PR24 Data Table Commentary
Section 4. Cost (wholesale) - waste water

1. Contents

2. CWW1 and CWW1a Totex analysis – wastewater network + and bioresources (pre and post frontier shift and real price effects)

The property connection forecasts used for AMP8 are based on forward forecasts of quantities reported in the APR in the periods FY17 to FY23 in Table 4Q. AMP8 numbers in PR24 Table DS4 are based on Developer Services knowledge of historic growth rather than other external forecasts. The spread and growth of SLPs and NAVs in the numbers is based on what we expect to happen in the market based on market intelligence.

Line CWW1.3 Developer services operating expenditure
AMP8 forecast £0 for five years from FY26-FY30. DS operating expenditure is Capex

Line CWW1.7 Grants and contributions - operating expenditure
AMP8 forecast £0 for five years from FY26-FY30. DS G&C operating expenditure is Capex.

Line CWW1.10 Developer services capital expenditure
Our forecasts at FY23 prices have been based on average capital expenditure from FY18 to FY23 and match the expenditure categories in PR24 Table DS3 specifically Table DS3.1 network reinforcement and Table DS3.4 requisition expenditure. This aligns to the table guidance.
The percentage allocations for expenditure on Foul, SWD and Highway Drainage in AMP8 are based on historic splits of spend between the three categories in the APR Table 4O from FY21 to FY23 APR actuals. The split of expenditure is foul 64%, SWD 31% and Highway Drainage £5%.

For assurance purposes CWW1.10, CWW1.10a and table line DS3.10 match. Total AMP 8 £50.416m.

<u>Converting CWW1a to CWW1</u>

We apply our assumptions for frontier shift and real price effects as set out in SUP11 to the CWW1a data table to populate CWW1. We note that:

- We do not propose real price effects in wholesale waste water.
- We do not apply a frontier shift efficiency to charges outside of our control, namely Local Authority and Cumulo rates, Service Charges and IED costs – identified in CWW2.

3.CWW2 Base expenditure analysis - wastewater network + and bioresources

Total base operating costs across the wastewater price controls are forecast to experience a significant step up in run rates between AMP7 and AMP8 of c£58m pa. This is driven by £30m of WINEP operating expenditure relating to AMP7 activity (classified as enhancement expenditure during AMP7 but transferring to base expenditure from AMP8). The remaining c£28m increase principally arises as follows:

- £5m Opex of capex from other AMP7 schemes (Spills reduction schemes)
- £4m from reinstating activity paused temporarily in 2024/25
- £2m movement from capex to Opex as a result of closing a process at Naburn STW
- £14m EDA Opex solutions
- £6m DPC implementation costs
- £-4m increase in the principal use recharge

AMP7 has seen volatility throughout the AMP in operating costs due to many factors including rising energy and chemical prices, and the instigation in 2022/23 of recognising the principal use adjustment within operating costs rather than within depreciation (as per Ofwat's clarification). The following line by line review provides further detail on how costs are predicted to move between years.

Power

PR19 assumed power costs of c£22m per year, remaining steady across AMP7, although the 2023/2024 budget is c£51m due predominantly to the increase in energy prices over the last 5 years.

Energy prices have steadily increased during AMP7 and unhedged energy was exposed to a very volatile energy market. We continues to manage price risk by hedging according to the energy purchasing policy and making trades according to carefully governed price targets. As of 31 March 2023, we had fixed over 77% of its forecast baseload power requirements for the remainder of AMP7, including 98% for the year to 31 March 2024. It is worth noting that some forward electricity volumes are left open (i.e. unhedged) to the Day Ahead index to make allowances for variations in volumes due to operational factors.

Forecasts for 2023/24 and 2024/25 therefore reflect known hedged prices. The reduction in prices from 2023/24 to 2024/25 reflects the full year effect of a Power Purchasing Agreement taken out during 2023. The Shell windfarm PPA commences in October 2023 to meet 20% of our baseload demand. The business plan power forecasts for 2023/24 and 2024/25 have then been deflated from 2023/24 prices (used in internal planning and

forecasting) to 2022/23 prices for completion of the business plan tables using the average CPIH forecast for 2023/24 as at 1 July 2023.

In 2022/23 we have focused on our electricity consumption performance and optimisation, which will be maintained for the rest of the AMP.

AMP7 has seen an extensive overhaul programme for our CHP assets to ensure resilience for the future and a high level of generation performance for the rest AMP7 and AMP8.

AMP8 unit power costs have been assumed to remain at the 2024/25 levels due to the lack of any certainty around future energy prices. The step increase between 2024/25 and 2025/26 is in relation to the inclusion of the WINEP AMP7 Opex of capex into base.

Other operating costs

Other operating costs saw a reduction in 2022/23 compared to 2021/22 of £21m, of which £15m arose due to the inclusion in 2022/23 of the principal use recharge in operating costs, which had previously been reported within depreciation. Additionally, there was a £3m year on year reduction due to pausing the annual programme of proactive sewer de-silts.

The business plan for 2023/24 projects a £11m increase in other operating expenditure due to enhanced level of spend on maintenance to support operational performance. We have also business planned for targeting wet well cleans.

Base Opex costs temporarily reduce in 2024/25 as Opex is re-directed to enhancement activity (WINEP). The reduction in costs to offset the increase in enhancement expenditure is expected to be delivered by:

- £4m from a further pause on de-silts and fly dosing
- £3m removal of all Opex contingency from the cost base
- £1m benefit from modernisation programme
- £2m reduction in the principal use recharge

The exit cost run rate at the end of AMP7 is then expected to step up in AMP8 as previously mentioned at the top of this section (WINEP, EDA Opex solutions and other costs).

PR19 forecast other operating costs of c£140m pa on average for AMP7 (at 2017/18 prices) which equates to £165m at 2022/23 prices. This compares to an average of £185m pa in CW2.6, which after removing WINEP and PU costs would be £173m, a c£8m pa increase from PR19 run rates.

Business rates

See commentary for business rates table CWW10. CWW10 in 2024/25 includes rates in relation to both base and enhancement expenditure, resulting in a difference between the two tables in relation to additional rates from WINEP schemes in AMP7.

Abstraction charges and discharge consents
We are not forecasting any change in discharge consents.

Costs associated with TMA
We are not expecting any additional councils to start charging traffic management permit fees. The permit fees for the current business plan year have been based upon business planned volumes of activity and contractual price increases for TTROs. Beyond the current business plan year we do not expect the level of activity to vary.

Industrial emissions directive
We are taking measures to comply with the Industrial Emissions Directive (IED) within AMP7 and this will lead to additional Opex costs such as sampling and permits.

Equity issuance costs
There are no equity issuance costs forecast between now and 2030.

4. CWW3 Enhancement expenditure - wastewater network+ and bioresources

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.

We can see strong support for reducing the use of storm overflows during other customer engagement, as identified during a study conducted via our online community on storm overflows. There is an expectation that we should stop using them altogether and anything less than this may be considered insufficient, however there was also acceptance that this would require significant investment and customer suggest they would be willing to pay more to address this.

This extensive engagement allowed us to establish the importance storm overflows to customers and to confidently include this for consultation with our customers in initial stages of affordability and acceptability testing (qualitative research). 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 programme of work in our plan for an additional cost over and above the 'least-cost' bill presented to customers. 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 enhancement spend in our proposed plan in final testing.

In the final quantitative affordability and acceptability testing of our proposed plan (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 we did the same and 79% of customers found our overall plan to be acceptable including this target.

We carried out extensive engagement with our customers, communities and stakeholders. Information on our engagement approach can be found in Chapter 6. Much of this engagement related to storm overflows and the importance of water quality in the rivers, streams and seas of Yorkshire as outlined below.

CWW3 is the Enhancement data associated with the Wastewater Network Plus and Bioresources Price Controls, for both capital and operation expenditure.

As part of our PR24 planning we have assessed what parts of the programme are driven from base. All our solutions are broken down into individual cost elements and these

elements are allocated as a new / additional asset or a like for like replacement asset. Where a cost element if for like for like replacement, we have allocated this to base.

There is no proposed investment for lines CWW3.1 and CW3.2, Event duration monitoring at intermittent discharges.

Lines CWW3.4 and CWW3.5 (£8.315m) contain the expenditure associated with Flow monitoring at sewage treatment works and along with lines CWW3.10 and CWW3.11 (£76.506m), MCERTs monitoring at emergency sewage pumping station overflows, form the Enhancement Case "Monitoring of WWTW intermittent discharges and WTW discharge flows", where full justification and evidence of the expenditure can be found.

Lines CWW3.7 and CWW3.8, Continuous river water quality monitoring (WINEP/NEP) has £155.055m totex, the justification for which can be found in the Enhancement case "Upstream and downstream monitoring of all our outfalls". Also, within that Enhancement case is £2.939m investigations which are allocated to line CWW3.107.

Justification for our expenditure for Bathing Waters is detailed in the Enhancement case "Bathing Waters" and covers the following lines (some partially):
CWW3.13/14 - Increase flow to full treatment (£49.247m totex out of a Line total of £92.676m)
CWW3.16/17 – Increase storm tank capacity at STWs - grey solution (£6.859m totex out of a line total of £29.319m)
CWW3.22/23 – Storage schemes to reduce spill frequency at CSOs etc - grey solution (£52.001m totex out of a line total of £597.190m)
CWW3.46/47 – Storm overflow - new / upgraded screen (£7.606m totex out of a line total of £126.569m)
CWW3.88/89 – Microbiological treatment - bathing waters, coastal and inland (£57.167m totex)
CWW33.109/110 - Investigations, other (WINEP/NEP) - multiple surveys, and/or monitoring locations, and/or complex modelling (£5.866m totex out of a line total of £84.456m)

Justification for our expenditure for the Storm Overflow Programme is detailed in the "Storm overflow Reduction Plan" Enhancement case. Lines that are supporting this case are:
CWW3.13/14 - Increase flow to full treatment (£43.373m totex out of the Line total of £92.676m)
CWW3.16/17 – Increase storm tank capacity at STWs - grey solution (£22.458m totex out of a line total of £29.319m)
CWW3.22/23 – Storage schemes to reduce spill frequency at CSOs etc - grey solution (£351.005m totex out of a line total of £597.190m)
CWW3.34/35 – Storm overflow - sustainable drainage / attenuation in the network (£55.918m totex out if the Line total of £140.617m)

CWW3.37/38 - Storm overflow - source surface water separation (£53.588m totex out of a Line total of £134.758m)

CWW3.46/47 – Storm overflow - new / upgraded screen (£102.696m totex out of a line total of £126.569m)
CWW33.109/110 - Investigations, other (WINEP/NEP) - multiple surveys, and/or monitoring locations, and/or complex modelling (£76.621m totex out of a line total of £84.456m)

Also within the "Storm overflow Reduction Plan" Enhancement case we are reporting on the FD_IMP – Urban Pollution Management Solutions which are supported by these lines:
CWW3.19/20 - Increase storm system attenuation / treatment on a STW - green solution (£4.348m totex)
CWW3.22/23 – Storage schemes to reduce spill frequency at CSOs etc - grey solution (£105.686m totex out of a line total of £597.190m)
CWW3.46/47 – Storm overflow - new / upgraded screen (£5.075m totex out of a line total of £126.569m)

We have brought forward into AMP8 all the coastal bathing waters for delivery in advance of the SODRP (storm overflow discharge reduction plan) target date of 2035 to deliver by 2030. We will deliver 27 schemes in AMP8 - some via DPC. Further details can be found in the Enhancement Case "Coastal Bathing Waters Overflows" and is supported by the following lines:
CWW3.22/23 – Storage schemes to reduce spill frequency at CSOs etc - grey solution (£88.500m totex out of a line total of £597.190m)
CWW3.34/35 – Storm overflow - sustainable drainage / attenuation in the network (£84.700m totex out if the Line total of £140.617m)
CWW3.37/38 - Storm overflow - source surface water separation (£81.171m totex out of a Line total of £134.758m)
CWW3.46/47 – Storm overflow - new / upgraded screen (£11.192m totex out of a line total of £126.569m)

There is no proposed investment for lines CWW3.25 and CW3.26, Storage to reduce spill frequency at CSOs etc - green solution.
There is no proposed investment for lines CWW3.28 and CW3.29, Storm overflow - discharge relocation.
There is no proposed investment for lines CWW3.31 and CW3.32, Storm overflow - increase in combined sewer / trunk sewer capacity.
There is no proposed investment for lines CWW3.40 and CW3.41, Storm overflow - infiltration management: wastewater.
There is no proposed investment for lines CWW3.43 and CW3.44, Storm overflow - sewer flow management and control.
There is no proposed investment for lines CWW3.49 and CW3.50, Treatment for chemical removal.

The Enhancement case for "Water Quality Improvements and Investigations for Chemicals and Microplastics" is supported by the lines:
CW3.52/53 – Chemicals and emerging contaminants monitoring, investigations, options appraisals (£5.572m totex)
CWW3.106/107 - Investigations, other (WINEP/NEP) - survey, monitoring or simple modelling wastewater (£0.105m totex out of a Line total of £2.498m).

There is no proposed investment for lines CWW3.55 and CW3.56, Treatment for total nitrogen removal (chemical).
There is no proposed investment for lines CWW3.58 and CW3.59, Treatment for total nitrogen removal (biological).

Lines CWW3.61 and CWW3.62, Nitrogen technically achievable limit monitoring, investigation, or options appraisal, contain the expenditure £0.047m associated with the Enhancement case "Investigation into Nitrogen Removal Technically Achievable Limit".

The Enhancement case "Schemes Driven by Population Numbers Under the Urban Wastewater Directive" contains the justification and evidence for the expenditure associated with the U_IMP1 and U_IMP2 Drivers and contains a subset of CWW3.64/65 (Treatment for phosphorus removal (chemical)) at £41.763m (from a Line total of £345.772m). in addition to this line there is a Q:B element £0.202m held within CWW2.16.

The Enhancement case for "River Water Quality Improvements (Sanitary and Nutrients)" contains the justification and evidence for the expenditure associated with the WFD_ND, WFD_IMP, WFD_IMP_MOD, HD_IMP and EnvAct_IMP1 Drivers and contains a subset of:
CWW3.64/65 (Treatment for phosphorus removal (chemical)) at £304.010m (from a Line total of £345.772m).
CWW3.70/71 (Treatment for nutrients (N or P) and / or sanitary determinants, nature based solution) at £3.718m.
CWW3.73/74 (Treatment for tightening of sanitary parameters) at £60.264m
in addition to these lines there is a Q:B element £0.978m held within CWW2.16.

There is no proposed investment for lines CWW3.67 and CW3.68, Treatment for phosphorus removal (biological).
There is no proposed investment for lines CWW3.76 and CW3.77, Catchment management - chemicals source control.
There is no proposed investment for lines CWW3.79 and CW3.80, Catchment management - nutrient balancing.
There is no proposed investment for lines CWW3.82 and CW3.83, Catchment management - catchment permitting.
There is no proposed investment for lines CWW3.85 and CW3.86, Catchment management - habitat restoration.

