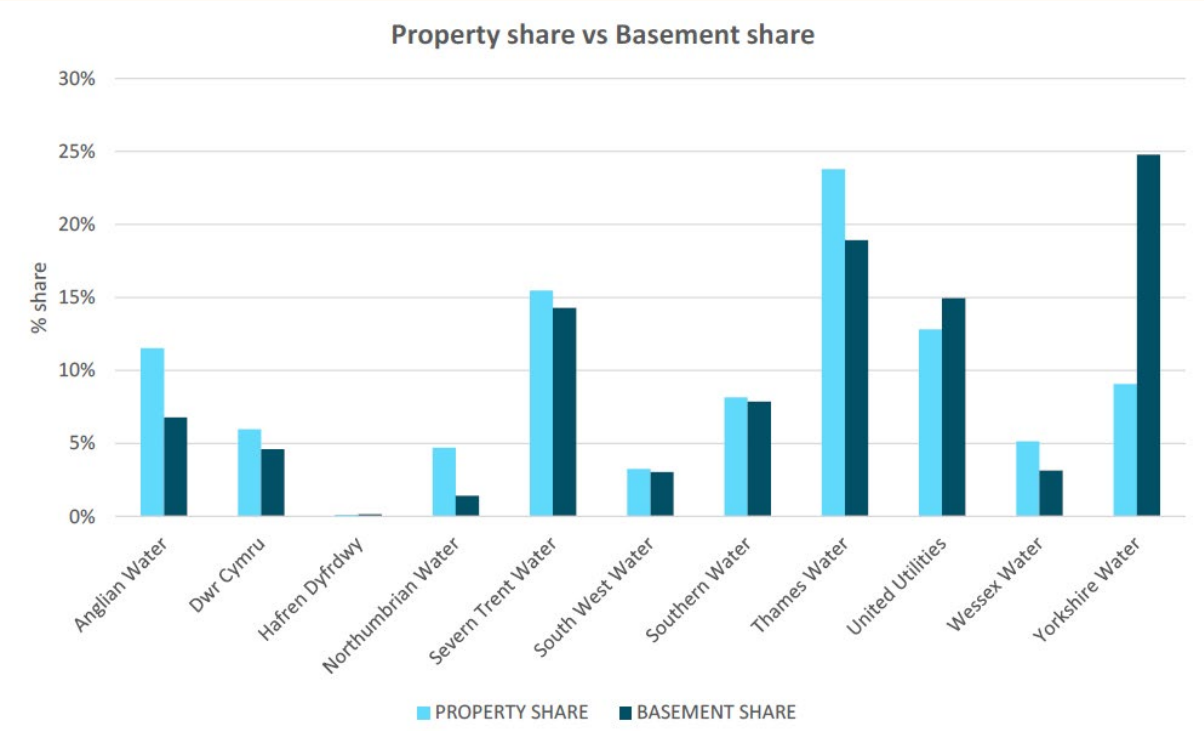



**Table 105: Edge Analytics assessment of the number of properties, basements estimated, indexed comparison to industry average of basement presence and percentage of properties with basements or cellars.**

| Water Company | Number of properties | Basements or cellars modelled | Index vs National | Percentage of properties with cellars or basements | 22/23 normalised performance |
|---|---|---|---|---|---|
| **Anglian Water** | 3,173,075 | 54,512 | -0.25 | 1.7% | 1.69 |
| **Dwr Cymru** | 1,644,966 | 36,971 | -0.49 | 2.2% | 1.14 |
| **Hafren Dyfrdwy** | 31,154 | 1,250 | -0.98 | 4.0% | 1.38 |
| **Northumbrian Water** | 1,292,213 | 11,586 | -0.84 | 0.9% | 1.21 |
| **Severn Trent Water** | 4,259,306 | 114,828 | 0.57 | 2.7% | 1.65 |
| **South West Water** | 896,571 | 24,465 | -0.67 | 2.7% | 0.63 |
| **Southern Water** | 2,245,618 | 63,275 | -0.13 | 2.8% | 2.25 |
| **Thames Water** | 6,547,218 | 152,139 | 1.08 | 2.3% | 1.91 |
| **United Utilities** | 3,524,616 | 120,228 | 0.65 | 3.4% | 2.32 |
| **Wessex Water** | 1,414,390 | 25,372 | -0.65 | 1.8% | 1.31 |

| | | | | | |
|---|---|---|---|---|---|
| **Yorkshire Water** | 2,496,490 | 199,211 | 1.73 | 8.0% | 2.67 |
| **England and Wales including Yorkshire Water** | **27,525,617** | **803,838** | | **Mean: 2.95%** | **Mean: 1.65** |
| **England and Wales excluding Yorkshire Water** | | | | **Mean: 2.45%** | **Mean: 1.55** |

For internal sewer flooding, the source of flooding is predominantly from the combined sewer (82%). This is particularly challenging for us as we have one of the highest combined sewer percentages of all water companies at 55% (Table 4). We also have one of the highest combined sewer to foul sewer ratios 3:1 (Table 4). Circa 96% of internal sewer flooding comes from these two sources of sewer type. For internal sewer flooding, the type of sewer related to the flooding is nearly 6:1 (combined sewer to Foul sewer). This indicates we are nearly twice as likely to see internal sewer flooding from the combined sewer compared with the foul sewer. Based on our evidence this indicates that it is harder to prevent flooding on the combined system compared with the foul and is a factor that influences performance. We note that ARUP identified drainage (combined sewers) as a potential factor of high performance in its March 2023 report to Ofwat on factors influencing sewerage growth [ref].

**Table 106 Data taken from the 2022/23 APR indicating the percentage of combined sewers Yorkshire Water have and the high ratio of combined to foul sewers.**

| Company | Length of "public" sewer (km) | | | Percentage of company "public" sewer by type | | | Ratio of Combined to Foul Sewer |
|---|---|---|---|---|---|---|---|
| | Combined Sewer | Surface Water Sewer | Foul Sewer | Combined Sewer | Surface Water Sewer | Foul Sewer | |
| Untied Utilities | 22,809 | 10,722 | 7,354 | 55.8% | 26.2% | 18.0% | 3.10 |
| South West Water | 5,879 | 2,552 | 2,128 | 55.7% | 24.2% | 20.2% | 2.76 |
| Yorkshire Water | 16,266 | 7,624 | 5,438 | 55.5% | 26.0% | 18.5% | 2.99 |
| Northumbrian Water | 8,408 | 4,560 | 3,123 | 52.3% | 28.3% | 19.4% | 2.69 |
| Dwy Cymru | 8,899 | 3,674 | 5,612 | 48.9% | 20.2% | 30.9% | 1.59 |
| Anglian Water | 10,320 | 11,677 | 19,237 | 25.0% | 28.3% | 46.7% | 0.54 |
| Severn Trent Water | 12,078 | 16,772 | 24,324 | 22.7% | 31.5% | 45.7% | 0.50 |
| Wessex Water | 3,121 | 4,479 | 9,237 | 18.5% | 26.6% | 54.9% | 0.34 |
| Southern Water | 2,513 | 5,157 | 13,123 | 12.1% | 24.8% | 63.1% | 0.19 |
| Thames Water | 5,816 | 22,812 | 38,250 | 8.7% | 34.1% | 57.2% | 0.15 |
| Total | 96,109 | 90,029 | 127,826 | 30.6% | 28.7% | 40.7% | 0.75 |

Annual rainfall may also be a contributing and connecting factor to the flooding. Where rain occurs there is the potential to surcharge behind a blockage and back up the sewer, and this will happen quicker and with more volume than dry weather flow. Where this occurs in cellared areas it has the higher chance of backing up before self-clearing due to the potential relatively limited head forming before leading to flooding. Higher annual rainfall occurs in the west of the region where we have the predominance of combined sewers and cellared properties. There is the potential though that rainfall can help to clear blockages that start to form as well, therefore its influence may not be as significant as other factors.

Our performance over the last five years has benefited from minimal severe rainfall events falling in urban areas which can lead to 100s of properties flooding internally. The number of classified hydraulic overloaded internal sewer flooding incidents is 35 per year considering 2019 through to 2023.

Cellared properties may be less likely to suffer external sewer flooding with the most common cause being internal. However, as some cellar properties have an external cellar entry/exit and that the curtilage around the property can flood, external cellar flooding can still occur. Furthermore, we have a high number of combined sewers which increases the risk of sewer flooding. However, if these factors were excluded, it may be reasonable to assume that there is a circa 5% benefit in reduced external sewer flooding incidents. In reality, the percentage benefit is likely to be significantly less and may not be material.