Lines CWW3.91 and CWW3.92 (Septic tank replacements - treatment solution) contain expenditure associated with the Enhancement case "Septic tank replacements - treatment solution" at a value of £12.669m. Also in this Enhancement case is the details behind the expenditure in lines CWW3.94/95 (Septic tank replacements - flow diversion) at £5.602m.

There is no proposed investment for lines CWW3.97 and CW3.98, Fish outfall screens.

Schemes to meet the 25 year Environment Plan that do not fall under any other Driver are in Lines CWW3.100 and CWW3.101 at £4.842m totex. The justification and evidence of these costs can be found in the Enhancement case "Schemes to Meet the 25-Year Environment Plan".

River water Quality Investigations are in lines CWW3.109 and CWW3.110 at £1.970m totex, details of these solutions can be found in the Enhancement case "River Water Quality Investigations".

There is no proposed investment for lines CWW3.115 and CW3.116, Contribution to third party schemes under WINEP/NEP only (not covered elsewhere).
There is no proposed investment for lines CWW3.118 and CW3.119, River connectivity (e.g. for fish passage); (WINEP/NEP).
There is no proposed investment for lines CWW3.121 and CW3.122, Restoration management (marine conservation zones etc).
There is no proposed investment for lines CWW3.124 and CW3.125, Access and amenity for WINEP/NEP only (not covered elsewhere).
There is no proposed investment for lines CWW3.127 and CW3.128, Advanced WINEP (not covered elsewhere).
There is no proposed investment for lines CWW3.131 and CW3.132, Sludge storage -Tanks (pre-thickening, pre-dewatering or untreated).
There is no proposed investment for lines CWW3.134 and CW3.135, Sludge storage -Tanks (thickened/dewatered or treated).

Lines CWW3.137/138 (£37.674m totex) and CWW3.143/144 (£6.062m totex) support the Enhancement case "SUiAR Schemes to improve the resilience of recycling sludge to land". Also within this case is £0.106m mapped to lines CWW3.168/169.

There is no proposed investment for lines CWW3.140 and CW3.141, Sludge treatment - Anaerobic digestion and/or advanced anaerobic digestion.
There is no proposed investment for lines CWW3.146 and CW3.147, Sludge treatment – Other.
There is no proposed investment for lines CWW3.149 and CW3.150, Sludge investigations and monitoring (NEP only).

Lines CWW3.153/154, Growth at sewage treatment works is £37.596m totex, evidence and justification of the expenditure is documented in the Enhancement case "Sewage treatment growth".

There is no proposed investment for lines CWW3.156 and CW3.157, Reduce flooding risk for properties.
There is no proposed investment for lines CWW3.159 and CW3.160, First time sewerage.
There is no proposed investment for lines CWW3.162 and CW3.163, Sludge enhancement (growth).
There is no proposed investment for lines CWW3.165 and CW3.166, Odour and other nuisance.
There is no proposed investment for lines CWW3.171 and CW3.172, Security - SEMD. This is all classed as clean water in AMP8.
There is no proposed investment for lines CWW3.174 and CW3.175, Security – cyber. This is all classed as clean water in AMP8.

Lines CWW3.177 and CW3.178 is the expenditure (£40.463m) for Greenhouse gases. The PV Groundmount and PV Roofmount solutions are split 50% clean and 50% waste, whilst the Methane and N_2O is 100% in the waste price controls. The expenditure for the full solutions (including clean) can be found in Enhancement case "Net Zero".

Lines CWW3.181 and CWW3.182 are additional lines for Living with Water (LWW) at £26.250m totex. LWW is working collaboratively with us and local councils, the Environment Agency and a local University to create a Blue Green plan for resilience in Hull and Haltemprice. Full details can be found in the Enhancement case "Living with Water".

There is no proposed investment for lines CWW3.183 and CW3.184 in AMP8, Additional line - WINEP / NEP Investigations (Frequently Spilling Storm Overflows).
There is no proposed investment for lines CWW3.185 and CW3.186 in AMP8, Additional line - Conservation drivers.

Lines CWW3.187 and CWW3.188 are additional lines for Appropriate Measures (IED) totalling £118.201m. These lines were added to meet the 'Biological waste treatment: appropriate measures for permitted facilities' published by the Environment Agency, further details can be found in the Enhancement case "Appropriate Measures".

5. CWW4 – Wastewater network+ - Functional expenditure

The table reconciles to functional base operating expenditure in CWW1 excluding rates and third party services. Frontier shift has not been applied to service charges.
For overall variance please see commentary for CWW2.

From 2022/23 to 2023/24 there is an increase in functional base operating expenditure due to enhanced level of spend on maintenance to support operational performance.

Functional base operating expenditure temporarily reduce in 2024/25 as Opex is re-directed to enhancement activity (WINEP).

We then see a step up in year 1 of AMP8 for base WINEP expenditure.

After reviewing the methodology in relation to Principal Use (PU) recharges, we have made the following changes:

- In year 4 we have allocated PU adjustment to direct costs and not G&S
- The Price Control for Principal Usage is now Sewage Collection.

6. CWW5 – Wastewater network+ - Large sewage treatment works

The Annual Performance Report of 2022/23 identified and reported upon 36 Large category waste treatment sites.

Two sites classified as Size 5 in 2022/23, Selby and Bolton on Dearne, are close to the load threshold between the Size 5 and the Large categories. The load projections predict that the Selby works and Bolton on Dearne works will cross the threshold to be reclassified as "Large" during 2024/25 and 2027/28 respectively; this is reflected in the Table for these years and subsequent year, making a total of 38 sites by 2030. The table below shows the load projections crossing the 1500 Kg BOD/day threshold for the category.

	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32
	BOD lOad kg/day	BOD lOad kg/day	BOD lOad kg/day	BOD lOad kg/day	BOD lOad kg/day	BOD lOad kg/day	BOD lOad kg/day	BOD lOad kg/day	BOD lOad kg/day	BOD lOad kg/day
BOLTON ON DEARNE/STW	1,479	1,480	1,485	1,491	1,496	1,501	1,505	1,509	1,481	1,484
SELBY/NO 2 STW	1,444	1,493	1,504	1,514	1,523	1,532	1,538	1,543	1,454	1,414

The calculations of load for Table CWW5 are based upon the established methodology for the Annual Performance Report; as such there are no material changes to reporting methods. However, the assumption that trade loads remain constant, as used for the PR19 projections, had to reviewed due to the impact of the Covid pandemic and Brexit which showed a significant reduction in the trade load from 2020 to 2022. We have assumed that pre 2020 trade loads will have reached a stable level by 2027.

The data accuracy is presented in the Table below. The data with the lowest confidence grade is line CWW.15 The flow to full treatment which includes storm volumes – Ofwat have acknowledged that this is a low confidence data item. It is also likely that the flow trends will increase as the investment in overflow spill reduction required by the Environment Act increases the storm volumes returned to the network for treatment.

We have a range of confidence grades across this table with the majority falling into A1 or B2, except for CWW5.10 which has been classified C3 as this is an extrapolation from Garde B data. Detail for each line available on request.

7. CWW6 – Wastewater network+ - Sewer and volume data

There are no material year on year variations in the table. There are no implemented changes to any reporting methods in the table.

The quality of the data is scored as A-2.

CWW6.1 & 2 is driven by customer requests for connection under S101a, recognising the challenge in forecasting ad hoc requests as only current known requests are listed.

CWW6.3 & 4 these are based on historic average of SPS adoptions, plus known planned increases in 26/27 for U_IMP7 & 2029/30 Maltkiln development.

Line 14-21 these are based on historic data and checked against expected new connections. Data forecasts ranged from 31,306km to 31,321km for total legacy sewers at 2029/30 depending on source data used for new connections (ONS vs Housing association). Lower forecast has been used for table.

Line 22 no change to reported value of s105A sewers is expected during the AMP8 period.

We have a range of confidence grades across this table with the majority falling into B3.

8. CWW6a Transition and accelerated programme - Wastewater network+ - Sewer and volume data

This table is intentionally left blank.

9.CWW7a – Wastewater network+ - Sewage treatment works data; size and consents

The underlying calculations for Table CWW7A follow the methodology used in the Annual Performance Reports. As such It Is felt that there are no significant material changes to the reporting methods that would impact on the data outputs.

Changes to Numbers of Waste Treatment Sites

There are 2 numeric site closures planned during Amp 7, Kirk Smeaton and Haxby Walbutts, which are transfer schemes under the AMP 7 Phosphorous removal programme. There are no numeric transfer schemes planned during Amp 8 although two septic tank sites are to be closed and pumped to Reeth STW.

The Amp 8 Phosphorous programme at 87 sites sees several sites change from secondary treatment categories to tertiary treatment sites where tertiary solids capture is required. By the end of AMP 8 the number of sites with a Phosphorus limit will be 183 compared to 100 at the end of AMP 7.

Growth and Impact on Total Load Received –Bod5 (as Population Equivalent)

The location of significant sites for housing involves significant extensions at Howden STW and Kirk Hammerton STW and are described in the Enhancement Growth programme submission. At a regional level the residential population growth is a steady 0.22% per annum and is derived from the 2020 Report from Edge Consultants. This report was commissioned in response to challenge from Ofwat concerning the projection method used for PR19.

The impact of COVID-19 and Brexit on trade load reductions is discussed in the report for Table CWW6 Line 12. We have projected recovery to pre pandemic levels by 2027 and then constant afterwards.

The impact of increasing load has been reviewed from the study of the impact of increasing population on the Dry Weather flow consents at localised sites ; the schemes identified to resolve the sites at risk of becoming non-compliant sites as population increases is described by the Enhancement programme for Growth at waste treatment sites.

We have a range of confidence grades across this table with the majority falling into A1 or B2, except for CWW5.10 which has been classified C3 as this is an extrapolation from Garde B data. Detail for each line available on request.

10. Table CWW7b Wastewater network+ - Sewage treatment works data; UV permits & CWW7c Wastewater network+ - Sewage treatment works data; treatment type

The BOD loadings and site counts in Table CWW7b and CCW7c are derived from the data prepared for Tables CWW5 and CWW7A. As such data quality is described in the Commentary sections for CWW5 and CWW7A above.

The calculations of load for Tables CWW5,CWW 7A, CWW7B and CWW7C are based upon the established methodology for the Annual Performance Report; as such there are no material reporting changes.

Table CWW7b Wastewater network+ - Sewage treatment works data; UV permits

Table CWW7b requires an aggregated and weighted figure for each site size category for the number of days per year of Ultra-violet disinfection. All our sites operate for 365 days per year and so this is a default value of 365 in the valid size category fields.

We raised a query with Ofwat with regard to inclusion of non-permitted storm flow disinfection in May 2023; Ofwat confirmed that these storm processes are not to be included in the Table. There are no in-year changes in this table as we anticipate using biological process enhancement rather than ultra-violet irradiation to improve microbiological quality of effluent for inland bathing waters.

CWW7C - Wastewater network+ - Sewage treatment works data; treatment type

Projected Changes to Treatment Codes Between 2023 and 2030

Table CWW7C is concerned with tracking changes in waste treatment type across the asset stock.

In May 2023 we raised a query with Ofwat as to whether the installation of chemical dosing for Phosphorus removal constituted " Tertiary Treatment". This was proposed because the process is retrofitted at existing sites to improve effluent quality however, the installation involves addition and augmentation of assets within primary and secondary treatment processes. Ofwat replied that a change in category to tertiary was only to be used if a tertiary solids capture stage was included.

The projected changes in Treatment Code to 2030 are summarised in the table below and compiled from:

- Asset Planning details of investments in new sites and treatment changes.

There are no changes in treatment type proposed within base expenditure, although some biological filters may be replaced with membrane units. There are 7 local areas served by us expected to experience significant and targeted development between 2025 and 2035. However, it is currently anticipated that these areas will be served by extensions at existing treatment works, one of which will involve the addition of wetlands.

- There are 4 site closures planned from 2023 to 2030.

Closed After	**Site To Be Closed**	**Driver**
2027/28	GRINTON EAST/STW	Closed Under U_IMP7 -Transfer to Reeth
2027/28	GRINTON WEST/STW	Closed Under U_IMP7 -Transfer to Reeth
2024/25	HATFIELD WOODHOUSE/STW	Closed From 2024/25 For AMP7 P removal - transfer to THORNE STW
2024/25	KIRK SMEATON/STW	Closed From 2024/25 For AMP7 P removal - transfer to NORTON STW

- The WINEP urban waste water driver "U_IMP7" target to convert 31 septic tanks to secondary treatment sites by installing either green filtration solutions or submerged aeration units. These schemes change the treatment code from "Primary" to "Secondary (Biological Filtration)" .
- AMP 7 Phosphorous removal scheme designs where tertiary wetland or solids capture processes have been identified through the design process.

- AMP 8 Phosphorous Removal Schemes. The treatment type changes to tertiary if the proposed Phosphorus scheme requires tertiary solids removal.

Table of Site Treatment Code Changes Between 2023 and 2030

Cause of Treatment Code Change (TSC=Tertiary Solids Capture)	Treatment Code Change between 2023 and 2029-30 Incl	No OF Sites
AMP7 P Removal-Chemical Dosing -Provision of TSC	From SECONDARY (ASP) to TERTIARY (A2)	6
	From SECONDARY (BIOL FILTER) to TERTIARY (B2)	12
	From TERTIARY (A1) to TERTIARY (A2)	4
	From TERTIARY (B1) to TERTIARY (B2)	5
AMP7 P Removal-Chemical Dosing -Provision of TSC	From SECONDARY (BIOL FILTER) to TERTIARY (B2)	1
AMP7 P Removal-EBPR -Provision of TSC	From SECONDARY (ASP) to TERTIARY (A2)	1
AMP7 P Removal-Soneco -Provision of TSC	From SECONDARY (BIOL FILTER) to TERTIARY (B2)	1
AMP7 P Removal-Transfer Hatfield Woodhosue to Thorne S	From SECONDARY (BIOL FILTER) to x-Closed-transferred To ThorneSTW	1
AMP7 P Removal-Transfer KIRK SMEATON STW TO NORTON STW	From TERTIARY (B1) to x-Closed-transferred To Norton STW	1
AMP7 P Removal-Wetland or Reactive Media	From SECONDARY (ASP) to TERTIARY (A1)	2
	From SECONDARY (BIOL FILTER) to TERTIARY (B1)	1
AMP8 P Removal-Wetland	From SECONDARY (BIOL FILTER) to TERTIARY (B1)	1
AMP8-UIMP7_Closed Under U_IMP7 -Transfer to Reeth	From PRIMARY to x-Closed Under U_IMP7 -Transfer to Reeth	2
AMP8-UIMP7_Green Soln for 2ndary trt	From PRIMARY SEPTIC TANK ONLY to SECONDARY (BIOL FILTER)	1
	From PRIMARY to SECONDARY (BIOL FILTER)	15
AMP8-UIMP7_SAF soln in 2028-29	From PRIMARY SEPTIC TANK ONLY to SECONDARY (BIOL FILTER)	2
	From PRIMARY to SECONDARY (BIOL FILTER)	8
AMP8-UIMP7_Site becomes reportable	From x-Not reported until 2028 when RBC fitted to SECONDARY (BIOL FILTER)	3
A - Total of Code Changes to End 2029-30		**67**
B-AMP 8 WINEP P Schemes -Compliance Date 31st Mar 2030		
AMP 8 P Scheme with TSC -31 Mar 2030	New Code = TERTIARY (A2)	11
	New Code = TERTIARY (B2)	26
AMP 8 P Scheme with Wetland -31 Mar 2030	New Code = TERTIARY (B1)	2
B - Total of Code Changes For Permits -		**39**

11. CWW8 Wastewater network+ – Energy consumption and other data

CWW8.1 Total Sewerage Catchment Area:

In 2022/23 the procedure for this line was reviewed and updated. The previous approach identified sites with 10 or more sewer length 'outside' of digitised catchment area. This was taken as a threshold as the criteria for an update as it identifies a change of reasonable significance.

Operational Business Process Change has driven a requirement to ensure we identify assets that are private or not adopted by us through the Developer Services Process. We wanted to ensure we understand and focus on activity and resources to maintain our Assets and their delivery of service to customers.

Process has been developed to ensure that all new development sites established since 2011 now have a digitised polygon where S104 has been received. This supports our operational teams in understanding the ownership of assets when investigating performance issues such as sewer flooding or pollution.

The data driven approach utilising post transfer (post2011) polygons mapped onto the corporate Sewer Network dataset held within Odyssey. A spatial analysis report is run using FME to identify newly mapped sewers from a new development that are 'outside' of a Wastewater Catchment area. These indicate where the area needs increasing. It also identifies the portion of any 'NAV sites' that overlap a Sewerage Catchment area and these overlapping areas require deducting from the overall Wastewater Catchment area reported figure.

CWW8.2 & 8.3 Designated Coastal Bathing Waters and Inland Bathing Waters:

This data is sourced from the published DEFRA data which complies with the standards set out by the Bathing Water Regulations.

CWW8.4 Number of intermittent discharge sites with event duration monitoring:

The data source is the DEFRA WINEP Spreadsheet, which is owned and maintained by the regulator.

As for AMP8 the total number of new installed duration monitors is forecast as 0 as there is no indication that more will be added year on year.

CWW8.5 Number of monitors for flow monitoring at STWs: C4

The data source for this will be the DEFRA WINEP Spreadsheet, which is owned and maintained by the regulator.
In AMP8 21 have been forecast for the first year of the AMP but the forecast thereafter is 0 additional flow monitors being added per year as there is no indication that further flow monitors will be required.

CWW8.6 Number of odour related complaints
This information is a subset of the data captured by agents recording inbound contacts, as described in "Total Household complaints".
The numbers for the forecasted for this line are taken from the average from the previous 3 years of data. However, the number is expected to be lower, so this is a cautious estimate, but reasonable given the high number for the 2020/21 data for Odour related complaints, relating to the public sewer.
2022/23 has a reported actual figure which is part of the CWW8.6 therefore the actual figure is used.

CWW8.7-8.9 Energy consumption

Lines 8.7 and 8.8 show Energy consumption for sewage collection/sewage treatment and wastewater network +. Line 8.9 is a summation of Collection and Treatment.

Base line data was taken from 2022/23's APR table with the same definition. The annual figure had to be normalised due to 2022/23 being a dry year. Data shows 8% less flow was treated in 2022/23 compared to the average of the 3 years prior.

An uplift of 8% of was applied to the electricity consumption for 'collection'. This boundary is primarily made up of pump stations, which have a direct correlation between flow and power. 'Treatment' on the other hand has other influencing factors, such as loading to the ASP's, and sludge processing. A desktop exercise on a typical works at Blackburn meadows (BBM) was carried out, where it was determined 52% of sites consumption was related to flow and loading accounting for 44%.
The tightening consent on phosphorus removal is predicted to have a material impact increase on our consumption.
A change from historic reporting has been made due to moving to a new energy system. This resulted in the overall consumption reducing by approx. 2.5%. the reason being a move from Grid supply point to Meter supply point.

We have a range of confidence grades across this table with the majority at A2.

12. CWW8a Transition and accelerated programme - Wastewater network+ - Energy consumption and other data

This table is intentionally left blank.

13. CWW9 Enhancement expenditure (cumulative) - wastewater network+ and bioresources

This table is intentionally left blank.

14. CWW10 Wholesale wastewater local authority rates

CWW10.1: Year 2022/23 is end of year Actual Rateable Values; 2023/24 is start of year Actual Rateable Values; 2024/25 onwards is company forecast. The current 2023/24 year has seen a significant 27% increase in the rating liability from the 2017 Rating List. The average overall increase on Treatment Works was 32%, with smaller STW's experiencing biggest increases of up to 300%. We – like all other WASC's - have numerous smaller works in rural locations. Our consultant advisors suggest that there are limited opportunities to challenge the increases without a significant and industry co-ordinated action which is currently under consideration.

CWW10.3; Year 2023/24 Actual opening year figure. The 2023/24 year benefitted from Transitional Relief of c£1.36m which reduced the full liability in year. No further Relief benefit is forecasted. The increase in base liability continues through future years of 2024/25 and 2025/26, in addition we have forecast an increase in Asset Stock from the AMP7 WINEP & IED Bioresources asset extensions to come into use from mid-2024/25 and then in full from 2025/26 with phased commissioning.

CWW10.11: Year 2023/24 is the effect of the 2023 Revaluation on the 2017 Rating List. Year 2026/27 is the effect of the 2026 Revaluation on the 2023 Rating List. From 2026/27 when the next 2026 Revaluation occurs the uncertainty and risk increases, we forecast a further increase of c£1.6m annually, which reflects the expected and forecasted increase in construction prices as advised by external consultants assuming the Decapitalisation percentage set by the government remains unchanged – both of which are key variables to the rating liability. However, by April 2026 we expect the legislative change of the introduction of the Duty to Declare (Notification) currently progressing in the Non-Domestic Rating bill 2023 (see Context above for details) that will require the disclosure of waste treatment assets not currently in rating liability which will significantly increase the base liability by+c£5.4m from the 2026/27 year. This higher base liability continues through the following years of 2027/28 and 2028/29, and then into the next Revaluation due April 2029.

We have rationalised office premises and space post-pandemic and change to working employee practices with the closure of three offices. We have reflected this change of asset stock from 2026/27 which is also the next Revaluation Year with the assumption that the properties will be disposed of by that date. Wastewater has 50% benefit of this saving (c£200K annual).

For 2029/30 year the new liability has been forecasted – again expecting an overall increase because of the forecasted continued construction cost and price growth but assuming no change to the Decapitalisation percentage set by government. By the 2029

Revaluation it is considered likely that the government will review and change the Decapitalisation percentage but as there is no data or external opinion as to if this is likely or if changed what that could be we assume no change to the key determinants.

CW10.3 To calculate/estimate rates transitional relief CW10.3: 2023/24 is the Actual Relief or Surcharge applied to Charge Bill. This is zero/nil. Relief/Surcharges are set at each national Revaluation next due April 2026. Therefore zero/nil for 2024/25 and 2025/26.

Years 2026/27, 2027/28, 2028/29 and 2029/30 figure is estimated as zero/nil following national Revaluations due April 2026 and April 2029 based on the forecasted rateable values and bill liability, per the following assumptions.

Years 2026/27, 2027/28, and 2028/29 figure has been estimated using methodology adopted by VOA for 2023 Revaluation, taking PR24 Final Determination Income Expenditure Depreciation values of Clean Water business only for 2024/25 Year (see Assumption A & Data Source I). Actual figures will depend on PR24 FD, and then negotiations with VOA.

2029/30 figure will be subject to national Revaluation due April 2029 (committed to by current government). Figure kept same as previous FY as no data to forecast from. Actual figures will depend on PR24 FD, and then negotiations with VOA.

15. CWW11 Third party costs by business unit for the wholesale wastewater service

During AMP7 the only third party costs reported in relation to bulk supply export (New Appointment and Variations -NAV activity) has been in relation to staff in the Wholesale Markets team who manage NAV activity and these had all been allocated to the water price control. The volume NAV sites has been an immaterial proportion of the overall cost of operations and combined with the fact that costs cannot be individually identified as directly relating to NAV activity, there were no operational third-party costs reported.

However, with the volume of properties served via a NAV expected to have increased 6 fold between now and the end of AMP8, it felt appropriate to recognise an estimate of the cost of treating the sewerage from NAVs throughout AMP8.

A forecast of the scale of cost was derived by calculating an average Opex cost per ML treated for 2023/24 for the whole of our operation and applying that unit cost to the forecast ML treated from NAVs each year throughout AMP8.
Costs are forecast to increase over AMP8 in line with the forecast increase of NAV connections.

16. CWW12 Transitional spending in the wholesale wastewater service

All expenditure in CWW12 follows the same line mapping as the expenditure reported in CWW3. Expenditure in CWW12 has no proportional allocation to base.
We are on track with our PR19 enhancement programme.

CWW12.13 – 48 relate to our Combined Sewer Overflow (CSO) programme which has been passed at solution level to our delivery function to evaluate the level of transitional expenditure required and is achievable without detriment to the AMP7 programme. Due to the size of the AMP8 proposed CSO programme transitional funding is required to ensure deliverability is achievable for Year 1 and beyond to realise the outputs before end of the amp.
To enable this process sites have been grouped according to value for batching, we have included Blue Green sites for early start due to partnership building and allow liaison with relevant stakeholders so agreements can be signed.
We have batched and grouped some catchments for early start as they interlink with the larger schemes. The value of transitional expenditure relates to 92 of our CSO's proposed in the PR24 plan.

Line CWW12.52 relates to WFD chemical & micro plastics to meet the regulatory deadline of 30th April 2027 the investigation into the impact of chemicals and microplastics in biosolids spreading on groundwater and soil, part of WFD investigations Chem A, and WFD Investigations MP, new land agreements must be set up and new monitoring boreholes drilled. As this process can take significant time due to discussions with landowners, it must be started early.
To deliver by the regulatory deadline of 30th April 2027 the investigation into the impact of chemicals in wastewater discharges into the Humber Estuary protected sites, part of WFD investigations Chem A, we need to work with a suitable contractor to put forward the case for adoption of a suitable existing Humber Estuary model, collate existing data, review it and analyse the gaps, and collect data (if required) then calculate loads and apportion them to sources for the project. Due to the significant uncertainty involved in modelling the Humber Estuary and disagreement with the Environment Estuary over Humber Estuary modelling outcomes last asset management period, this work must be started early.

Lines CWW12-64-73 relates to WINEP no deterioration driver and we have allocated 10% of the total scheme cost to 24/25 to enable deliver of early statutory deadlines in PR24. Below is a table showing the sites with associated delivery dates.

Site name	Completion date
BRANDESBURTON/STW	2 phase-WFD_ND 31 Mar 2026 and WFD_IMP 31 Mar 2030
BURLEY IN WHARFEDALE/STW	2 phase-WFD_ND 31 Mar 2026 and WFD_IMP 31 Mar 2030
CHERRY BURTON/STW	2 phase-WFD_ND 31 Mar 2026 and WFD_IMP 31 Mar 2030
COLD HIENDLEY/STW	2 phase-WFD_ND 31 Mar 2026 and WFD_IMP 31 Mar 2030
EASINGTON/STW	Early Start- compliance 31 Mar 2026
HALIFAX COPLEY/STW	Early Start- compliance 31 Mar 2026
HUNMANBY/STW	Early Start- compliance 31 Mar 2026
KIRKBY FLEETHAM/STW	Early Start- compliance 31 Mar 2026
KIRKLINGTON/STW	Early Start- compliance 31 Mar 2026
KNARESBOROUGH/STW	2 phase-WFD_ND 31 Mar 2026 and WFD_IMP 31 Mar 2030
LECONFIELD/STW	2 phase-WFD_ND 31 Mar 2026 and WFD_IMP 31 Mar 2030
LEVEN/STW	2 phase-WFD_ND 31 Mar 2026 and WFD_IMP 31 Mar 2030
LEYBURN/STW	Early Start- compliance 31 Mar 2026
NAFFERTON/STW	Early Start- compliance 31 Mar 2026
NOTTON VILLAGE/STW	2 phase-WFD_ND 31 Mar 2026 and WFD_IMP 31 Mar 2030
PATRINGTON/STW	Early Start- compliance 31 Mar 2026
RUFFORTH/STW	2 phase-WFD_ND 31 Mar 2026 and WFD_IMP 31 Mar 2030
SHERBURN IN ELMET/STW	Early Start- compliance 31 Mar 2026
SINDERBY/STW	2 phase-WFD_ND 31 Mar 2026 and WFD_IMP 31 Mar 2030
WATTON/STW	Early Start- compliance 31 Mar 2026
WOOLLEY VILLAGE/STW	2 phase-WFD_ND 31 Mar 2026 and WFD_IMP 31 Mar 2030

CWW12.106 Investigations, other (WINEP/NEP) - survey, monitoring or simple modelling wastewater capex relates to WFD investigations - silver Knostrop £0.346m

CWW12 .109 includes is £7.55m of expenditure relating to the EnvAct_INV4 storm overflow investigations is needed to ensure that we meet the delivery date of 30th April 2027 for the first tranche of work (474 investigations). The early phasing is required due to both the volume of the work for us and the supply chain to deliver, along with the expected complexity of the data collection and monitoring phase, which similar work in previous AMP's has taken us 2.5-3 years to complete.
Also included in this line is £1.962 related to bathing waters to enable deliver of early statutory deadlines in PR24. See table below.

Site		£
BW_Inv1 Ilkley	2027 date	£0.65m
BW_Inv5 Wetherby	2027 date	£0.66m
BW_Inv5 Knaresborough	2027 date	£0.65m

For further information on the detail of the schemes requesting transitional expenditure please refer to each enhancement case.

17. CWW13 Best value analysis; enhancement expenditure - wastewater network+ and bioresources

We have not identified any Third Party expenditure for wastewater.

The data captures expenditure in both AMP8 and AMP9 for schemes that start in AMP8, and the Present value of costs for the years 2025/2055. The Present value expenditure was discounted in line with the HMT Green Book Guidance at the rate of 3.5%.

We have not submitted any costs in addition to the present-value costs for 2025/2055.

18. CWW14 Best value analysis; enhancement expenditure of least cost options -wastewater network+ and bioresources

This table is intentionally left blank.

19. CWW15 Best value analysis; enhancement benefits - wastewater network+ and bioresources

Definition of Benefit Types In Table CWW15

The table requires the entry of benefit units and their monetised impact from 2025 to 2035 for each category of enhancement expenditure set out in Tables CWW3 and CWW13.