### 24.5.3 Previous investment that influences our current performance

We have renewed our emphasis on creating greater visibility and network understanding since Year 4 of AMP6. This has been firstly through sensor trials and installations to gain greater insight into when blockages arise (which occur randomly across the region) and improving the operational response to an alert. Secondly, it has been through a greater understanding of the health of assets where we see the greatest problems (in and close to properties in section 24 and private to public sewers / laterals). Our improvement relates to a number of activities in combination, which we summarise below.

**Gaining visibility through customer sewer alarms**

During Year 4 and 5 of AMP6 and Year 1 of AMP7 we undertook trials to install sensors close to properties in combined sewer areas that have a higher likelihood of flooding. This was through undertaking field trials at one of our wastewater treatment works to simulate performance issues and test potential sensors as well development of technology with suppliers. Research was also undertaken with the University of Sheffield to evaluate the performance of small diameter sewer / lateral to different types of blockages and inflows. As a result of that we commenced installation of sensors in and close to the properties. Two different types of sensors were utilised in earnest with circa 2000 sensors installed in total. This provided the basis for our first test of technology in and close to the property, overcoming installation issues and the analytics of the data to interpret alerts and when these should be turned into alarms with an incident response.

The result of our work has been to embark on a journey of customer sewer alarm (CSA) installations. We commenced installing the CSAs in Year 3 of AMP7, with over 20,000 installed by the end of Year 3 targeting internal and external sewer flooding. The locations have been driven from our CSA benefit model. Our intent is to have 40,000 CSAs installed in AMP7. The CSA is close to the property, with a greater focus being to install these in high likelihood of internal sewer flooding postcodes. Enabling works are undertaken to support installation.

The aim of the CSAs is to identify when a pre-emptive intervention is required and over what time period (the level of urgency). We know from our inspection data that blockages occur regularly in our high likelihood areas, but often self-clear. Using inspection by our teams supported by analytics (which will develop and improve overtime) we can start to identify where a blockage is forming and assign a response to the property. This may not be an instant response based on our understanding of the data. Using more sensors in the network is driving an organisational shift in how we deploy and react which is currently under review including how we triage, schedule etc.

**Local sewer inspection, cleansing and rehabilitation programme**

We commenced a programme of local sewer inspection in and around our high likelihood internal sewer flooding properties. This targeted approach saw over 100,000 properties targeted in Year 3 of AMP7, with over 1060km of sewer inspected. These sewers were predominantly section 24 or transferred assets (from 2011) close to properties. The inspection included:

- Recording details of the inspection including defects, sewer grade, sewer length
- identifying if a blockage was present and if so clearing it, typically through sewer cleansing

The defects were reviewed, and rehabilitation requirements determined and agreed, to form part of the ongoing rehabilitation programme. As part of our work, over the first three years of the AMP, we undertook 15,000 interventions which included dig-down repairs, gully replacement, lining (over 50% of works), root cutting and trap removal (to reduce internal and external sewer flooding).

To support local inspection, we have also been trialling and now mainstreaming the use of lateral cameras to gain insight into the sewer network condition of laterals direct from the main sewer. This is an efficient way for us to inspect a large number of laterals that are on housing stock with a high likelihood of internally flooding.

Along with local sewer inspection we have inspected mainline sewers in key areas, to understand if cleansing or repair is required. This targeted over 100km per year typically (across

pollution, internal and external sewer flooding). This is a continual programme, which will be revised as we install more sensors in the sewer network.

### Evolving and improving our response to incidents

As part of our modernisation programme, we reviewed our operational response to incidents (blockages and flooding). As part of this organisational review, we made the decision to bring the operational response inhouse. This gave us greater control to target and respond as required, e.g. to reduce our reactive times based on urgency and need. Our proactive and pre-emptive work is delivered by our in-house teams and supply chain. Our rehabilitation work is delivered by our supply chain.

A key focus of our recent work has been to reduce the likelihood of repeat incidents occurring at a single property, particularly within a short space of time. We applied a renewed focus, driven through our ‘repeat hubs’ that develop our thinking and learning through to resolving an incident in one visit, and organise follow on work as soon as possible. We continue to work in this area to strive for improvement. The number of repeat flooding incidents have reduced significantly already as outlined in section 1.1.5.2.

## 24.6 Setting the target

### 24.6.1 Our approach to setting the target

The 2024/25 (end of AMP7) common industry target for this Performance Commitment is 1.34 internal sewer flooding incidents per 10,000 sewerage connections. Yorkshire Water is forecasting to not meet this, with our performance expected to be at 2.29 incidents per 10,000 sewerage connections. This is because of the exogenous regional factors we face, which are summarised in our performance to date above, and our reasoning below, including econometric modelling.

Ofwat intends to set a common performance commitment level (PCL) for companies in relation to ISF at PR24.[50] However, the Yorkshire region faces unique regional circumstances that mean we are unable to meet the same target as other companies, with Ofwat's expected cost allowances. Given that Ofwat have not yet set out the common PCL for ISF at PR24, we are not able propose an adjustment to this common level. Instead, we are proposing an ISF target for Yorkshire Water of 1.76 incidents per 10,000 sewerage connections.

Our approach to reduce internal sewer flooding is based on creating enhanced visibility of system performance, response, customer engagement and continual improvement in asset health. There is a continued focus on properties with cellars which contribute significantly to our internal sewer flooding performance. A glide path is shown in our forecast numbers as we roll out the interventions in a sustainable programme during the AMP. There is benefit in this approach also to adopt learning as it arises and adapt appropriately. We outline how we will achieve this target in 1.10.

Interventions will take time to roll out, which is reflected in the glide path from our AMP8 entry point. Firstly, through a significant sensor programme (which also requires enabling works where access is poor) in and around properties and in the main sewer. Secondly through inspection and rehabilitation of sewers in poor condition, again with a focus in and around cellared properties, along with targeted operational management e.g., removal of silt through the visibility programme. The impact of this approach will result in a decline in our customers experiencing internal sewer flooding over time.

Ofwat identifies practicality, affordability or customer support as valid reasons that a common level of performance is not justified. Activity to make our exogenous factors align with the industry average would not be practical or affordable. Replacing our combined sewers with separate systems or protecting all cellared properties would cost billions and not be achievable in any reasonable timescale. We therefore believe that it is in customers interests to adjust the target which is demonstrably stretching for a company with our characteristics.

#### 24.6.1.1 Defining the need for a performance adjustment for internal sewer flooding based on econometric modelling

As set out in our main document "*Adjustments to Common Performance Commitment Levels (PCLs)*", we recognise the benefits to Ofwat and customers in being able to directly compare company performance, and support this where a fair comparison between companies can be made. However, we remain concerned that setting some PCLs at a common level does not allow this fair comparison. Ofwat recognises in its econometric cost models that not all companies are the same, reflecting this in some of the variables, but not when setting common PCLs. Without accounting for these in setting PCLs some companies are benefitting from a favourable set of factors and others are being overly stretched.

If Ofwat repeats its use of an upper quartile common target to set internal sewer flooding PCLs in AMP8, our performance will remain above this UQ position despite our programme of interventions being in-line with or ahead of the rest of the industry. This is down to the effect of key exogenous drivers that make YW different to the majority of companies driving this UQ. We engaged our economic advisors (Economic Insight) to explore these drivers using an econometric modelling framework. This activity demonstrates that these drivers significantly impact relative performance across the industry and allows us to estimate the expected performance level of a company with our unique regional circumstances. As explained below,

50 'Appendix 9: Setting expenditure allowances.' Ofwat (December 2022); Table 4.1.

our analysis indicates a normalised target for a company with YW's characteristics would be between 1.96 and 3.44 ISF incidents per 10,000 properties per year at the end of AMP8.

Whilst it may intuitively look like there is an overlap with this claim and the evidence provided for adjusting our costs related to percentage of combined sewers, we do not consider this to be the case.

The cost models are built on historic expenditure data which is independent of relative company performance and therefore solely reflect the cost differences between companies at current (and historic) performance levels. Companies with high percentages of combined sewers see higher costs (accounted for in the cost models) as well as poorer performance (not reflected in the cost models).

The performance models adjustment therefore solely accounts for the observed performance differences between companies, independent of cost allowances.

Our econometric modelling is designed to fulfil four criteria:

- The model is founded on engineering and economic rationale.
- The input data accurately describes the determinants of performance.
- The model is robustly estimated.
- The results are appropriately applied to the regulatory issue.

The specific model detail is set out in the Annexes to this document (Annexes - Supporting evidence to econometric modelling). We demonstrate that our modelling meets each criteria in turn below.