Ofwat prefers that the table articulates benefit using the Common Performance Commitments developed for PR24 as far as possible. However, the Ofwat table guidance also offers the alternative of the use of the WINEP Environmental outcomes or a bespoke benefit valuation system. We have reviewed these data options and propose to use the benefit valuation system from the corporate Investment Planning Tool.

Our investment planning system uses a bespoke benefit identification and scoring system for cost benefit analysis. The benefit scores are then monetised using a Six Capitals approach. This system was developed and assured for PR19 and enhanced for PR24. Twenty-four different benefit impacts were used in the system's wastewater enhancement portfolio.

It is not possible to easily condense these corporate benefit metrics to map directly to the common performance commitments in Table OUT 3 due to non-uniformity between units. Furthermore, the table guidance suggests that all benefit should be articulated rather than solely the benefits associated directly with the Performance Commitments.

As such we propose that Table CWW15 uses the "Other Category" option extensively to list and monetise benefits.

We acknowledge that this compromises the automatic calculations in Table OUT3 (columns U to AY); these calculations only collate the monetised benefit figures from Table CWW15 that are mapped to the Common PC framework codes i.e. the lookups in table OUT 3 do not consider the lines assigned to benefit type "Other" .

The Table below summarises the benefit types proposed for use in Table CWW15 (bespoke to us).

Table Listing our Benefit Metrics associated with Waste water Enhancement Expenditure

Service Measure and Impact # Units	Sum of Units-2025-30	Sum of Units-2030-35
Additional Metrics-Air pollution emissions# Tonnes PM10 (tPM_{10}) (2DP)	-6.40	-11.00
Additional Metrics-Operational carbon# Tonnes CDE (tCO_2e) (2DP)	-64,837.00	-118,700.00
Avoidable Costs-Avoidable costs# £000s (3DP)	-0.28	-0.70
Bathing Water-Compliance failure# No of Failures (2DP)	-83.92	-109.90
Bathing Water-Deterioration in classification# Nr Of Bathing Waters (3DP)	-4.22	-6.02
DWMP overflow spills-Overflow spill frequency# number (1DP)	-3,665.00	-36,638.00
DWMP overflow spills-Overflow spill volume# metres cubed (2DP)	-617,872.00	-11,555,810.00
Final Effluent Compliance Numeric-Discharge Permit Compliance Impacting Failure# Nr of failures (2DP)	-935.00	-1,240.00
Flow Compliance WWTW-Failing DWF# Nr OF Failures (2DP)	-11.00	-25.00
Flow Compliance WWTW-Failing FFT# Nr OF Failures (2DP)	-3.60	-6.00
Flow Compliance WWTW-Failure to record report flow correctly# Nr OF Failures (2DP)	-15.84	-26.40
Flow Compliance WWTW-MCERTS failure# Nr OF Failures (2DP)	-15.84	-26.40
IFH-Flooding of habitable area# Nr of incidents (3DP)	-21.88	-54.70
Land Use-Area of additional inland wetland# Total area restored or protected (ha) (4DP)	4.12	13.36
Land Use-Area of bare ground# Total area restored or protected (ha) (4DP)	-24.45	-69.42
Land Use-Area of greenspace# Total area restored or protected (ha) (4DP)	16.26	44.70
Water Use-Surface water separated from combined# Hectares (ha) (3DP)	0.00	856.25
Legal Non Compliance-Fines and Compensation events# Number of Non Compliance Events (3DP)	-1,264.64	-10,165.22
River Quality-WINEP Bad to Poor# Km (2DP)	8.65	265.55
River Quality-WINEP Moderate to Good# Km (2DP)	50.79	771.10
River Quality-WINEP Poor to Moderate# Km (2DP)	16.91	748.43
Sludge Treatment and Disposal-Additional transport required more than 10percent# Tonnes Dry Solids (2DP)	0.00	-83,775.00
Sludge Treatment and Disposal-Loss of throughput to sites less than 10ktDs per annum# Tonnes Dry Solids (2DP)	0.00	-25,405.00
Sludge Treatment and Disposal-Loss of throughput to sites more than 10ktDs per annum# Tonnes Dry Solids (2DP)	0.00	-36,360.00
Grand Total		

Unit Values for Benefit Types

The unit valuations for each unit of benefit were developed for PR24 from corporate data and enhanced for the WINEP Options Development process for development of the WINEP programme for PR24. The Table below summarises the benefit in £mill predicted for each Enhancement Category by the Yorkshire Water benefit framework (Service Measure Framework- SMF)

Table - Annual Benefit Monies Generated by Service Measure Framework For Waste Enhancement Categories

Enhancement Category	Benefit (£m) 2025-26	Benefit (£m) 2026-27	Benefit (£m) 2027-28	Benefit (£m) 2028-29	Benefit (£m) 2029-30	2030-31 and after	Sum of 30 year NPV
Event Duration Monitoring at intermittent							
Flow monitoring at sewage treatment works		£0.10	£0.10	£0.10	£0.10	£0.10	£1.62
Increase flow to full treatment		£7.61	£7.61	£7.61	£7.61	£7.61	£123.38
Increase storm tank capacity -grey solution					£0.04	£0.04	£0.49
Increase storm system attenuation / treatment on a STW - green solution				£0.26	£0.26	£0.26	£3.74
Storage schemes to reduce spill frequency at CSOs etc - grey solution	£0.01	£9.37	£9.38	£9.38	£9.65	£10.52	£167.11
Storm overflow - sustainable drainage / attenuation in the network	£0.00	£0.00	£0.00	£0.00	£0.55	£2.94	£38.44
Storm overflow - source surface water	£0.00	£0.00	£0.00	£0.00	£0.53	£2.81	£36.84
Storm overflow - infiltration management							
Storm overflow - sewer flow management							
Storm overflow - new / upgraded screens	£0.00	£0.47	£0.47	£0.47	£0.63	£0.80	£12.08
Treatment for phosphorus removal			£0.18	£0.41	£0.41	£8.86	£115.47
Treatment for nutrients (N or P) and / or sanitary determinands, nature based			£0.00	£0.00	£0.00	£0.32	£4.11
Treatment for tightening of sanitary				£0.44	£0.44	£0.94	£12.91
Microbiological treatment - bathing waters, coastal and inland					£25.69	£25.69	£352.57
Septic Tank Replacements - Treatment				£0.00	£0.00	£0.00	£0.01
Septic Tank Replacements - Flow diversion				£0.33	£0.33	£0.33	£4.81
25 Year Environment Plan						£0.34	£4.39
Investigations, other (WINEP/NEP) - desk-based studies only		£0.00	£0.00	£0.00	£0.00	£0.00	
Investigations, other - survey, monitoring or simple modelling		£0.00	£0.00	£0.00	£0.00	£0.00	
Investigations, other - multiple surveys, and/or monitoring locations, and/or				£5.17	£5.17	£5.17	£75.02
Sludge storage - Cake pads / bays						£2.13	£27.58
Sludge treatment - Thickening and/or dewatering						£0.25	£3.23
Growth at sewage treatment works (excluding sludge treatment)			£0.99	£1.66	£1.66	£5.63	£76.32
Greenhouse gas reduction (net zero)		£3.54	£7.63	£9.46	£10.14	£10.14	£163.86
Additional line 1 (living With Water)						£1.38	£18.78
	£0.02	**£21.09**	**£26.37**	**£35.29**	**£63.21**	**£86.26**	**£1,242.76**

Statement on Application of inflation and Net Present Valuations

All benefit monetised factors were extracted from the EDA Investment Planning System at a price base relevant to April 2022. These have then been converted at entry to the Ofwat Table to a 2022/23 financial year average using the CPIH index published by the ONS. The 30-year NPV value was calculated according to the social time preference rates as set out in the 'The Green Book' (HM Treasury, 2020).

Cost Benefit Review of Enhancement Schemes

It should be stated that the majority of the Enhancement schemes are driven by statutory drivers and as such not required to a positive cost benefit to assure delivery. This is reflected in the use of the non-monetised benefit of "Legal Non Compliance-Fines and Compensation events# Number of Non Compliance Events (3DP)" in Table CWW15.

There are only two areas of Enhancement that are fully considered to be choice, namely Greenhouse Gas Reduction (Net Zero) and Living With Water (TOTEX lines CWW13.239 and CWW13.243 respectively). The Totex and benefit values from tables CWW13 and CWW15 are summarised in the Figure below. Living with Water is not fully cost beneficial as the AMP 8 Scope includes a significant degree of planning for AMP 9 and 10 delivery and does not see any benefit arising from AMP 8 activities until AMP 9.

Scheme	Units	Expenditure and Benefit												Net Present Value 2025-55
		2025-26	2026-27	2027-28	2028-29	2029-30	2025-30	2030-31	2031-32	2032-33	2033-34	2034-35	2030-35	
Greenhouse gas reduction (net zero)														
TOTEX CWW13.239 Greenhouse gas reduction (net zero); BVA wastewater totex	£m	17.690	16.697	5.388	0.878	-0.190	40.463	-0.169	-0.169	-0.169	-0.169	3.519	2.843	51.367
Benefit CWW15.640 Greenhouse gas reduction (net zero)	£m	0.000	3.536	7.631	9.460	10.140	30.769	10.140	10.140	10.140	10.140	10.140	50.702	163.861
												CBA Ratio	CBA Ratio	**3.19**
Living with Water														
TOTEX CWW13.243 Living with Water; BVA wastewater totex	£m	5.100	5.100	5.350	5.350	5.350	26.250	0.350	0.350	0.350	0.350	0.350	1.750	27.573
Benefit CWW15.651-Additional line 1 (living With Water)	£m	0.000	0.000	0.000	0.000	0.000	0.000	1.382	1.382	1.382	1.382	1.382	6.910	0 18.780
												CBA Ratio	CBA Ratio	**0.68**

Uncertainty of Cost Benefit Review of Enhancement Schemes

Uncertainty with regard to the corporate benefit impact is affected by the assignment of the magnitude of units and the unit valuation. The valuations have been developed from corporate financial reporting and will have the uncertainty associated with using regional "top-down" data to assess the benefit of localised schemes.

The statutory nature of the majority of the Enhancement expenditure has made detailed and quantitative cost benefit articulation less of a priority.

20. CWW16 – Best value analysis; enhancement benefits of least cost options – wastewater network+

This table is not populated for PR24.

21. CWW17 Accelerated programme expenditure –wastewater network+

Expenditure relates to schemes approved under Ofwat Accelerated Infrastructure Delivery Project:

- Scheme 6: Inland bathing water improvement scheme - Wharfe Ilkley
- Scheme 9: Coastal bathing water improvement

Both these areas of expenditure support bathing waters currently classified as 'Poor' under the Bathing Water Legislation, and therefore are accelerated to support water company contributions towards bathing water quality.

For scheme 6, we are proposing statutory and non-statutory investment to ensure the catchment is addressed at the same time to ensure for more efficient solution development and delivery.

At the time of submitting our initial Accelerated Infrastructure Delivery Project proposals, our submission was informed by the Government's Storm Overflow Reduction Plan and our interim digital modelling which we undertook following on from the bathing water designation on the River Wharfe in Ilkley.
Three areas included in our accelerated infrastructure delivery project submission have been removed from the WINEP. These are:

- Tertiary treatment at Grassington STW
- Tertiary treatment at Draughton STW
- Tertiary treatment at Beamsley STW

The Environment Agency removed these from the WINEP due to the bathing water classification in Ilkley being driven by elevated samples during wet weather events rather than continuous impacts within the catchment. We therefore have not included these scheme costs within our accelerated infrastructure delivery cost profiles, and we do not propose to deliver these schemes.

Since our submission of costs through the acceleration process, we have continued to review our cost profiles in line with our delivery profiles. For Ilkley, we have reviewed 2026/2027 costs and brought these into 2025/2026 to reflect the commitment dates. For Wheatcroft, we have reviewed 2025/26 costs into 2024/25 to also reflect delivery dates.

We have also reviewed screen costs and profiled these into the final year of delivery to reflect when these asset improvements will be delivered on site. Our Opex allowances also reflect the year of delivery.

22. CWW18 Cost adjustment claims - base expenditure: wastewater network+ and bioresources

	Title	Commentary
CWW18.1	**Description of cost adjustment claim**	The base cost impact of our AMP7 Phosphorus Removal Programme unfunded through base modelling
CWW18.2	**Type of cost adjustment claim**	We have assigned this to 'new legal requirements' as the claim is for the costs to maintain compliance with new legal requirements not in the historic dataset.
CWW18.3	**Symmetrical or non-symmetrical**	This is a forward-looking claim and therefore non-symmetrical.
CWW18.4	**Reference to business plan supporting evidence**	Refers to the Cost Adjustment Claim Appendix
CWW18.5	**Total Gross Value of Claim**	We populate the gross value of the claim to align our latest costed ongoing operating costs excluding Sludge. We do not populate claim values for the period 2022-25 as we assume that any operating costs in this period are allowed for through the PR19 Totex allowance.
CWW18.6	**Implicit Allowance**	This has been calculated as set out in Section 1.5
CWW18.7	**Total Net Value of Claim**	Calculated from above two lines
CWW18.8	**Historic Base Expenditure**	The investment to address these new obligations has only begun in AMP7 with the first operating expenditure seen in 2021/22 so we have not included historic base expenditure for years prior to this. A small value (as reported in APR table 7F Column O has been reported in 2021/22) as the first small schemes with early compliance dates have been delivered.
CWW18.9	**Totex for the control**	We are not required to populate Totex value but include a WWN+ value
CWW18.10	**Materiality**	N/A We note that the size of the claim is significantly higher than 1% of WWN+ Totex historically.

	Title	Commentary
CWW18.11	**Description of cost adjustment claim**	This claim is due to the non-inclusion of a combined sewers variable in the base cost modelling.
CWW18.12	**Type of cost adjustment claim**	This claim is related to a regional operating circumstance.
CWW18.13	**Symmetrical or non-symmetrical**	Symmetrical
CWW18.14	**Reference to business plan supporting evidence**	Refers to the Cost Adjustment Claim Appendix
CWW18.15	**Total Gross Value of Claim**	We have used totals identified through the modelling and split these costs across the SWC value chain using the average splits across our last 7 APRs
CWW18.16	**Implicit Allowance**	We have not included an implicit allowance as the value of the claim has been derived from the difference between models including and excluding the % combined sewer driver so already excludes implicit allowance.
CWW18.17	**Total Net Value of Claim**	Calculated from above two lines
CWW18.18	**Historic Base Expenditure**	We have used our modelling to estimate historic implicit combined sewer allowances from 2012-2023. See Appendix 2. We have used the net values from this to populate the 'historic total expenditure' in the CWW18 data table and split the costs across the value chain using a) the in-year value chain split as reported in APR or b) the average value chain split for 2016-2022 if a is not available (or is a forecast cost).
CWW18.19	**Totex for the control**	We are not required to populate Totex value but identify that the claim sits in the WWN+ price control.
CWW18.20	**Materiality**	N/A We note that the size of the claim is significantly higher than 1% of WWN+ Totex historically.