#### 24.6.1.2 The model is founded on engineering and economic rationale

Our econometric models are based on solid engineering and economic rationale. This allows us to estimate the relative impact of key exogenous drivers on ISF performance. In particular:

- The model includes the key exogenous drivers of ISF discussed in section [1.1.5.2]. These are: (i) cellared properties; (ii) combined sewers; (iii) annual rainfall; and (iv) Food Service Establishments.
- The model includes a linear time trend. As can be seen in Figure 1 the evidence indicates a general downwards trend in ISF incidents across companies over time. We do not consider that this downwards trend is driven by the four exogenous factors, because these variables do not follow a trend over time. For example, the annual rainfall experienced by each company fluctuates from year to year but does not clearly trend upwards or downwards over time over a 10-year period. Hence, our model includes a linear time trend to capture this effect. We note that this trend may be overstating the level of improvement achievable by all companies as improvements may see diminishing returns as the impact of recent investment passes through to service.

#### 24.6.1.3 The input data accurately describes the determinants of performance

The input data employed in our modelling accurately describes the drivers in question. This allows us to robustly estimate their impact on ISF performance. Below, we discuss the data used in our analysis and the structure of our final data set.

**Data sources**

Table 5 presents the data employed in our econometric models. It sets out: (i) the name of the variable; (ii) its purpose in the modelling; (iii) the source of this data; and (iv) any further calculation notes.

### Table 107: Econometric model data sources

| Variable | Purpose | Source | Notes |
|---|---|---|---|
| **Number of ISF incidents** | Dependent variable | Ofwat Historical Performance Trends for PR24 v2.0<br>Annual Performance Report 2022/23 | This variable is normalised by the number of connected wastewater properties (10,000s).<br>We take the natural logarithm of this variable for the econometric models. |
| **Length of combined sewers** | Independent variable | PR24 Cost Assessment Master Dataset, Wholesale Wastewater Base Costs<br>Annual Performance Report 2022/23 | This variable is normalised by the total length of sewers in the network and presented as a percentage.<br>We describe our method of calculating this in 1.1.16.2. |
| **Annual urban rainfall** | Independent variable | CEDA HadUK-Grid - Gridded Climate Observations on a 1km grid over the UK, which is created by the MetOffice (except for January to March 202351) | Annual rainfall was calculated for each Middle Super Output Area (and if it has an urban runoff component using the methodology taken by Ofwat52) to give more representative reflection of where annual rainfall occurs and the impact it has in our region. |
| **Number of cellared properties** | Independent variable | Analysis by Edge Analytics reported in section 1.1.5.2. | This used property listings of over 11m properties to develop a cellars model. |
| **Number of FSEs** | Independent variable | Density of fast food outlets in England, PHE | This variable is normalised by the number of connected wastewater properties (10,000s). |
| **Length of sewer network** | Normalisation factor | PR24 Cost Assessment Master Dataset, Wholesale Wastewater Base Costs<br>Annual Performance Report 2022/23 | |
| **Number of connected wastewater properties** | Normalisation factor | PR24 Cost Assessment Master Dataset, Wholesale Wastewater Base Costs<br>Annual Performance Report 2022/23 | |
| **PCL of ISF at PR19** | Charts | Ofwat Service and Delivery Report 2020-21 data | This variable is normalised by the number of connected wastewater properties (10,000s). |
| **Forecast PCL of ISF at PR24** | Charts | Company Business Plan Submissions for PR19, App1<br>DWMP Data Tables | This variable is normalised by the forecast number of connected wastewater properties (10,000s).<br>We describe our method of calculating this in 1.1.16.3. |

### Data structure

We constructed an industry wide panel data set of 10 wastewater companies over the period 2016/17 to 2022/23. We combined data for Severn Trent and Hafren Dyfrdwy in line with Ofwat's base cost model methodology at PR24.[53] This yields a total of 70 data points in our econometric models.

[51] In England, rain gauge data sourced from the Environmental Agency was used to estimate the annual urban rainfall. In Wales we used the historical averages that were calculated based on the 2012-2022 data.
[52] Urban rainfall calculations - Ofwat
[53] Please see: https://www.ofwat.gov.uk/wp-content/uploads/2023/04/Econometric_base_cost_models_for_PR24_final.pdf

#### 24.6.1.4 The model is robustly estimated

We have tested the robustness of our models to different specifications and find that they pass relevant statistical tests. This allows us to have confidence in our modelling results. Below, we discuss: (i) the specification of our econometric models; and (ii) the results of our modelling.

**Specification**

We have created seven model specifications and estimate each using both Ordinary Least Squares (OLS) and Random Effects (RE). The seven model specifications use the natural logarithm of ISF incidents per 10,000 connected properties as the dependent variable. The independent variables of each of the seven model specification are as follows:

- **Model 1:** Percentage of combined sewers.
- **Model 2:** The natural logarithm of annual urban rainfall.
- **Model 3:** Percentage of properties with cellars.
- **Model 4:** The natural logarithm of normalised FSEs.
- **Model 5:** Percentage of combined sewers, the natural logarithm of annual urban rainfall, the percentage of properties with cellars, and the natural logarithm of normalised FSEs. This encapsulates all variables included individually in models 1 to 4.
- **Model 6:** Percentage of combined sewers, the natural logarithm of annual urban rainfall, and the percentage of properties with cellars. This encapsulates all variables included individually in models 1 to 3.
- **Model 7:** Percentage of combined sewers, the natural logarithm of annual urban rainfall, and the percentage of properties with cellars. This is equivalent to model 6, with the addition of a linear time trend.

We do not have a strong preference between the OLS and RE modelling approaches (and, as shown in Annex D: Model and adjusted PCL results they yield very similar results in any case). Of the seven model specifications set out above, our preferred model is Model 7, which excludes FSE. This is because:

- **The inclusion of FSE in the model is problematic for the robust estimation of the effect of the other variables of interest.** The number of FSEs is highly colinear with both: the percentage of combined sewers; and annual urban rainfall. This means that it is hard for the model to disentangle the effect of each of these variables from the effect of FSE. This collinearity appears to be the cause of the stark change in coefficients in model 5 relative to models 1-4 (as shown in Annex D: Model and adjusted PCL results). While combined sewers and annual urban rainfall are colinear with FSE, they are not colinear with each other. This means we have a choice of whether to include either: (i) percentage of combined sewers and annual urban rainfall; or (ii) FSE, but not both. We consider that it is more appropriate to include both the percentage of combined sewers and annual urban rainfall, rather than just FSE, because:
    - This allows us to capture more of the drivers of ISF described in 1.4.2.
    - Publicly available data on number of FSEs is only available for 2018. This means that our model assumes that FSEs are constant over time. Due to the negative impact of the Covid-19 pandemic on the hospitality industry, the robustness of this assumption is somewhat weakened.
- **It includes a time trend.** As described above, the evidence indicates a downward trend in ISF incidents across the industry, which is not captured by the other variables in the model (which do not trend over time). It is important that our models are able to explain this trend.

It is unclear whether the exclusion of FSE from our preferred model results in an under- or over-estimation of our adjusted PCL. More specifically:

- The exclusion of FSE from our preferred model may mean our estimated adjusted PCL is a conservative estimate. This is because Model 7 only captures the effect of three of the four exogenous factors which interact through the mechanisms set out in 1.4.2 to affect our ISF performance.
- The exclusion of this variable may also cause an omitted variable bias in the estimation of the remaining coefficients (i.e. the percentage of properties with cellars, the percentage of combined sewers, the natural logarithm of annual urban rainfall and the

time trend). However, it is not clear how this bias would affect the estimation of our adjusted PCL.

The results of our econometric modelling are presented and discussed in detail in Annex D (2.4). Our preferred model specification (Model 7) indicates that the proportion of cellared properties is the most material driver of ISF performance and that annual rainfall, combined sewers and FSE are also important drivers of performance.

#### 24.6.1.5 The results are appropriately applied to the regulatory issue

We apply the results of our econometric models to estimate an adjusted PCL which reflects our unique regional circumstances. Below, we discuss: (i) our approach to calculating this adjustment; and (ii) the results of our calculations.

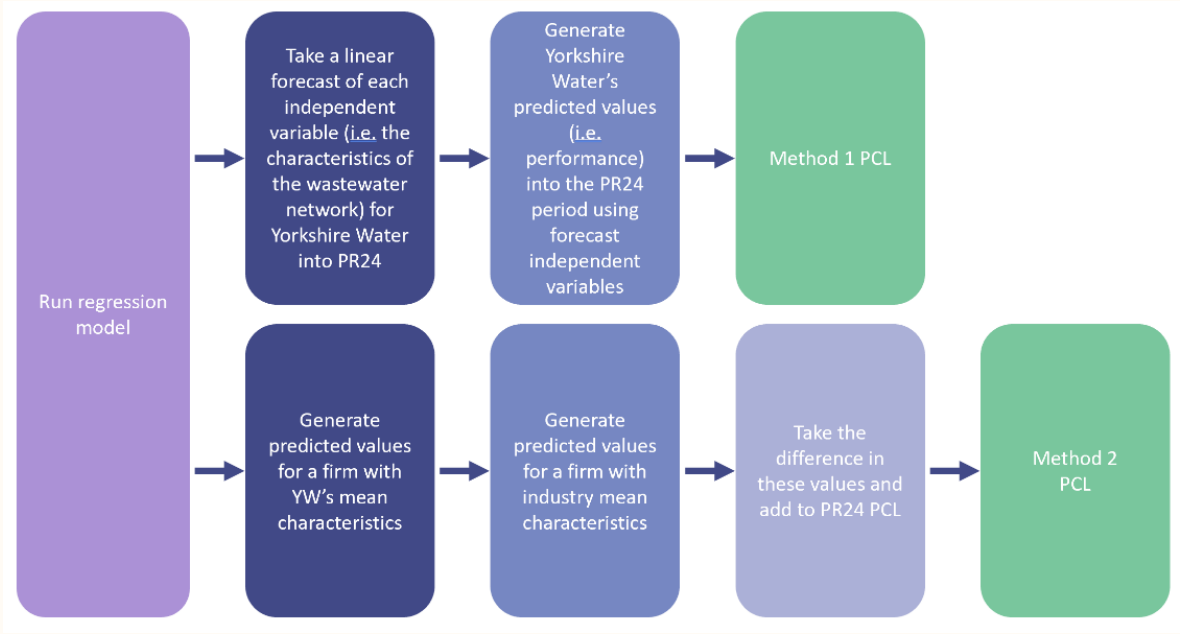
**Methods**

We employ two methods to estimate an adjusted PCL which reflects the unique regional challenges that our network faces.

- **Method 1:** Estimate a unique PCL for Yorkshire Water directly from the econometric model, using the model's predicted values for Yorkshire Water. In order to get model predicted values that continue through PR24 (as the data for the models' independent variables only exists up to 2022/23), we take a company-level linear forecast for each independent variable over the PR24 period.
- **Method 2:** Rather than estimating the PCL directly, this method estimates an adjustment or 'uplift' to the common PCL for Yorkshire Water. This uplift is calculated as the difference between the model's predicted values for Yorkshire Water's and the model's predicted values if we had the characteristics of the hypothetical average firm (in other words, if we had the average value of each of the model's independent variables). This uplift is added to the common PCL for ISF to get the adjusted PCL for Yorkshire Water.

Figure 5 illustrates how these two methods stem from the regression model.

**Figure 77 Two methods for estimating adjusted PCLs for Yorkshire Water**



### Results

The results of our adjustment calculations are presented and discussed in detail in Annex D (Section 2.4). Using our preferred model specification (Model 7, for both OLS and RE), the results indicate that we should receive a PCL of between 1.96 and 3.44 ISF incidents per 10,000 properties per year, to account for our unique regional circumstances. These values are substantially greater when compared with the industry average or an upper quartile position, but representative of the challenges we face.

The results of the economic modelling based on the engineering rationale can be seen in Figure 6. Both adjustment methods indicate a starting position above those previously set during AMP7 by Ofwat, taking into account the regional circumstances we face. We are suggesting a PCL which we believe is stretching when viewed against our model suggested target, due to the more difficult engineering circumstances.

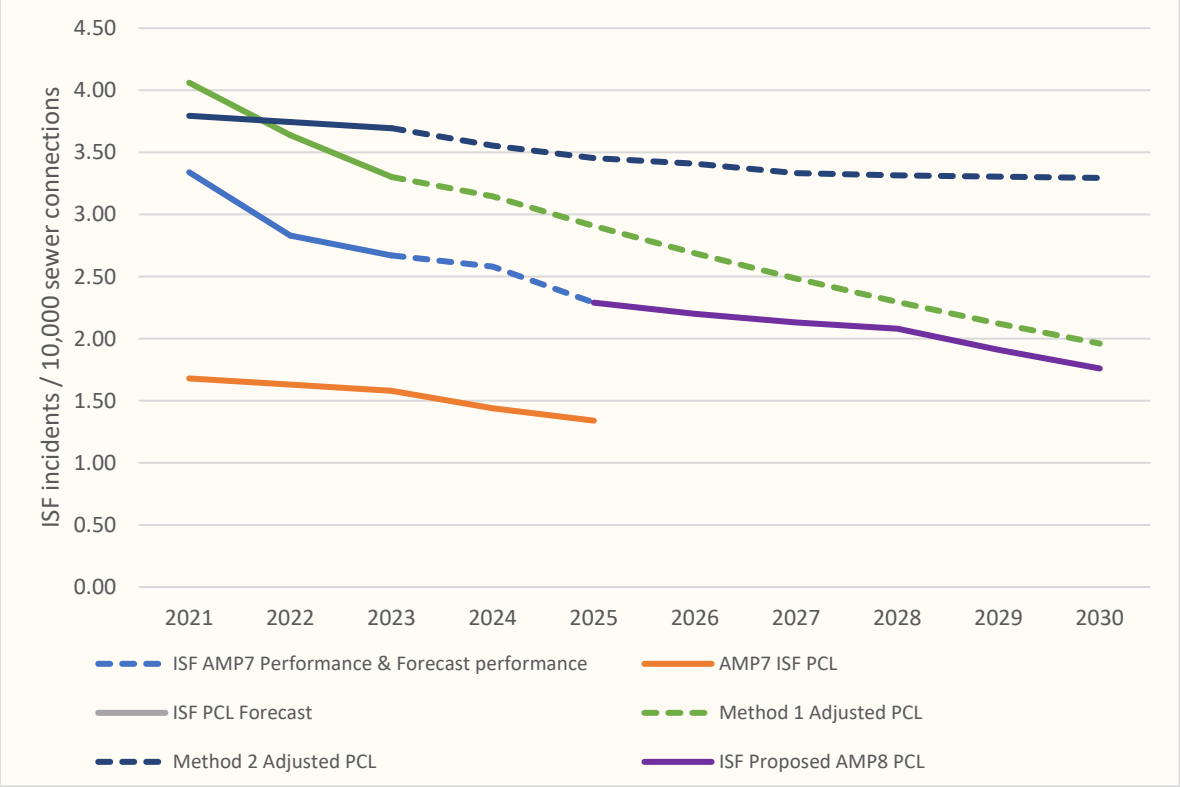



**Figure 78 Model 7 (RE) estimated adjusted PCLs for Yorkshire Water**

## 24.7 Setting our Performance Commitment Level

Table 6 provides both the industry and company actuals and forecasts for the internal sewer flooding performance commitment for both AMP7 and AMP8, as well as the PR19 final determination for this performance commitment.

**Table 108: Industry and company actuals and forecasts and PR19 final determination for internal sewer flooding**

| Number of internal sewer flooding incidents per 10,000 sewer connections | AMP7 | | | | | AMP8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2020 /21 | 2021 /22 | 2022 /23 | 2023 /24 | 2024 /25 | 2025 /26 | 2026 /27 | 2027 /28 | 2028 /29 | 2029 /20 |
| **PR19 final determination** | 1.68 | 1.63 | 1.58 | 1.44 | 1.34 | | | | | |
| **Industry upper quartile actuals and *arithmetic forecast*** | 1.87 | 1.47 | 1.23 | ***1.15*** | ***1.13*** | ***1.11*** | ***1.09*** | ***1.05*** | ***1.02*** | ***0.98*** |
| **Industry average actuals and *arithmetic forecast*** | 2.16 | 2.10 | 1.68 | ***1.60*** | ***1.54*** | ***1.47*** | ***1.42*** | ***1.36*** | ***1.31*** | ***1.27*** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Company actuals, *arithmetic forecast and business plan proposed targets*** | 3.34 | 2.83 | 2.67 | ***2.58*** | ***2.29*** | ***2.20*** | ***2.13*** | ***2.08*** | ***1.91*** | ***1.76*** |

Table 6 shows that we are currently underperforming against our AMP7 target and are currently underperforming against the industry average and industry upper quartile. We have underperformed against both the PR19 final determination and against our industry peers because of the significant, exogenous regional differences we experience. These include a greater proportion of combined sewers and properties with cellars, combined with more annual rainfall in areas in the west of the region. These variables have been used in econometric modelling to determine an expected performance range, and we have then used this output to set a fair and appropriate yet stretching target. Due to the importance of internal sewer flooding to our customers, we have stretched our target further, beyond the modelled performance range.