23. CWW19 – Wastewater network+ - WINEP phosphorus removal scheme costs and cost drivers

CWW19.1-400 and 402 – x - Companies should provide all additional relevant quantitative cost driver data in the blank columns and provide further explanatory text in the table commentary.	**N/A - No additional Cost driver attributes , other than those cited in the Table CWW19, have been used**
26.2 Annual actual or forecast costs are required and not cumulative costs. This value should be the incremental, proportional allowance to the phosphorus or nitrogen removal scheme on a site. The method used to apportion or estimate costs should be set out in table commentary.	
26.6 Where a company has a single phosphorus or total nitrogen removal scheme in WINEP/NEP that is made up of works over multiple sites and also includes undertaking associated interventions within the catchment as part of the single scheme, it should report all relevant information on each site or catchment area as separate line. The same WINEP/NEP reference will enable linking of the parts of the scheme. **For the catchment-based intervention relevant quantitative cost drivers can be included in the column provided and other further explanatory text included in table commentary**	**N/A -there are no single schemes involving multiple sites**
For sites included within catchment permitting schemes the details of the site-specific phosphorus permit should be given in the relevant cost driver columns. **Information relating to stretch targets, and further explanatory text, should be provided in table commentary**	**N/A - there are no catchment permitting schemes proposed at this time for AMP 8**
Where a site has a new or enhanced permits for both phosphorus and total nitrogen, costs should be apportioned between the phosphorus and total nitrogen cost incurred. The apportioned costs should be reported separately in both the phosphorus and total nitrogen section of the table. **In addition, please provide commentary on the methodology you have followed to apportion the costs for the relevant schemes.**	

Under cost driver 10 'Solution type' please choose one of the following. If you have entered 'Other' for any then please provide explanation in your table commentary: 1. Chemical treatment only; 2. Biological treatment only; 3. Nature based solution only; 4. Catchment nutrient balancing only; 5. Combined chemical and biological; 6. Combined chemical and nature based; 7. Combined chemical and CNB; 8. Combined biological and nature based; 9. Combined biological and CNB; and 10. Other. There are examples in guidance	**Yes**

Section 1 – Data Table Context

The need for enhancement spending on nutrient removal in AMP8 is due to the continuing information on the impact of our asset base and catchments and interaction with the impact of nutrients on the receiving environment alongside increased Regulatory expectations.

This table provides cost drivers of the Phosphorus removal schemes identified as of July 5th for AMP 8 completion. There are 87 waste treatment sites where a phosphorus removal scheme is all or part of the enhancement expenditure at the site.

There are no Total Nitrogen removal schemes propose din Amp 8 and this section of Table CWW19 is blank.

2 - Data Overview

Scheme Reference In Table CWW19	Scheme Type	% Scheme Costs Assigned To Phosphorus Removal
Scheme 77 -APPLETON WISKE/STW	Phosphorus and BOD	80%
Scheme 78 -BRANDESBURTON/STW	Phosphorus and BOD	80%
Scheme 79 -EASINGTON/STW	Phosphorus and Ammonia	50%
Scheme 80 -EAST COWTON/STW	Phosphorus, BOD and Ammonia	60%
Scheme 82 -MAUNBY/STW	Phosphorus and BOD	70%

Scheme 83 -NORTH COWTON/STW	Phosphorus, BOD and Ammonia	60%
Scheme 84 -NORTHALLERTON/STW	Phosphorus and BOD	70%
Scheme 85 -SKIPSEA/STW	Phosphorus, BOD and Ammonia	60%
Scheme 86 -WENTWORTH/STW	Phosphorus and Ammonia	50%
Scheme 87 -WEST ROUNTON/STW	Phosphorus and BOD	80%

The data is pertinent to AMP 8 regulatory requirements under the Environment Agency's WINEP Programme and extends nutrient removal (phosphorus) to the smaller waste treatment sites, the larger sites having schemes for completion under the AMP 7 investment programme (80 Schemes).

The quality and provenance of the site load data and required permit limits is available in the commentary for Table CWW5 and CWW7a-b-c which report on projections of Phosphorus limits and site loadings.

3-Apportionment of Costs for Joint Driver Schemes
The derivation of the Programme for the Phosphorus programme is described in the Enhancement Case For River Water Quality. Eighty -seven sites for Phosphorus removal are identified of which 10 also include a tightened sanitary limit for ammonia or BOD.

The costs associated with each parameter is differentiated by the Enhancement categories in Tables CWW3 and CWW13. The apportionment of costs in these tables is derived during the detailed design and costing of the scheme; the design components are assigned according to their role in delivering the revised permits.

The table below summarises the percentage of the total scheme costs assigned to the scheme in Table CWW19.

Permit Only Sites

There are 3 sites where the proposed Phosphorus limit of 2 mg/l under the urban waste water driver U_IMP2 for AMP 8 is higher than the water framework directive limit of 0.5 mg/l set for the AMP 7 scheme. At these 3 sites we have allowed notional costs for monitoring and permit compliance.

For these sites in the "Cost Driver 10-Solution Type" we have used the code "10. Other # Permit Change"

Wastewater network+ - WINEP nutrient removal (phosphoru			
Scheme name and WINEPID reference	Units	DPs	Cost driver 10 Solution type
Scheme 41 -LEEMING BAR/STW-08YW100037a	£m	3	10. Other #Permit Change
Scheme 62 -THORP ARCH/STW-08YW100036a	£m	3	10. Other #Permit Change
Scheme 67 -WETHERBY/STW-08YW100045a	£m	3	10. Other #Permit Change

Cost Driver 10 Solution Type

The Solution Types for Cost Driver 10 were assigned from consideration of the proposed scope for each scheme as summarised in the table below.

Table CWW19 Solution Type	Scheme Outline
1. Chemical treatment only	Single Ferric and Caustic
1. Chemical treatment only	Soneco + Tertiary Solids Capture
1. Chemical treatment only	Single Stage Ferric + Tertiary Solids Capture
1. Chemical treatment only	Single Ferric and Caustic + Tertiary Solids Capture
1. Chemical treatment only	2 Stage Ferric + Caustic Dosing
1. Chemical treatment only	2 Stage Ferric + Tertiary Solids Capture
1. Chemical treatment only	Caustic Dosing + Tertiary Solids Capture
1. Chemical treatment only	2 Stage Ferric + Caustic Dosing + Tertiary Solids Capture
2. Biological treatment only	SAF
2. Biological treatment only	SAF + Tertiary Solids Capture
3. Nature based solution only	Wetland
5. Combined chemical and biological	Secondary SAF + 2 Stage Ferric + Caustic Dosing + Tertiary Solids Capture
10. Other #Permit Change	Monitoring and Permit change only

24. CWW20 Transition and accelerated programme - Wastewater network+ - Sewage treatment works population, capacity and network data

CWW20.9 3 scheme have been selected for delivery via a wetland solution:

- 2025/26 Kirklington STW
- 2029/30 Baldersby STW
- Sand Hutton STW

CWW20.10 - the current design area of the wetland for the 3 schemes is:

- Kirklington STW 0.426ha
- Baldersby STW 0.408ha
- Sand Hutton STW 0.418ha

CWW20.19 no schemes for meeting the new P limit consents have been chosen to meet this with biological treatment .

CWW20.20 sites with P limit consent changes treated by chemical dosing are listed below:

SITE	Consent year	New P limit
EASINGTON/STW	2025/26	4
HUNMANBY/STW	2025/26	5
LEYBURN/STW	2025/26	2
NAFFERTON/STW	2025/26	6
WATTON/STW	2025/26	3.5
BRANDESBURTON/STW	2025/26	5
CHERRY BURTON/STW	2025/26	6
COLD HIENDLEY/STW	2025/26	4
LECONFIELD/STW	2025/26	4
LEVEN/STW	2025/26	5
NOTTON VILLAGE/STW	2025/26	5
RUFFORTH/STW	2025/26	6
SINDERBY/STW	2025/26	8
WOOLLEY VILLAGE/STW	2025/26	6
BURLEY IN WHARFEDALE/STW	2025/26	3
KNARESBOROUGH/STW	2025/26	4

SITE	Consent year	New P limit
BRANDESBURTON/STW	2029/30	0.25
CHERRY BURTON/STW	2029/30	0.25
COLD HIENDLEY/STW	2029/30	0.25
LECONFIELD/STW	2029/30	0.25
LEVEN/STW	2029/30	0.25
NOTTON VILLAGE/STW	2029/30	0.25
RUFFORTH/STW	2029/30	1
SINDERBY/STW	2029/30	0.25
WOOLLEY VILLAGE/STW	2029/30	0.25
BURLEY IN WHARFEDALE/STW	2029/30	2
KNARESBOROUGH/STW	2029/30	0.25
BRANDESBURTON/STW	2029/30	0.25
CHERRY BURTON/STW	2029/30	0.25
COLD HIENDLEY/STW	2029/30	0.25
LECONFIELD/STW	2029/30	0.25
LEVEN/STW	2029/30	0.25
NOTTON VILLAGE/STW	2029/30	0.25
RUFFORTH/STW	2029/30	1
SINDERBY/STW	2029/30	0.25
WOOLLEY VILLAGE/STW	2029/30	0.25
BURLEY IN WHARFEDALE/STW	2029/30	2
KNARESBOROUGH/STW	2029/30	0.25
DANBY/STW	2029/30	0.25
COLBURN/STW	2029/30	2
ILKLEY/STW	2029/30	2
LEEMING BAR/STW	2029/30	2
THORP ARCH/STW	2029/30	2
WETHERBY/STW	2029/30	2
HARROGATE NORTH/STW	2029/30	0.25
RAWCLIFFE YORK/STW	2029/30	0.7
YORK NABURN/STW	2029/30	0.25
ELVINGTON/STW	2029/30	2
KIRKBYMOORSIDE/STW	2029/30	0.7
WHELDRAKE/STW	2029/30	0.7
CUDWORTH/NO 2 STW	2029/30	0.25
DARTON/STW	2029/30	0.25
HAMBLETON/STW	2029/30	0.25

HARLINGTON/STW	2029/30	0.25
WATH ON DEARNE/STW	2029/30	0.25
ABERFORD/STW	2029/30	1.5
ALDBROUGH/STW	2029/30	0.3
AMPLEFORTH VILLAGE/STW	2029/30	0.7
APPLETON WISKE/STW	2029/30	0.25
ASKHAM BRYAN/STW	2029/30	3
ATWICK/NO 2 STW	2029/30	4
BARWICK IN ELMET/STW	2029/30	0.7
BECKWITHSHAW/STW	2029/30	0.25
BOLTON ON DEARNE/STW	2029/30	0.25
CARLTON HUSTHWAITE/STW	2029/30	1
CAWTHORNE/STW	2029/30	0.3
CLAXTON/STW	2029/30	0.8
CRANE MOOR/STW	2029/30	0.25
DANBY WISKE/STW	2029/30	0.25
DARFIELD/NO 2 STW	2029/30	0.25
EAST COWTON/STW	2029/30	0.25
ESCRICK/STW	2029/30	1.5
FARLINGTON/STW	2029/30	1
FLAXTON/STW	2029/30	0.25
GREAT SMEATON/NO 1 STW	2029/30	0.25
HARLEY/STW	2029/30	0.7
HAXBY WALBUTTS/STW	2029/30	0.25
HOLTBY/STW	2029/30	0.25
INGLEBY ARNCLIFFE/STW	2029/30	0.25
KIRK HAMMERTON/STW	2029/30	2.5
LONG MARSTON/STW	2029/30	1
LONG RISTON NORTH/STW	2029/30	4
LUNDWOOD/STW	2029/30	0.25
MAUNBY/STW	2029/30	4
MICKLEFIELD/NO 2 STW	2029/30	0.25
NORTH COWTON/STW	2029/30	0.25
NORTH DEIGHTON/STW	2029/30	4
NORTHALLERTON/STW	2029/30	0.25
PATELEY BRIDGE/STW	2029/30	0.25
SHIPTON/NO 2 STW	2029/30	0.3
SILKSTONE/STW	2029/30	0.4
SKIPSEA/STW	2029/30	0.25

STAPLETON PARK/STW	2029/30	0.5
SUTTON WHITESTONECLF/STW	2029/30	0.5
TANKERSLEY/STW	2029/30	0.25
TEMPLE NORMANTON/STW	2029/30	0.25
TOCKWITH/STW	2029/30	0.25
WARTHILL/STW	2029/30	0.4
WENTWORTH/STW	2029/30	0.25
WEST ROUNTON/STW	2029/30	0.25
WILLIAMTHORPE/STW	2029/30	0.25
WITHERNWICK/STW	2029/30	1
WOMBWELL/STW	2029/30	0.25
WOODALL/STW	2029/30	1.5
WORSBROUGH/STW	2029/30	0.25
YEARSLEY/STW	2029/30	0.3
DANBY/STW	2029/30	0.25

CWW20.27 & CWW20.28 current design size for chemical treatment

SITE	Consent year	New P limit	Chem dosing m3
EASINGTON/STW	2025/26	4	3.1
HUNMANBY/STW	2025/26	5	3.66
LEYBURN/STW	2025/26	2	8.93
NAFFERTON/STW	2025/26	6	3.96
WATTON/STW	2025/26	3.5	4.16
BRANDESBURTON/STW	2025/26	5	3.36
CHERRY BURTON/STW	2025/26	6	2.74
COLD HIENDLEY/STW	2025/26	4	1.72
LECONFIELD/STW	2025/26	4	2.16
LEVEN/STW	2025/26	5	1.35
NOTTON VILLAGE/STW	2025/26	5	2.9
RUFFORTH/STW	2025/26	6	0.6
SINDERBY/STW	2025/26	8	0.32
WOOLLEY VILLAGE/STW	2025/26	6	1.17
BURLEY IN WHARFEDALE/STW	2025/26	3	5
KNARESBOROUGH/STW	2025/26	4	8.91

SITE	Consent year	New P limit	Chem dosing m3
BRANDESBURTON/STW	2029/30	0.25	16.79
CHERRY BURTON/STW	2029/30	0.25	8.22
COLD HIENDLEY/STW	2029/30	0.25	8.58
LECONFIELD/STW	2029/30	0.25	10.8
LEVEN/STW	2029/30	0.25	6.76
NOTTON VILLAGE/STW	2029/30	0.25	8.69
RUFFORTH/STW	2029/30	1	1.8
SINDERBY/STW	2029/30	0.25	1.61
WOOLLEY VILLAGE/STW	2029/30	0.25	3.51
BURLEY IN WHARFEDALE/STW	2029/30	2	14
KNARESBOROUGH/STW	2029/30	0.25	58.36
BRANDESBURTON/STW	2029/30	0.25	16.79
CHERRY BURTON/STW	2029/30	0.25	8.22
COLD HIENDLEY/STW	2029/30	0.25	8.58
LECONFIELD/STW	2029/30	0.25	10.8
LEVEN/STW	2029/30	0.25	6.76
NOTTON VILLAGE/STW	2029/30	0.25	8.69
RUFFORTH/STW	2029/30	1	1.8
SINDERBY/STW	2029/30	0.25	1.61
WOOLLEY VILLAGE/STW	2029/30	0.25	3.51
BURLEY IN WHARFEDALE/STW	2029/30	2	14
KNARESBOROUGH/STW	2029/30	0.25	58.36
DANBY/STW	2029/30	0.25	1.79
COLBURN/STW	2029/30	2	40.33
ILKLEY/STW	2029/30	2	61.38
HARROGATE NORTH/STW	2029/30	0.25	124.34
RAWCLIFFE YORK/STW	2029/30	0.7	21.57
YORK NABURN/STW	2029/30	0.25	279.14
ELVINGTON/STW	2029/30	2	1.74
KIRKBYMOORSIDE/STW	2029/30	0.7	4.64
WHELDRAKE/STW	2029/30	0.7	5.15
CUDWORTH/NO 2 STW	2029/30	0.25	25.12
DARTON/STW	2029/30	0.25	42.29
HAMBLETON/STW	2029/30	0.25	33.72
HARLINGTON/STW	2029/30	0.25	15.3
WATH ON DEARNE/STW	2029/30	0.25	0
ABERFORD/STW	2029/30	1.5	2.37

ALDBROUGH/STW	2029/30	0.3	1.61
AMPLEFORTH VILLAGE/STW	2029/30	0.7	5.12
APPLETON WISKE/STW	2029/30	0.25	3.16
ASKHAM BRYAN/STW	2029/30	3	2.13
ATWICK/NO 2 STW	2029/30	4	0.43
BARWICK IN ELMET/STW	2029/30	0.7	4.82
BECKWITHSHAW/STW	2029/30	0.25	0.96
BOLTON ON DEARNE/STW	2029/30	0.25	65
CARLTON HUSTHWAITE/STW	2029/30	1	0.2
CAWTHORNE/STW	2029/30	0.3	4.32
CLAXTON/STW	2029/30	0.8	1.35
CRANE MOOR/STW	2029/30	0.25	1.38
DANBY WISKE/STW	2029/30	0.25	0.33
DARFIELD/NO 2 STW	2029/30	0.25	12.02
EAST COWTON/STW	2029/30	0.25	6.35
ESCRICK/STW	2029/30	1.5	5.91
FARLINGTON/STW	2029/30	1	0.15
FLAXTON/STW	2029/30	0.25	4.23
GREAT SMEATON/NO 1 STW	2029/30	0.25	0.42
HARLEY/STW	2029/30	0.7	1.25
HAXBY WALBUTTS/STW	2029/30	0.25	48.95
HOLTBY/STW	2029/30	0.25	1.39
INGLEBY ARNCLIFFE/STW	2029/30	0.25	0.46
KIRK HAMMERTON/STW	2029/30	2.5	3.78
LONG MARSTON/STW	2029/30	1	0.81
LONG RISTON NORTH/STW	2029/30	4	1.07
LUNDWOOD/STW	2029/30	0.25	2
MAUNBY/STW	2029/30	4	5.64
MICKLEFIELD/NO 2 STW	2029/30	0.25	6.14
NORTH COWTON/STW	2029/30	0.25	1.31
NORTH DEIGHTON/STW	2029/30	4	3.93
NORTHALLERTON/STW	2029/30	0.25	33.77
PATELEY BRIDGE/STW	2029/30	0.25	8.14
SHIPTON/NO 2 STW	2029/30	0.3	2.79
SILKSTONE/STW	2029/30	0.4	8.91
SKIPSEA/STW	2029/30	0.25	10.26
STAPLETON PARK/STW	2029/30	0.5	8.44
SUTTON WHITESTONECLF/STW	2029/30	0.5	0.46
TANKERSLEY/STW	2029/30	0.25	6.43

TEMPLE NORMANTON/STW	2029/30	0.25	0.8
TOCKWITH/STW	2029/30	0.25	3.13
WARTHILL/STW	2029/30	0.4	0.94
WENTWORTH/STW	2029/30	0.25	1.22
WEST ROUNTON/STW	2029/30	0.25	4.59
WILLIAMTHORPE/STW	2029/30	0.25	5.89
WITHERNWICK/STW	2029/30	1	4.94
WOMBWELL/STW	2029/30	0.25	2
WOODALL/STW	2029/30	1.5	0
WORSBROUGH/STW	2029/30	0.25	2
YEARSLEY/STW	2029/30	0.3	0.63
DANBY/STW	2029/30	0.25	1.79

CWW20.29 & CWW20.30 Current sites requiring tertiary treatment for consents limit and design size

SITE	Consent year	Consent type	Tertiary Treatment size m3/day
SHERBURN IN ELMET/STW	2025/26	BOD	9599

SITE	Consent year	Consent type	Chem dosing m3
BRANDESBURTON/STW	2029/30	P	1546.6
CHERRY BURTON/STW	2029/30	P	1288.6
COLD HIENDLEY/STW	2029/30	P	2851.0
LECONFIELD/STW	2029/30	P	940.0
LEVEN/STW	2029/30	P	1653.0
NOTTON VILLAGE/STW	2029/30	P	629.4
SINDERBY/STW	2029/30	P	405.5
WOOLLEY VILLAGE/STW	2029/30	P	266.8
KNARESBOROUGH/STW	2029/30	P	11415.2
BRANDESBURTON/STW	2029/30	P	1546.6
CHERRY BURTON/STW	2029/30	P	1288.6
COLD HIENDLEY/STW	2029/30	P	2851.0
LECONFIELD/STW	2029/30	P	940.0
LEVEN/STW	2029/30	P	1653.0

NOTTON VILLAGE/STW	2029/30	P	629.4
SINDERBY/STW	2029/30	P	405.5
WOOLLEY VILLAGE/STW	2029/30	P	266.8
KNARESBOROUGH/STW	2029/30	P	11415.2
DANBY/STW	2029/30	P	1901.0
YORK NABURN/STW	2029/30	P	128588.4
CUDWORTH/NO 2 STW	2029/30	P	6396.4
DARTON/STW	2029/30	P	16132.4
HARLINGTON/STW	2029/30	P	1427.0
ALDBROUGH/STW	2029/30	P	835.2
AMPLEFORTH VILLAGE/STW	2029/30	P	667.8
APPLETON WISKE/STW	2029/30	P	316.2
BOLTON ON DEARNE/STW	2029/30	P	16634.7
CAWTHORNE/STW	2029/30	P	689.9
CRANE MOOR/STW	2029/30	P	415.1
DANBY WISKE/STW	2029/30	P	119.7
DARFIELD/NO 2 STW	2029/30	P	5704.8
EAST COWTON/STW	2029/30	P	348.1
FLAXTON/STW	2029/30	P	197.0
GREAT SMEATON/NO 1 STW	2029/30	P	349.0
HAXBY WALBUTTS/STW	2029/30	P	12768.2
HOLTBY/STW	2029/30	P	226.0
INGLEBY ARNCLIFFE/STW	2029/30	P	440.0
LUNDWOOD/STW	2029/30	P	50475.8
MAUNBY/STW	2029/30	P	582.4
MICKLEFIELD/NO 2 STW	2029/30	P	1254.8
NORTH COWTON/STW	2029/30	P	322.2
NORTHALLERTON/STW	2029/30	P	9135.3
PATELEY BRIDGE/STW	2029/30	P	2186.0
SHIPTON/NO 2 STW	2029/30	P	514.1
SILKSTONE/STW	2029/30	P	2031.2
SKIPSEA/STW	2029/30	P	1441.8
STAPLETON PARK/STW	2029/30	P	1172.3
SUTTON WHITESTONECLF/STW	2029/30	P	219.8
TANKERSLEY/STW	2029/30	P	1367.1
TEMPLE NORMANTON/STW	2029/30	P	216.8
WENTWORTH/STW	2029/30	P	262.5
WEST ROUNTON/STW	2029/30	P	437.4
WILLIAMTHORPE/STW	2029/30	P	2668.3

WOMBWELL/STW	2029/30	P	36654.3
WORSBROUGH/STW	2029/30	P	13819.6
YEARSLEY/STW	2029/30	P	123.0
DANBY/STW	2029/30	P	1901.0
BURTON PIDSEA/STW	2029/30	NH3 & BOD	583.4
OTTRINGHAM/STW	2029/30	NH3 & BOD	236.7
PATRINGTON/STW	2029/30	NH3 & BOD	1166.8
Wetherby Bathing waters (WETHERBY/STW, POOL/STW, OTLEY/STW, KEARBY/STW, BURLEY IN WHARFEDALE/STW, BEN RHYDDING/STW)	2029/30	Inland bathing	60713.0
Knaresborough Bathing waters (HARROGATE NORTH/STW, DARLEY/STW, KILLINGHALL/STW, PATELEY BRIDGE/STW)	2029/30	Inland bathing	52200.0
Ilkley Bathing waters (ILKLEY/STW)	2029/30	Inland bathing	21035.1
SEAMER/STW	2029/30	NH3	15463.9
TUPTON/STW	2029/30	NH3	7093.3
KEYINGHAM/STW	2029/30	BOD	3992.0
MARKINGTON/STW	2029/30	BOD	836.0

CWW20.61-63

Number of WINEP/NEP investigations - desk-based studies only – zero

Number of WINEP/NEP investigations - survey, monitoring or simple modelling

	2025/26	2026/27	2027/28	2028/29	2029/30
EnvAct_INV1	0	1	0	0	0
EnvAct_INV2	0	59	0	0	0
EnvAct_INV3	0	1	0	0	0

Number of WINEP/NEP investigations - multiple surveys and/or monitoring locations, and/or complex modelling

	2025/26	2026/27	2027/28	2028/29	2029/30
EnvAct_INV4	0	474	0	0	217
BW_INV1	0	0	1	0	0
BW_INV5	0	0	2	0	0
N_TAL	0	0	3	0	0
INV_MOD	0	0	3	0	0
INV_UPM	0	0	2	0	0
INV_CHEM	0	0	19	0	0
INV_MP	0	0	3	0	0
Knostrop_Silver	0	0	1	0	0
WINEP_WFD_NDLS_CHEM1	0	34	0	0	0
25_YEP	0	0	2	0	0

The confidence grades across this table fall in to either A1 or B2.

25. CWW20a

This table is intentionally blank as we do not have any accelerated programme expenditure – water resources and water network plus

26. CWW21 Wastewater network+ - Asset Condition Grade

Legacy sewers

Analysis is based on a snapshot of sewer attribute data taken on 30 April 2021 which was originally used to update the wastewater collapse model developed PR19. Analysis involves a total length of 29,395km of foul, combined and surface water sewers having 22,573 collapses over a 19.16year observation period to 31 December 2020. *Note that analysis of condition grade had been based on all collapses and not just those reported in the APR as stated in the guidance.*

The total length of sewer modelled differs from that of the 30,501.9km stated in APR 21 due to the exclusion of a) 801.5km of sewer whose function was neither combined/foul/surface water and b) 305.4km of Abandoned Assets.

It is recognised that the definition of a collapse has changed during the period of historic data used in this analysis. However, using a longer period of historic failures is likely to reduce the number of cohorts having a zero failure history and consequently reduce the

likelihood of having to aggregate cohorts that differ greatly with regards to the primary cohorting variables.

The magnitude of the standardised beta coefficients associated with the collapse model enables a ranking of the strongest to the weakest drivers of collapses for this dataset. This ranking was used to inform the ordering of secondary variables for cohorting.

The total length of foul, combined and surface water legacy sewer analysed is 29,395km which compares with 29,328km stated in APR23. Using the collapse model dataset results in the exclusion of 1,314 collapses from the analysis (based on a pro rata of the 736 collapses reported for APR 21 for the period January to Match 2021). This implies an average collapse rate of 40.07 collapses per annum/1000km sewer based on an observation period of 21.41 years and compares with 38.04 collapses per annum/1000km sewer for the dataset used in the analysis. Given cohorts are based on total average collapses per year, it is expected that using the reduced dataset will have negligible impact on the resulting distribution of condition grades.

The primary variables used to cohort are as follows:

- *Material Group* - Brick (BR)/Cast Iron (CI) Concrete (CO) /Glass Reinforced Plastic (GRP)/ Polyethylene (PE)/ Pitch Fibre (PF) / Polyvinyl Chloride (PVC) / Other
- *Sewer Function* - Combined/Foul/Surface Water
- *Installation Year Band* – Pre-1880, (1880-1900], (1900-1920], (1920-1940], (1940-1960], (1960-1980], (1980-2000], (2000-2020], Post 2020
- *Size* – (0, 165mm], (165mm, 320mm], (320mm, 625mm], (625mm, 1500mm], >1500mm

Material Group results from an aggregation of individual sewer material types that was used as an input into the collapse model. Sewers of type GRP/PE/PF/PVC sewers were grouped together given their very small collapse rates.

A flag indicating whether a sewer is a former private sewer or lateral drain (s105A sewer), was specified as a primary cohorting variable in the guidance for this analysis – however, it has not been used here. The recorded attribute data for the s105A sewers is not as detailed as it is for the legacy sewers and therefore, different secondary variables have been used for cohorting these assets. In the cohorting example provided in the Ofwat document entitled *CWW21-Additional-Cohort-Table-Guidance (2),* a single cohort does not include both legacy and s105A sewers. Therefore, a separate analysis has been undertaken for the s105A assets. However, an additional pareto analysis based on combined legacy and s105A cohorts has been provided.

The following, in decreasing order of influence on collapses, were used as secondary cohorting variables:

- *Secondary Installation Year Band* - further splitting of *Primary Installation Year* bands
- *Secondary Size* – further splitting of *Primary Size* bands.
- *Gradient*
- *Sewer Type* (Public/S24)
- *Customer Count/Length* (a measure of density of connections)
- *Hotspot Drainage Area Zone (DAZ)* – Yes/No
- *Sewer Criticality* (A-D in decreasing order of criticality – a measure of the consequence of failure of an asset with grade A being the most critical)

A total of 20 Hotspot Drainage Area Zones were identified. These are zones found to be outliers with regards their average annual historic collapse rate but which were *not* outliers with regards to any of the cohorting variables, i.e.: zones having a relatively large collapse rate which could not be explained in terms of any of the cohorting variables. Outlier thresholds for each numeric variable were estimated using the following rule:

*Upper bound outliers = 75th percentile + (1.5*IQR)*

*Lower bound outliers = 25th percentile – (1.5*IQR)*

where *IQR* is defined by the interquartile range.