We set out our modelling evidence in our Annex in Section 2 and in our combined sewers Cost Adjustment claim.

More detail on this subject can be found in **Combined Sewers Cost Adjustment Claim**

Our blind forecast for Year 4 and 5 are 2.58 and 2.29 per 10,000 connections respectively. We are proposing an AMP8 target starting at 2.20 incidents per 10,000 sewer connections in year 1, improving to 1.76 incidents per 10,000 sewer connections by the last year of AMP8, which shows a continuous glidepath of improvement from Year 5 AMP7 forecast outturn and a stretch on the modelled expected performance given our regional specific factors. We will achieve this through several interventions focused on areas with high numbers of cellar properties. This includes the use of sensors, inspection, and rehabilitation of sewers in poor condition as well as targeted operational management (e.g., silt reduction).

## 24.8 Our long-term ambitions

Our LTDS is to continually reduce internal sewer flooding, improving to zero incidents by the end of AMP12. The improvement glidepath is set out in Table 5.

Our modelling shows that we can anticipate achieving a service level of 1.09 incidents per 10,000 sewer connections in 2050, but we recognise that in respect of our wastewater service, ISF reduction is the highest priority for customers.

Achieving zero would be exceptionally challenging given our specific regional factors which include, urban rainfall, length of combined sewers and prevalence of cellared properties. However, we will strive to a target of zero in 2050 and during the next 25 years, will focus on innovation and technology development in this area to support this aspiration. We will collaborate with other companies across and outside the sector to ensure that we are adopting all suitable technologies to achieve this goal.

### Table 109: Our long-term ambitions

| Units | AMP8 | AMP9 | AMP10 | AMP11 | AMP12 |
|---|---|---|---|---|---|
| **Number of incidents per 10,000 sewer connections by end of AMP** | 1.76 | 1.53 | 1.38 | 0.68 | 0 |

Our LTDS plans to target the reduction of modelled flood risk from AMP9 onwards, which will help to reduce the likelihood of internal and external sewer flooding. To do this, in-line with our approach in the DWMP and other non-flooding drivers, e.g. storm overflows, we will need to remove surface water from our drainage networks. A key part to this approach being successful is our work in partnerships, which we are continuing to do in AMP8, and will grow in AMP9. Our

work with Living with Water provides a more detailed blueprint of what is needed with our 25-year Blue-Green Plan in our highest flood risk area Hull and Haltemprice, where improving resilience is critical.

Against the current definition, there is the risk, that a severe rainfall event, could lead to 100s or 1000s of properties flooding in any given year (e.g. as seen in 2007). Whilst we have a long-term plan to increase flood resilience in Hull through Living with Water for example, it is possible that our performance is affected by such severe rainfall events that could fall anywhere across the region, whereby it exceeds the capacity of the sewer system. The latest evidence points to greater extremes in rainfall which creates a greater risk of flooding and highlights that extremes will become worse in the North of England.

Read more about this at
**New extreme rainfall projections for improved climate resilience of urban drainage systems**

### 24.9 Social and Environmental Benefits

Reducing internal flooding provides a societal benefit by:

- Customers not experiencing the onset of flooding,
- Not going through a clean-up operation,
- Not having to have a property repaired,
- Not having to leave the property whilst repairs are made, potentially being out of the property for months,
- Not having the psychological fear or concern of flooding happening again.

### 24.10 Our plans to deliver this commitment

#### 24.10.1 Scale of investment

We are taking a blended approach of operational and capital interventions, reliant on building and creating ever better data to support decision making. Table 5 contains the overarching investment for our delivery plan for AMP8. It includes the three key areas of focus which are:

- Visibility and inspection - understanding where the performance in the sewer network is impacted by customer disposal habits, asset health and rainfall to make capital and operational decisions, including the type and timing of response. We achieve this through our sensor roll out programme and insight work.
- Operational response – providing the appropriate response and decision making to the visibility required by the sensors installed. These may be physical interventions on the sewer e.g. to cleanse the sewer to remove a partial soft blockage or silt deposition through to our customer behavioural targeted campaigns.
- Rehabilitation – where the asset health is identified as requiring attention, taking a predominantly proactive approach to network improvements such as lining, robotic cutting and gully replacement.

We will deliver these through organisation improvements, data confidence, innovation and on the ground interventions.

#### 24.10.2 Organisational delivery approaches

We launched our transformation approach, Wastewater Networks 2.0 in early 2023. The aim of this transformation is to make significant quality and productivity improvements to our end-to-end customer journey for wastewater. This includes how we plan and schedule our work baskets, both through validation of the work required and prioritisation, using informed and evolving triage processes. As part of these improvements, we are developing our Unified Operations Centre concept. Its aim is to provide a platform that brings multiple disparate systems together (e.g. telemetry, asset data in a spatial form, weather) and provide a user interface to view all critical information together in one view. Once the concept is proven and tested (currently ongoing) we plan to roll out across the region.

The journey for improvement is also factoring in how we plan and respond to the growing number of CSAs and main sewer sensors. This will evolve our service to shift more to pre-

emptive interventions in a timely manner rather than reactionary which typically relies on the customer to inform an incident has occurred. As our analytics of the sensors and our fundamental understanding evolves, we will evolve the service offering and how we are organised to deliver pre-emptive and operational intervention.

Our transformation applies throughout our end-to-end process for the customer, starting with our contact centre. We have a targeted up-skilling programme to provide greater content knowledge and awareness of the customer challenges to in turn drive the right level and type of response. This includes providing greater 'on-the-floor' support with experienced team members who can review and support our customer centre staff. We will also be more reliant on digital interaction with our customers so we have greater evidence and also help direct what our first response needs to be (e.g. identifying the right machine and crew dependent on the problem, the access requirements etc).

Organisationally we are also targeting the reduction in "private" jobs to target those that we are directly responsible for. We see this as important to ensure our resources are addressing our customer needs. This starts in our customer centre but will be backed up more and more through innovation such as determining private vs public sewers and hybrid mapping of unknown assets.

### 24.10.3 Driving data confidence and visibility

Our success will in part be dependent on the data and analysis we perform on what we receive from the sensors we are planning to install. The data we have will provide us with a companywide situational awareness view, that we can build investment decisions on, prioritising based on a wide range of factors.

We are developing the platforms and protocol to provide us with the long-term situational awareness required. With so much data, and the need for validation of the data and insight to inform decision-making, this is critical. We will have the ability to analyse the data through a machine learning / artificial intelligence approach. We will critically align the data received from sensors to validate it with nearby sensors and other available data (e.g. weather) to improve the confidence and understanding. We have already developed approaches that enables us to identify blockages forming, and these will continue. We are currently trialling such approaches with our SMART pilot, working with partners (Stantec and StormHarvester) that is analysing multiple sensors in one of our internal sewer flooding hotspots in Leeds (along with other interventions in the trial).

Our sensors will provide the visibility in the main sewer and on the property level. The locations will be targeted based on risk of flooding (and recognising there is interaction between some internal and external sewer flooding locations). The analysis will derive when we need to attend site e.g. to remove silt, optimising our cleansing programmes to ensure they offer the maximum value.

### 24.10.4 Driving improvement through innovation

Innovation will support our transformation to continue to drive efficiency along with reducing the likelihood of internal sewer flooding. Our focus is on digitalisation, rehabilitation, smart control and analytics.

**Digitisation and field systems**

We are testing new approaches that will digitalise, capture and share data and information back to our platform. For example, using the V scout to capture high precision data through to using an i-pad to undertake scans of inspection and manhole chamber.

We are trialling ESRI field maps to capture and update our systems automatically to provide greater knowledge of the local sewer network in and around properties (often not mapped). Such information is critical for our operational teams visiting site and critical to understand intervention choices, including at the customer contact centre as well as scheduling).

We will auto code CCTV data, including laterals, that are difficult and slow to camera (using the lateral camera). This approach reduces significant time in coding large amounts of data and will enable us to target with greater certainty where defects need to be addressed in the future, confirming long term investment needs and having the pipe history tagged and geolocated.

We are trialling the hybrid mapping of sewers to provide better insight on the location of drainage systems in and around properties (typically the transferred assets). Such information will support our planners scheduling and operatives undertaking work. This information will also be of benefit as we update our hydraulic sewer models.