For categorical cohorting variables, outliers were identified using *% public sewer length*, *% length PVC + PF* and *% length criticality bands C + D,* within a drainage area zone. In the collapse model, *Sewer Type (Public)* and *Material Group (PVC and PF)* were found to be the factor levels most strongly associated with increasing collapses. With regards sewer criticality, an assumption was made regarding potential differences in the maintenance of critical and non-critical sewers.

Initial analysis produced a total of 132,838 cohorts. Aggregation and/or splitting in line with Ofwat guidance to ensure that cohort tolerances in terms of total average annual collapses were met as far as was possible, reduced this to 519 cohorts. This was further reduced to 518 cohorts following the splitting of a single cohort comprising 2,278km of unknown *Material Group, Size* and *Installation Year* on a pro rata basis across all other cohorts.

Just eight cohorts (1.54%) fall outside of the required range of collapses per year. Aggregation of these cohorts with others was deemed inappropriate either because the cohort was uniquely defined (eg: all brick, foul sewers) or because aggregation with the cohort immediately preceding or following (if of similar cohorting characteristics) would result in total collapses falling outside the required tolerance.

Averaged over all cohorts, the expected number of collapses is 2.35 which falls within the

+/- 10% tolerance of the nominal size of 2.5 stated in the guidance.

Table 1 below provides the percentage splits of legacy sewer length by condition grade, after taking sewer function into account. It is not known how this compares with any previous work that may have been done with regards condition grading of sewers.

CG	C	F	S	Total
1	6.43%	7.22%	55.09%	18.83%
2	16.34%	45.72%	28.85%	24.99%
3	39.53%	31.95%	11.76%	31.12%
4	27.71%	10.64%	3.54%	18.43%
5	10.00%	4.48%	0.76%	6.64%
Total	100.00%	100.00%	100.00%	100.00%

Percentage splits of legacy sewer length by sewer function within each condition grade

Given the length of historic data differs from the five years specified in the Ofwat guidance, the average distance between collapses per 1000km of sewer for each condition grade required amending. Table 2 below provides the updated distances based on historic collapses spanning a 19.16year period.

Condition Grade	Threshold (based on 5yr historic data)	Threshold (based on 19.16yr historic data)
1	Collapse average up to 12/1000km/annum (equivalent to 16km or more between collapses)	Collapse average up to 12/1000km/annum (equivalent to 4km or more between collapses)
2	Collapse average greater than 12 up to 25 collapses/1000 km/annum (equivalent to less than 16km down to 8km between collapses)	Collapse average greater than 12 up to 25 collapses/1000 km/annum (equivalent to less than 4km down to 2km between collapses)
3	Collapse average greater than 25 up to 50 burst/1000 km/annum (equivalent to less than 8km down to 4k between collapses)	Collapse average greater than 25 up to 50 collapses/1000 km/annum (equivalent to less than 2km down to 1km between collapses)
4	Collapse average greater than 50 up to 100 collapses/1000 km/annum (equivalent to less than 4km down to 2km between collapses)	Collapse average greater than 50 up to 100 collapses/1000 km/annum (equivalent to less than 1km down to 0.5km between collapses)
5	Collapse average greater than 100 collapses/1000 km/annum	Collapse average greater than 100 collapses/1000 km/annum

	(equivalent to less than 2km between collapses)	(equivalent to less than 0.5km between collapses)

Condition grade thresholds for legacy sewers with updated estimates of average distance between collapses

Outputs from the Pareto analysis indicate that approximately 80% of the legacy sewer collapses in the historic data are associated with just under 50% of the sewer length.

Analysis suggests that almost 75% of the legacy sewer length is associated with CG1-CG3. Hence it may be expected that a relatively large increase in sewer length is associated with a relatively small increase in collapses.

See ***CWW21 - Legacy sewers.xls*** for required outputs.

Other wastewater network pipes

Poor population of asset reference on the corporate system has meant it has not been possible to build a failure history for these assets. In the absence of any better information, the proportion of asset length within each condition grade is assumed to be the same as that for the legacy sewers (see Table 1).

Formerly private sewers and lateral drains (s105A sewers):

Analysis is based on sewers totalling a length of 3,316.9km which as at August 2023, had had one or more work orders assigned and which had been recorded in Odyssey (i.e.: 'red-lined' assets). This equates to 15.4% of the assumed total length of s105A sewers and of these,

just 234.5km have had one or more collapses in the 11.83year period since the transfer of these assets in October 2011. The dataset comprises a total of 29,905 collapses. *Note that this analysis has been based on all collapses and not just those reported in the APR.*

The primary variables used to cohort are as follows:

- *Material Group* - Brick (BR)/Cast Iron (CI) Concrete (CO) / Pitch Fibre (PF) / Plastic (PL) (PVC) / Steel (ST) / Vitrified Clay (VC)
- *Sewer Function and Installation Year Band* – as for the legacy sewers
- *Size* – (0, 165mm], (165mm, 320mm], (320mm, 625mm].

The following were used as secondary cohorting variables:

- *Secondary Installation Year Band* - further splitting of *Primary Installation Year* bands
- *Secondary Size* – further splitting of *Primary Size* bands
- *Hotspot Drainage Area Zone (DAZ)* – Yes/No

- *Catchment Management Zone (CMZ)* – North, South, East, West
- *Catchment Management Zone* – Barnsley, Bradford, Colburn, Doncaster, Harrogate, Hull, Leeds, Scarborough, Sheffield, Tadcaster, York
- *Drainage Are Zone (DAZ)* – 300 in total
- *Length* – bands determined as required to aid in meeting cohort tolerance

Sewer length was an input into the collapse model. It was not required as an input into the cohorting of the legacy sewers given the relatively large number of variables available. However, it has been used to cohort these assets given the reduced number of other cohorting variables available.

A total of 11 hotspot drainage area zones were identified using the same approach as that used for the legacy sewers but using *Age, Size, % length combined sewer, % length PF sewer* and *% length of sewer in criticality grades C + D.*

Initial analysis produced 155,488 cohorts which were reduced to 1,041 cohorts following aggregation and/or splitting in line with Ofwat guidance.

The estimated length of s105A sewer reported in APR tables is 21,560km of which 3,317km has been used in this analysis. Prior to estimating cohort condition grade, the remaining 18,243km of sewer was distributed across all cohorts on a pro rata basis based on the proportion of total length (3,317km) within each cohort.

A total of 41 cohorts (3.9%) fall outside of the required range of collapses per year. Cohorts falling outside of the lower tolerance bound tended to so do because they comprised hotspot DAZs (which occur in the South and West Catchment Management Zones only) and it was not deemed appropriate to aggregate them with non-hotspot DAZs. Those falling just outside of the upper tolerance bound had originally been further split by *Sewer Length*. However, they were later aggregated back to their original sizes to ensure that the overall average total collapses p.a. fell within +/-10% of the nominal collapses. Averaged over all cohorts, the expected number of collapses is 2.43 which falls within the +/- 10% tolerance of the nominal size of 2.5 stated in the guidance.

Table 3 below provides the percentage splits of s105A sewers by condition grade. It is not known how this compares with any previous work that may have been done with regards condition grading of sewers.

CG	%
1	8.79%
2	6.67%
3	17.95%
4	28.56%
5	38.04%
	100%

Table 3: Percentage splits of s105A sewers by condition grade

Little is known about these assets and to date, information has only been gleaned from the relatively small sample that have had jobs allocated since the transfer of ownership in October 2011. It is expected that the transferred sewers are likely to be in poorer condition than those sewers that have been our responsibility. The results obtained from this analysis suggest that this may be the case with less than 35% of the total length of s105A sewers being assigned CG1-CG3. Outputs from the Pareto analysis suggest that approximately 80% of the s105A sewer collapses in the historic data are associated with just over 40% of the sewer length which is slightly less than that for the legacy sewers.

Both the legacy and S105A cohorts have been combined and re-ranked to enable a Pareto analysis of the combined cohorts. Outputs from this suggest that approximately 80% of collapses are associated with 40% of the sewer length.

Sewage pumping mains

Analysis is based on a snapshot of rising mains data taken in September 2022 which was used to update the rising mains burst model developed for PR19. The dataset comprises a total length of 1,324km comprising 328 reportable bursts over a 5-year period. It compares with a total length of 1,288km reported in APR23. The difference is due to inclusion of the following in this analysis:

- 50.7km of T2011 assets
- 2.9km of non-operational (closed) assets
- 9.7km for which Legal Status is unknown.
- Increase of 2km between the September 2022 data cut and April 2023 APR data

The primary variables used to cohort these assets are as follows:

- *Material Group* – Asbestos Cement (AC) / Cast Iron (CI) / Ductile Iron (DI) / Polyethylene (PE) /Plastic (PL) / Polyvinyl Chloride (PVC)
- *Size* - <=320mm / > 320mm
- *Sewer Function* and *Installation Year Band* - the same as those used for legacy sewers with the former starting at (1900, 1920]

The following were used as secondary cohorting variables:

- *Secondary Installation Year Band* - further splitting of *Primary Installation Year* bands
- *Hotspot Drainage Area Zone (DAZ)* – Yes/No

Sewer Criticality was unknown for 763km (57.6%) of the total length of rising mains and was therefore excluded from cohorting.

A total of 28 Hotspot Drainage Area Zones were identified in line with the approach used for legacy sewers. For these assets, outliers were identified using *Age, Size,* and *% length AC, CI and PL* within a zone. These materials were found to be associated with increasing burst rates in the clean water asset deterioration models.

Initial analysis produced a total of 6,530 cohorts. Aggregation and/or splitting in line with Ofwat guidance reduced this to 60 cohorts. Assets of *Material Group* ST or CO were placed into four separate cohorts (two *Size* groups for each Material Group), each of which had a zero failure history. This was the case for a further 15 cohorts resulting in a total length of 66.6km of rising main which did not have a failure history. Rather than excluding this length from the analysis, it was split on a pro rata basis between the remaining 41 cohorts taking care to ensure that the smaller (<=320mm) and the larger (>320mm) sized assets were distributed amongst the cohorts comprising assets belonging to the same *Size* group.

A total of 11 cohorts (26.8%) fall outside of the required range of bursts per year of which five related to cohorts comprising assets of size <=320mm (nominal expected bursts of 2.5 p.a.) with the remaining six relating to cohorts comprising assets of size >320mm (nominal expected bursts of 1.0 p.a.). Aggregation of these cohorts with others was deemed inappropriate either because the cohort was uniquely defined (eg: all AC combined sewers > 320mm) or because aggregation with the cohort immediately preceding or following (if of similar cohorting characteristics) would result in total bursts falling outside of the required tolerance.

Averaged over all cohorts the expected number of bursts falls within a tolerance of +/- 10% of the nominal sizes stated in the Ofwat guidance.

Ofwat guidance requires that the condition grading of rising mains uses the thresholds provided for the analysis of clean water mains. The historic data has an average of 66 rising main bursts per year and based on a total length of 1,324km, equates to an average of 4km between bursts. This is significantly less than the CG1 threshold for clean water mains (up to 125 bursts/1000km/annum over five years or equivalently, 1600m or more between bursts over the five-year period). This explains why, when using the thresholds specified for clean water mains, analysis leads to approximately 95% of the rising mains being assessed as CG1 (not included).

Guidance states that *"…….given the consequence of rising main failure is often high, consideration will be given to the provision of condition grades with lower thresholds."* Further analysis has been undertaken to estimate more suitable thresholds for rising mains. It is based on a comparison of the average distance between historic legacy sewer collapses over a five-year period with that associated with each of the legacy sewer condition grade thresholds. In doing so, it is possible to obtain a calibration factor for each condition grade which is then applied to the average distance between historic

rising main bursts. This provides an estimate of the average distance between bursts for each condition grade from which a threshold of number of bursts can be estimated.

Worked example for CG1

Average no. legacy sewer collapses p.a. = 1,178.131

Average no. legacy sewer collapses in 5 years = 5,890.658

Based on a total legacy sewer length of 29,395,368km:

Average distance between collapses over a 5-year period = 4,990.167m (assume 5km).

Based on a total rising main length of 1,323,955km and 328 bursts over a 5-year period:

Average distance between bursts over a 5-year period = 4,036.449m. (assume 4km).

For legacy sewers, CG1 is equivalent to a distance of at least 16km between collapses.

Comparing this with the average distance between legacy sewer collapses yields a calibration factor of 3.2, i.e.: CG1 threshold is 3.2 times the average collapse distance for the legacy sewers.

Applying this calibration factor to the average distance between historic rising mains bursts suggests that the threshold for CG1 rising mains is 3.2 times this average distance, i.e.: 12.916m.

Therefore, for CG1, it is required to find no. bursts/1000km annum/over a five-year period which is the equivalent to 13km (rounded) between bursts over the five-year period.

(5 * no. bursts)/1000 = 12.92km which estimates the CG1 threshold for no. bursts to be 16 (rounded).

This approach was repeated for the remaining condition grades which leads to the following thresholds being used for rising mains (all thresholds have been rounded):

Condition Grade	General meaning
1	Excellent Burst average up to 16/1000km/annum over five years, (equivalent to 13km or more between bursts over the five-year period).
2	Good Burst average greater than 16 up to 31/1000 km/annum over five years, (equivalent to less than 13km down to 7km between bursts over the five-year period).
3	Adequate Burst average greater than 31 up to 63/1000km/annum over five years (equivalent to less than 7km down to 4km between bursts over the five-year period).
4	Poor Burst average greater than 63 up to 125/1000 km/annum over five years (equivalent to less than 4km down to 2km between bursts over the five- year period).
5	Very Poor Burst average greater than 125/1000 km/annum over five years (equivalent to less than 2km between bursts over the five- year period).

Table 4: Amended thresholds used for rising main condition grades

Table 5 below provides the percentage splits of rising mains by condition grade. It is not known how this compares with any previous work that may have been done with regards condition grading of these assets.

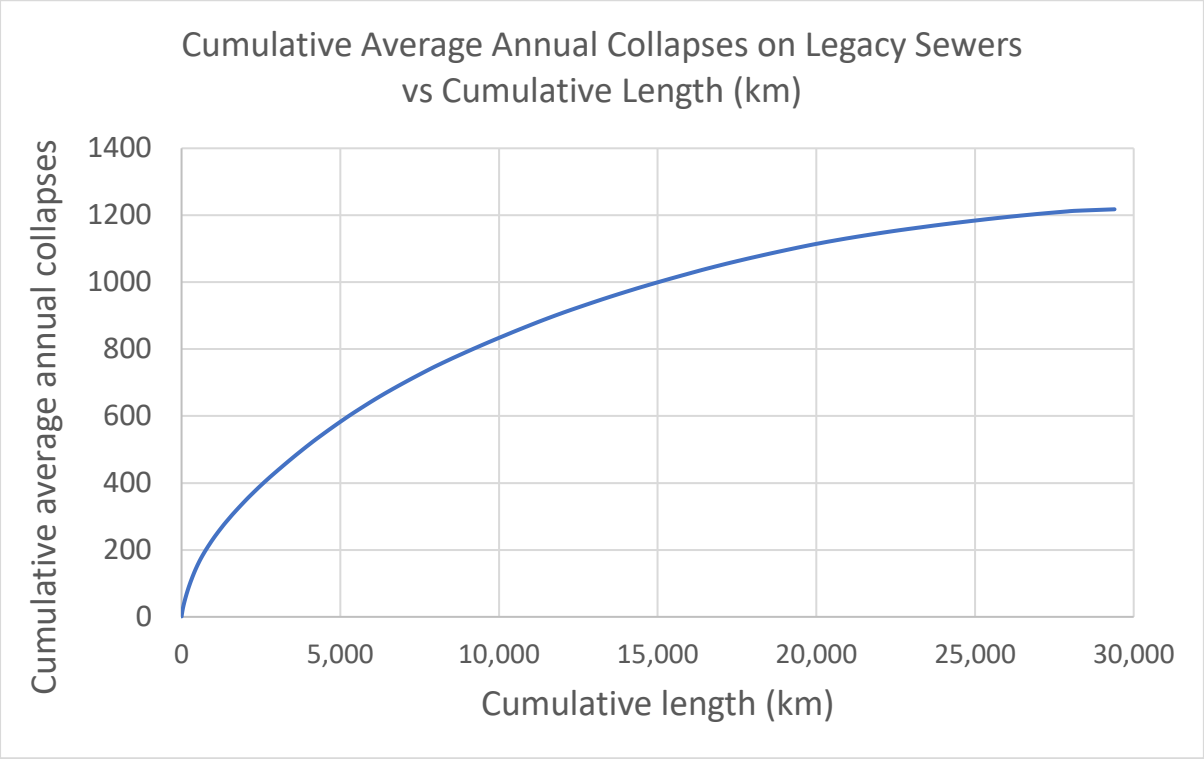
CG	%
1	0.00%
2	24.48%
3	53.55%
4	16.62%
5	5.36%
Total	100%

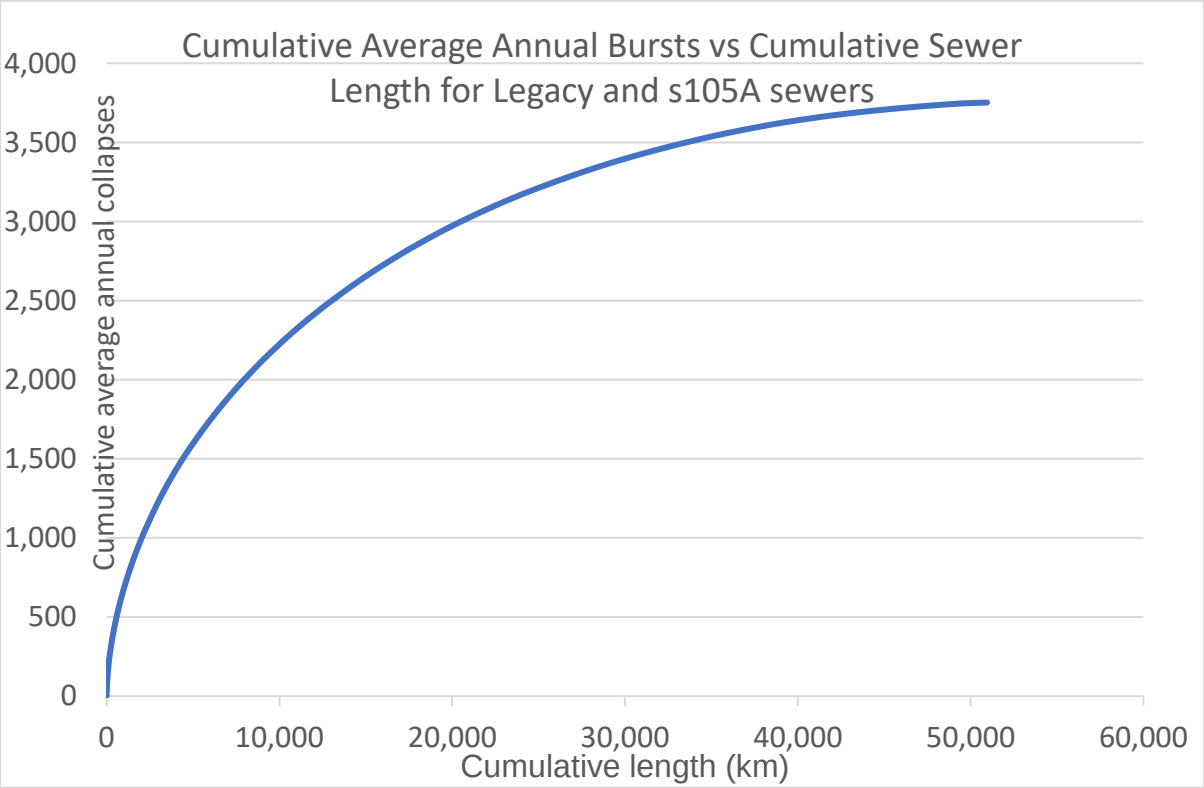
Table 5: Percentage splits of rising mains by condition grade

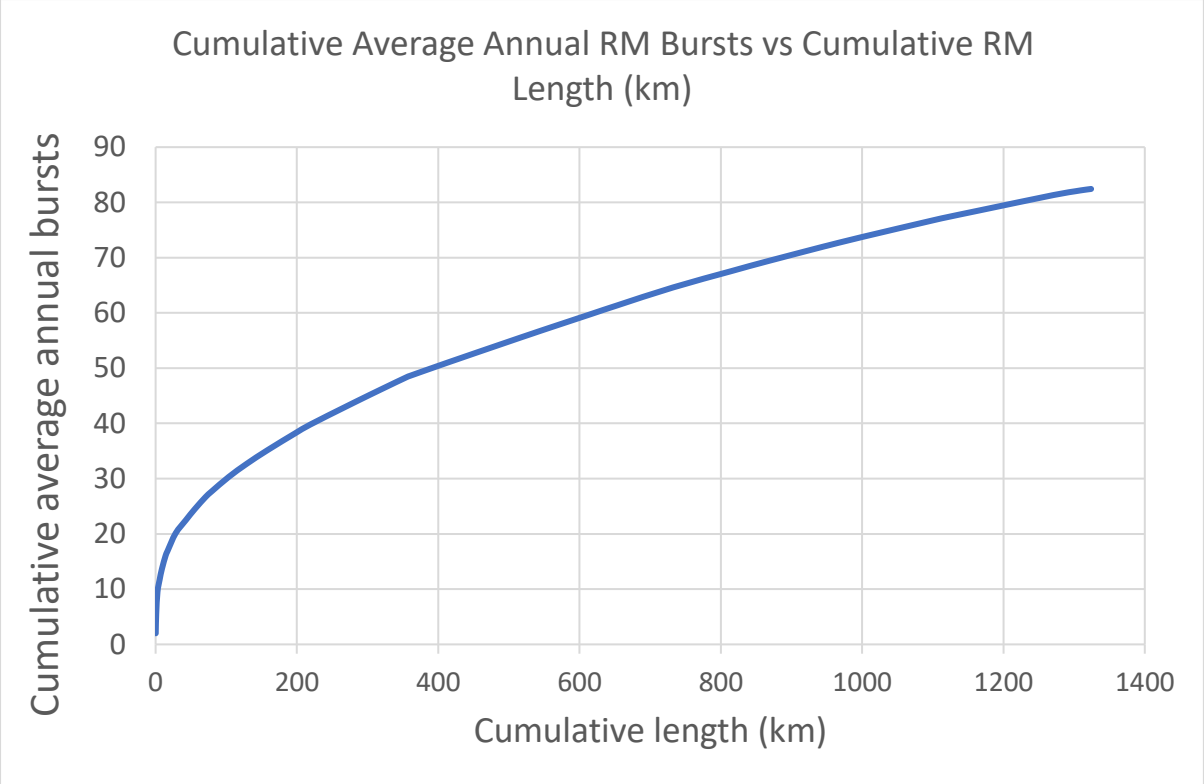
Outputs from the Pareto analysis indicate that approximately 80% of bursts in the historic data are associated with just over 60% of the length of rising mains.

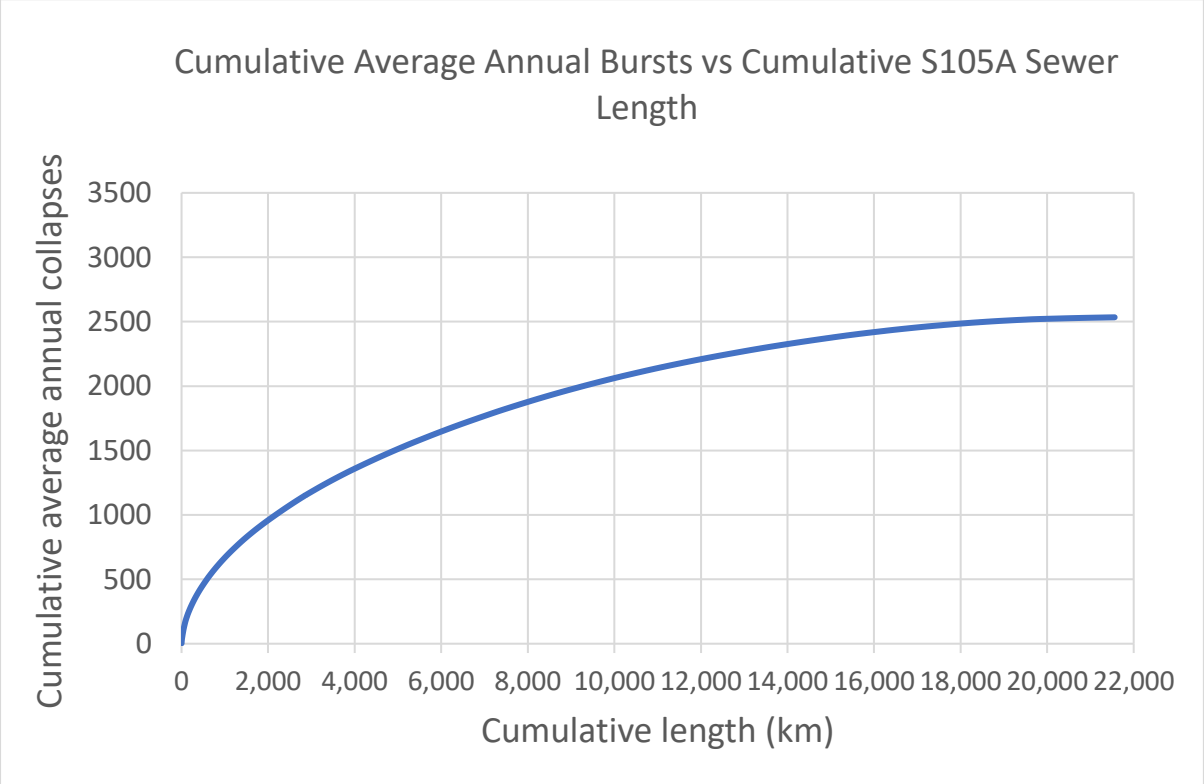
We have a range of confidence grades across this table with the majority at B2

Pareto Graphs






Cumulative Average Annual RM Bursts vs Cumulative RM Length (km)
Cumulative average annual bursts
90
80
70
60
50
40
30
20
10
0
0
200
400
600
800
1000
1200
1400
Cumulative length (km)


Cumulative Average Annual Bursts vs Cumulative S105A Sewer Length
Cumulative average annual collapses
3500
3000
2500
2000
1500
1000
500
0
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
Cumulative length (km)

27. CWW22 Net zero enhancement schemes

Where the net zero activity overlaps with base maintenance funded activities, such as the replacement of current assets, the base element should be identified and removed from the request together with any future base savings. The assumptions made for this adjustment should be described in the table commentary.

Commentary on the data including assumptions around implicit allowance of base maintenance costs and how the carbon impact and benefits of schemes have been calculated should be included

The data (CWW22) tells us the enhancement investment required for wastewater during AMP 8 to invest in additional renewable (solar) energy to reduce scope 2 emissions associated with purchased electricity (location-based emissions per Ofwat reporting requirements for AMP 8), and Scope 1 process emissions from wastewater treatment (nitrous oxide from ASP lanes) and bio-resources (methane from the digestion of sludge). The larger portion of investment for net zero has been put forward for wastewater reflecting a) the larger scale of emissions and b) the priority of addressing the process emissions. Opex savings for renewables and methane are not included in this table.

The net zero enhancement investment for wastewater is £49.4 million Totex and includes:

£17.6m Totex for solar renewables which includes Opex savings that will continue beyond the end of the AMP out to 2050 (assumes 25-year life of system).

£31.8m investment for the control of process emissions with an investment totex for methane (£19.23m) and nitrous oxide reduction (£12.57m). All price adjusted to 2023 prices.

Key activities to drive reduction:

- Renewables: Investment in roof and ground mounted solar across our sites equivalent to install of 20MWp to reduce emissions associated with purchased electricity by an amount equivalent to 3500tCO2e annual emission reduction (gross).
- Methane: Investment in sites Knostrop, Blackburn Meadows, Esholt, Huddersfield, Hull, Dewsbury, Woodhouse Mill, Old Whittington, Sandall to reduce methane process emission by 18322 tCO2e per year (gross).
- Nitrous oxide: Investment in sites Knostrop, Blackburn Meadows, Esholt, Dewsbury, Hull, York, Halifax, Woodhouse Mill, Caldervale, Old Whittington,

Aldwarke, Sandall to reduce Nitrous Oxide process emissions by 5418 tCO2e per year (gross).

Figures net of embodied carbon are included in table CWW22.

Grid decarbonisation is expected by 2040, so long term investment in solar will be less necessary, and energy cost and resilience will become the primary drivers.
Process emission factors for nitrous oxide may be increased fourfold, which would improve the efficiency Cost/tCO2e removal and increase the need for N2O reduction.
Process emission calculation has taken the worst case in estimation of the reductions to avoid overstating the reductions and benefits to customers etc.

Key risks:

- Relies on £49m enhancement investment being allowed at an efficient unit rate in bid challenge
- There is potentially a process emission uplift for N2O that would quadruple emissions. If implemented this would improve the cost/benefit ratio, however emissions would need re-baselining
- Delivery of interventions require adequate supporting resources/capacity in the bio-resources and wastewater teams to project manage changes and ensure these meet all compliance requirements required via internal and external parties
- Process emission reductions will be subject to price-controlled deliverables, and proof of reduction is dependent on baseline monitoring and on-going monitoring substantiating the reduction. Modelling work done to support high level costs has provided indicative reductions –to minimise risk the lowest estimates of reductions have been used for reduction forecast.

We have highlighted a discrepancy between what we published to Ofwat as an early submission requirement on the 7th August 2023, and our final Table submission. This error within the first submission, has now been corrected. The below summarises the change:

Changes	Table	Cell	Data Line	Early Submission	Current Data Table
8	CWW1	H23	CWW1.10	0.078	0