**Rehabilitation**

We are undertaking rehabilitation trials that will improve the speed, quality and cost of lining small diameter sewers. Our spray lining trials have the potential to swiftly improve asset health where structural lining is not required.

We are also supporting the work undertaken on major research programmes such as Pipebots (Pipebots). This research paves the way for the development of small robots to move autonomously through a network identifying issues to inform where an intervention may be required.

**Smart control of the sewer system**

We are trialling the use of smart water butts to optimise when the storage should be empty and when it is safe for the contents to be available for customer use. This technology is applicable to residential if we can drive the costs down and is particularly of value on non-residential premises where there is the potential for larger storage to manage runoff from larger roofs.

We are currently piloting approaches to maximise the use of storage in the drainage network to reduce hydraulic flooding and overflows. Our active system control pilot with Stantec and Siemens is determining the protocols of where to apply active system control to utilise our existing assets as well how us maximise the use of new assets (grey and blue-green). Successful desktop testing will lead to full scale trials.

**Analytics**

Having learnt from the roll out, data analysis and platform requirements from successful sensor trials earl in the AMP, we continuing to develop the analytics and platforms to analyse sensors.

For our sensors in the sewer and our customer sewer alarms where we currently analyse data on a daily basis we will be moving to automated analysis and in the future, automated scheduling. We plan to roll out a large programme of CSAs and main sewer sensors in AMP8, therefore being ready for this deployment is key. To that end we are also undertaking our Smart Wastewater Network Pilot, which is targeting a key internal sewer flooding hot spot in Leeds.

Here along with sensor deployment, and understanding the condition of our assets to high detail, we are combining all the data together and working with our partners Stantec and Stormharverster to analyse and identify where interventions are required using machine learning approaches and data validation with neighbouring sensor data.

### 24.10.5 Interventions in the field to achieve the performance commitment

We will deliver this reduction in internal sewer flooding to properties through a combination of interventions, which build on the learning and application of work through this AMP. We summarise these interventions below which outline how we will gain visibility, respond, rehabilitate where necessary, work with customers and build more flood resilience through partnerships.

We will deploy more **customer sewer alarms**, combined with our revised operational response to reduce internal sewer flooding in high-risk areas. In AMP7 we will have circa 40,000 CSAs deployed, and our intent in AMP8 is to increase this to cover the majority of our cellared property asset base. This will provide visibility to some of our most high-risk locations. This will continue to be a gradual roll out year on year to continue to provide learning to how we prevent incidents and enable future structured replacement programmes for sensors. Along with the CSAs, we will be deploying **main sewer sensors** (circa 68,000 number), targeting locations where internal sewer flooding locations are as well as known operational issues that may contribute to internal sewer flooding.

Enabling the success of CSAs and main sewers sensors is the **analytics** outlined above to determine when to intervention. This may be proactive activities, cleansing the sewer to remove silt through to pre-emptive jetting to remove forming blockages. The insight from the CCTV inspection and coding, will provide the detailed evidence base for future rehabilitation decision making.

Critical to the success is the timely operational response as result of capacity reducing issues forming such as soft blockages and siltation. Our transformation activities are planned to provide us with the flexibility to adapt to pre-emptive, proactive and reactive interventions, based on the data received from our CSAs and main sewer sensor. Our work to continually improve how we schedule and manage crews to deliver a programme of jobs will enable us to be agile in our future ways of working and respond to sensor alerts -whether there are potentially several days to respond or whether a “blue-light” intervention is required within 2 hours.

Where we respond and find more serious defects that require a swift intervention, we are putting in place the mechanisms to enable a first fix fast track civils repair intervention to further avoid repeat incidents.

In support of our inspection approaches we are using the wider breadth of inspection techniques such as CCTV and radar to undertake and record the sewer investigations in the high-risk areas.

We aim to build on the significant investment proposed in behavioural campaigns towards the end of this AMP focused on changing people’s habits of what they dispose of via the sewer system whilst learning from industry work (e.g. UKWIR’s Learning and recommendations from customer behaviour campaigns on blockage reduction project). Our campaigns will take a balanced approach targeting high likelihood of flooding areas along with regional campaigns. Critically we will look to understand and record the impact of these campaigns, along with other interventions to support future decision making.

We will continue and grow our partnership working to increase flood resilience. Whilst this will become a growing focus in AMP9, we are proposing partnership funded investment in Hull and Haltemprice using the knowledge of the Blue-Green Plan created this AMP. Furthermore, there is the potential through the overflow programme where we remove surface water to reduce flooding and create wider benefits.

### 24.11 Our incentive to deliver

**Table 110: ISF Performance Commitment Incentives**

| Incentive Parameter | YW BP proposal/submission |
|---|---|
| **Incentive form** | Revenue |
| **Incentive type** | Outperformance and underperformance payments |
| **Price control allocation** | 100% wastewater network plus |
| **Outperformance payment- standard** | £10.31 million per incident per 10,000 sewer connections (in 22/23 FY average CPIH prices) |
| **Outperformance payment- enhanced** | £20.62 million per incident per 10,000 sewer connections (in 22/23 FY average CPIH prices) |
| **Underperformance payment - standard** | £10.31 million per incident per 10,000 sewer connections (in 22/23 FY average CPIH prices) |
| **Timing of underperformance and outperformance payments** | In-period |

### 24.12 Outperformance and underperformance payments

The ODI rate for this PC is £10.31m per internal sewer flooding incident per 10,000 sewer connections. These values were provided to Yorkshire Water by Ofwat on 23 June and are in financial year 2022/23 values.

Yorkshire Water is not proposing a different ODI rate from that proposed by the regulator.

Yorkshire Water is not proposing a different sharing factor from that outlined in the Appendix 8 of the final methodology for PR24.

### 24.13 Performance Possibilities

Please see Chapter 9: risk and return and uncertainty mechanisms and RoRE risk analysis appendix for details of the overall ODI performance possibilities.

More detail on this subject can be found in **Chapter 9: Risk and Return**

More detail on this subject can be found in **Uncertainty mechanisms and RoRE risk analysis**

### 24.14 Deadbands

Deadbands do not apply to this PC.

### 24.15 Cap/Collars

The guidance published by Ofwat on the development of business plans for PR24 currently suggests that no caps or collars will apply to this PC.

## 24.16 Annexes - Supporting evidence to econometric modelling for ISF

### Annex A: Financial consequences of our Performance Adjustment

In this Annex, we present the estimated financial consequences of Ofwat not recognising our claim; these financial consequences are material. Below, we present: (i) our approach to estimating the financial consequences of our claim; and (ii) the results of this estimation.

**Approach**

We estimate the financial consequences of our claim as the financial penalties we would incur across PR24, if our unique circumstances in are not accounted for. This is calculated by multiplying our estimated PCL uplifts[54] (which are discussed in section 1.1.6.2 and presented in 1.1.16.4) by the ODI rate that Ofwat have indicated for Yorkshire Water at PR24.[55] This rate is £ 10.31m per ISF incident per 10,000 properties. The fact that the ODI rate is symmetrical and linear means that the value of the claim is the same, regardless of our actual performance level.

**Results**

The table below presents the estimated financial penalties we would incur over PR24, if we were to perform at the level suggested by each of the two adjustment methods discussed in section 1.1.6.4, but our target was the common PCL. These estimates are based on our preferred model specification (Model 7), for both OLS and RE. As can be seen, we would incur penalties (relative to our proposed adjustment) in the region of £56.3m to £110.7m across PR24, if our unique circumstances are not accounted for.

**Table 111: Estimated financial consequences of not adjusting performance over PR24**

| Year | Method 1 | Method 2 |
|---|---|---|
| **Model 7 (OLS)** | £57.4m | £110.7m |
| **Model 7 (RE)** | £56.3m | £109.0m |

*Source: Yorkshire Water*

### Annex B: Calculating the percentage of combined sewers in each network

In this Annex, we explain how we calculate the percentage of combined sewers in each network. This is required because Ofwat data does not break down formerly private sewers by sewer type. In addition, we set out a method of testing the sensitivity of our results to assumptions on the proportion of foul sewers that are also combined.
Existing Ofwat data on the length of sewers in each wastewater company's network includes the following elements.

- Length of foul (only) public sewers (in km).
- Length of surface water (only) public sewers (in km).
- Length of combined public sewers (in km).
- Length of rising mains (in km).
- Length of other wastewater network pipework (in km).
- Total length of legacy public sewers as at 31 March (in km).
- Length of formerly private sewers and lateral drains (s105A sewers) (in km).

Where items 1 to 5 sum to form item 6.

However, we want to remove the total length of surface only sewers from the measure of total sewer length, because the vast majority of flooding incidents occur from the foul and combined sewer. In other words, we want to calculate the total percentage of combined sewers in each company's wastewater network as the following:

[54] The uplift is the difference between our forecast PCL for ISF and our adjusted PCL. The details of how the forecast PCL is calculated are presented in 1.1.16.3.
[55] These were shared with us by Ofwat.

$$\frac{Total\ km\ of\ Combined\ Sewers\ (Private\ and\ Public)}{Total\ km\ of\ Sewers\ (Private\ and\ Public) - Total\ km\ of\ Surface\ Sewers\ (Private\ and\ Public)}$$

The Ofwat data, in its current form, is inadequate for the calculation above because it does not break down the length of formerly private sewers (item 7) by sewer type (foul, surface water, combined, etc.) in the same way that it does for public sewers (see items 1 to 5). Thus, we are unable to add the total length of private combined sewers to the denominator, and we are unable to subtract the total length of private surface sewers from the numerator. We therefore estimate the length of legacy private combined and surface sewers in the following way.

- Firstly, we calculate the ratio of lengths of sewer types for public sewers in the oldest year of data available (2011/12) for each wastewater company.
- Secondly, we multiply the length of legacy private sewers (which is fixed) by this ratio. This gives the estimated length of each legacy private sewer type for each wastewater company.

We also test the sensitivity of our Model 7 to also including a subset of foul sewers in the total length of combined sewers. We do this because some foul sewers also take surface water, often referred to as partially separate systems. These foul sewers carry a proportion of the runoff generated in the area, with the remaining carried by the surface water systems. We test the sensitivity of our results to assuming 25% or 50% of foul sewers are acting in a combined manner (the baseline model assumes 0%). We find that our results are not materially sensitive to these changes but do find that the models predict that combined sewers have a greater effect on ISF than they would if foul sewers were not included in the length of combined sewers.

## Annex C: Forecasting the common PCL for ISF at PR24

In this Annex, we explain how we forecast the common PCL for ISF at PR24. This is required because Ofwat have not yet provided an indication of the common PCL for ISF at PR24.[56]
In order to estimate the predicted PCL for ISF at PR24, we take the following steps:

- Gather data shared by companies in their Drainage and Waste Management Plan (DWMP tables. This data includes a prediction of each company's PCL for ISF over the PR24 period and beyond.
- Southern Water and Welsh Water have not published their DWMP tables. For these companies, we therefore take the following steps.
  - Gather data submitted in the App1 tables of each company's business plan. This data includes a prediction of each company's PCL for ISF over the PR24 period and beyond.
  - Where company predictions are not scaled by the number of connected wastewater properties, we scale the data using a linear forecast of connected wastewater properties over the relevant period.
- We then take the upper quartile of the companies' predicted PCLs for ISF for each year of the PR24 period. This gives us the predicted PCL for the PR24 period, which is the same for all companies.

## Annex D: Model and adjusted PCL results

In this Annex, we present the results from our econometric modelling and our estimated adjusted PCL, which are discussed in sections 1.1.6.2.2 and 1.1.6.3.

### Econometric model results

and present the results from the seven model specifications discussed in section 1.1.6.3, for OLS and RE. We make the following observations on these results:

6. **Percentage of combined sewers.** The percentage of combined sewers in a wastewater company's network typically has a statistically insignificant but material relationship with the number of ISF incidents that wastewater companies' customers experience in any given year. The models show that a percentage point increase in the

[56] Please see: https://www.ofwat.gov.uk/publication/pr24-final-methodology-appendix-7-performance-commitments/

percentage of combined sewers is associated with a 0.0 % to 0.8% increase in normalised ISF incidences.[57]

7. **Annual urban rainfall.** Annual urban rainfall has a somewhat statistically significant but material relationship with the number of ISF incidents that wastewater companies' customers experience in any given year. The models show that a 1% increase in annual urban rainfall is associated with a 0.0% to 0.3% increase in normalised ISF incidences.[58] We note that it is unsurprising that this variable is sometimes not statistically significant, because, as explained in section 3.1, annual urban rainfall is not a perfect measure of this driver of ISF.
8. **Percentage of properties with cellars.** The percentage of properties with cellars in a wastewater company's network has a statistically significant and material relationship with the number of ISF incidents that wastewater companies' customers experience in any given year. The models show that a percentage point increase in the percentage of cellars is associated with a 7.6% to 16.3% increase in normalised ISF incidences.[59]
9. **FSEs.** The number of FSEs in a wastewater company's network has a significant and material relationship with the number of ISF incidents that their customers experience in any given year. The models show that a 1% increase in the number of FSEs is associated with a 1.3% to 1.8% increase in normalised ISF incidences.[60]
10. **Robustness and statistical tests.** We find that, with the exception of Model 5, the coefficients of our models are robust to changes in specification. The R-squared of our models is reasonably high but the RESET test (for correct functional form) pass rate is relatively low.

### Table 112: Econometric model results, OLS

| Normalised ISF incidences, natural log | Model 1 OLS | Model 2 OLS | Model 3 OLS | Model 4 OLS | Model 5 OLS | Model 6 OLS | Model 7 OLS |
|---|---|---|---|---|---|---|---|
| **Percentage of combined sewers** | 0.007 | | | | -0.002 | 0.006 | 0.006 |
| **Annual urban rainfall, natural log** | | 0.278 | | | -0.01 | 0.207 | 0.229 |
| **Percentage of properties with cellars** | | | 0.151*** | | 0.090** | 0.109** | 0.106** |
| **Normalised FSE, natural log** | | | | 1.449*** | 1.281** | | |
| **Time trend** | | | | | | | -0.078** |
| **Constant** | 0.429* | -1.419 | 0.307 | -3.601** | -3.171* | -1.439 | -1.296 |
| **R-squared** | 0.096 | 0.084 | 0.296 | 0.407 | 0.479 | 0.355 | 0.450 |
| **RESET test** | FAIL | PASS | FAIL | FAIL | FAIL | FAIL | FAIL |

Source: Economic Insight / Yorkshire Water. Notes: Asterisks indicate statistical significance: *** for 1%; ** for 5%; and * for 10%. Standard errors are robust and clustered at the company level, in line with Ofwat's base cost methodology. RESET pass or fail is assessed at 5% significance level.

### Table 113: Econometric model results, RE

| Normalised ISF | Model 1 RE | Model 2 RE | Model 3 RE | Model 4 RE | Model 5 RE | Model 6 RE | Model 7 RE |
|---|---|---|---|---|---|---|---|

57 The interpretation of the coefficient is calculated as 100*(EXP(B)-1)%.
58 The interpretation of the coefficient is simply taken as B%.
59 The interpretation of the coefficient is calculated as 100*(EXP(B)-1)%.
60 The interpretation of the coefficient is simply taken as B%.

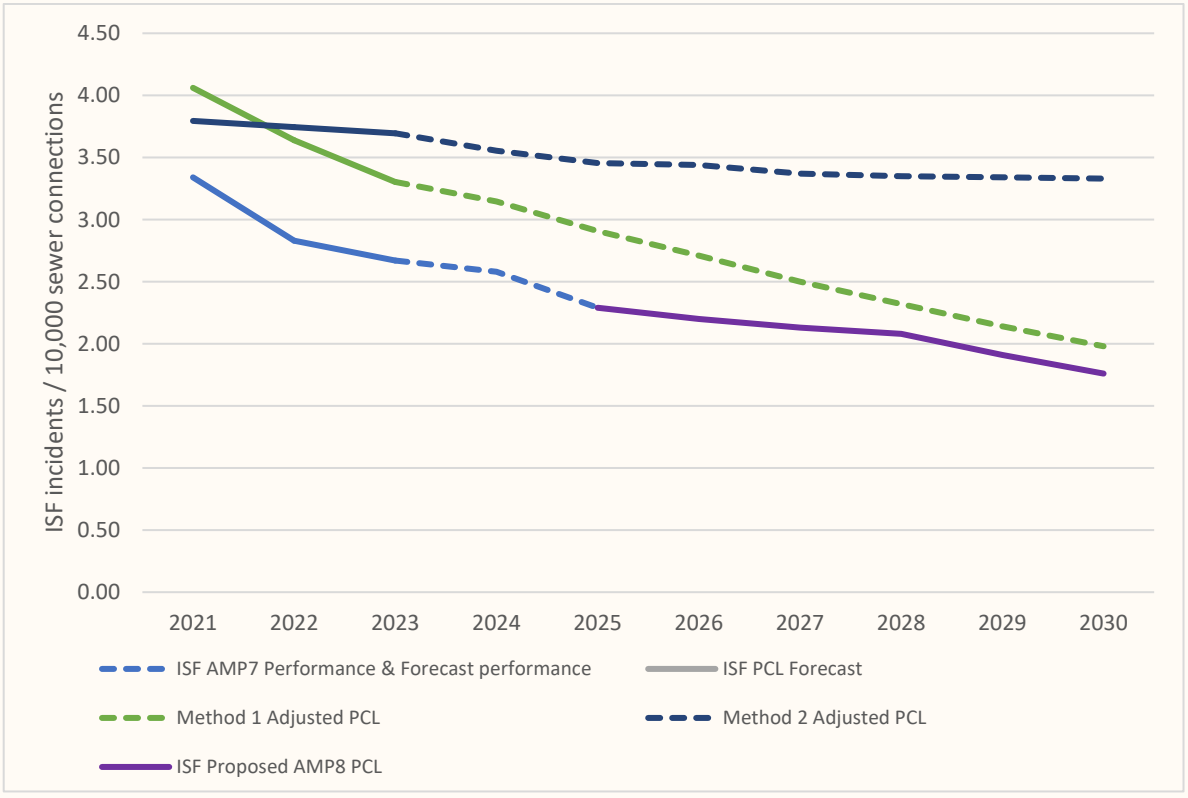
| incidences, natural log | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Percentage of combined sewers** | 0.008 | | | | -0.005 | 0.006 | 0.006 |
| **Annual urban rainfall, natural log** | | 0.163 | | | -0.038 | 0.128 | 0.252* |
| **Percentage of properties with cellars** | | | 0.151** | | 0.073** | 0.118*** | 0.103** |
| **Normalised FSE, natural log** | | | | 1.710*** | 1.805*** | | |
| **Time trend** | | | | | | | -0.079*** |
| **Constant** | 0.400* | -0.526 | 0.307* | -4.387*** | -4.361* | -0.838 | -1.48 |
| **R-squared** | 0.109 | 0.098 | 0.306 | 0.416 | 0.497 | 0.376 | 0.481 |
| **RESET test** | FAIL | PASS | FAIL | FAIL | FAIL | PASS | FAIL |

Source: Yorkshire Water. Notes: Asterisks indicate statistical significance: *** for 1%; ** for 5%; and * for 10%. Standard errors are robust and clustered at the company level, in line with Ofwat's base cost methodology. RESET pass or fail is assessed at 5% significance level.

### Adjusted PCL results

We apply the results from preferred model specification (Model 7) to the two adjustment methods discussed in section 1.1.6.4. The adjusted PCLs generated by the OLS model are shown in Figure 6 and in . The adjusted PCLs generated by the RE model are shown in  and . As can be seen, we calculate a range of adjusted PCLs between 1.96 and 3.44 ISF incidents per 10,000 properties per year.

**Figure 79: Model 7 (OLS) estimated adjusted PCLs for Yorkshire Water**



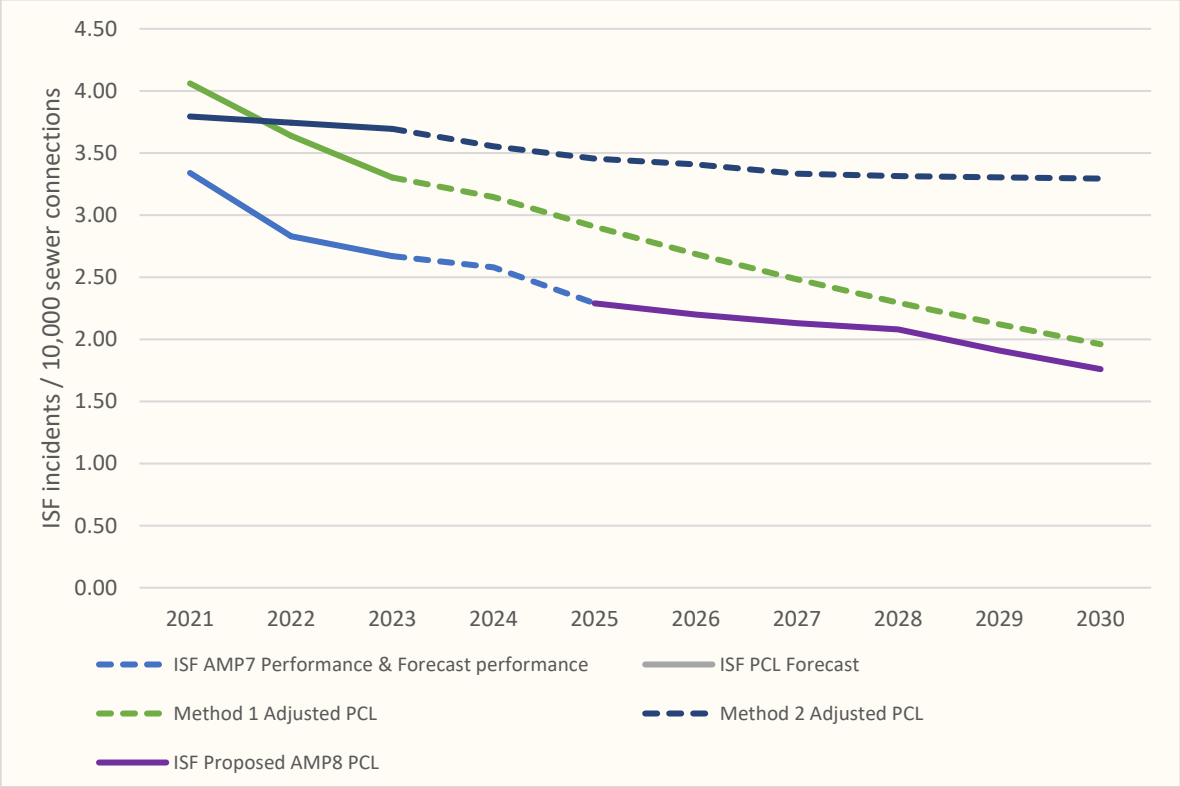

*Source: Economic Insight analysis*

### Table 114: Model 7 (OLS) estimated adjusted PCLs for Yorkshire Water

| Year | Method 1 | Method 2 |
|---|---|---|
| **2026** | 2.71 | 3.44 |
| **2027** | 2.50 | 3.37 |
| **2028** | 2.32 | 3.35 |
| **2029** | 2.14 | 3.34 |
| **2030** | 1.98 | 3.33 |

*Source: Economic Insight Analysis*

### Figure 80: Model 7 (RE) estimated adjusted PCLs for Yorkshire Water




*Source: Economic Insight analysis*

### Table 115: Model 7 (RE) estimated adjustments for Yorkshire Water

| Year | Method 1 | Method 2 |
|---|---|---|
| **2026** | 2.69 | 3.41 |
| **2027** | 2.48 | 3.33 |
| **2028** | 2.30 | 3.31 |
| **2029** | 2.12 | 3.30 |
| **2030** | 1.96 | 3.29 |

*Source: Economic Insight Analysis*

## Annex E: Census Data from 2001 of properties with a cellar / basement

The 2001 Census data included a question of whether the property included a basement[1]. This information has been used to evaluate the proportion of cellars[2] in the Yorkshire Water (YW) region compared with other Water and Sewerage Company (WaSC) sewerage boundaries and England and Wales (excluding YW) as a whole. This indicates that YW has 6.2% of properties with cellars compared with 2.4% across England and Wales (). The basement data was reported at an Output Area level. Subsequent Census questionnaires did not ask if the property had a basement.

### Table 116: Summary of the 2001 Census data for number of properties and those a basement

| Company Name | Total Assessed Households - 2001 Census | Lowest Floor is Basement - 2001 Census | Percentage of Properties with Basements - 2001 Census |
|---|---|---|---|
| **Yorkshire Water** | 2053934 | 126865 | 6.2% |
| **Thames Water** | 5255204 | 183864 | 3.5% |
| **Southern Water** | 1775220 | 56380 | 3.2% |
| **South West Water** | 737761 | 20507 | 2.8% |
| **United Utilities** | 2964718 | 72685 | 2.5% |
| **Welsh Water** | 1351948 | 30001 | 2.2% |
| **Wessex Water** | 1143190 | 23516 | 2.1% |
| **Severn Trent** | 3580039 | 61500 | 1.7% |
| **Anglian Water** | 2515618 | 26788 | 1.1% |
| **Northumbrian Water** | 1135294 | 7490 | 0.7% |
| **England and Wales including Yorkshire Water** | **22512926** | **609596** | **2.7%** |
| **England and Wales excluding Yorkshire Water** | **20458992** | **482731** | **2.4%** |