WSX10 - Maintaining our services commentary and analysis

Business plan
2025-2030

Wessex Water
YTL GROUP

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WSX10 - Maintaining our services commentary and analysis

CONTENTS

This supporting document is part of Wessex Water's business plan for 2025-2030.

Please see WSX00 – Navigation document' for where this document sits within our business plan submission.

More information can be found at wessexwater.co.uk.

For annexes, see Supporting Document WSX11 – Annexes - Maintaining our services

Executive summary

This document describes how we have approached the assessment of our future investment needs, provides an overview of the cost of maintaining our services in AMP8 and details the levels of performance we will maintain through investment in our assets. It characterises the costs to Wessex Water associated with operation, inspection, maintenance and replacement covered by 'base' expenditure, which Ofwat defines as 'routine, year-on-year expenditure to provide a base level of good service to customers and the environment', which comprises:

- Running costs to provide a base level of good service to customers and the environment.
- Expenditure on maintaining the long-term capability of assets.
- Expenditure to improve efficiency.
- Expenditure to comply with current legal obligations.

Note this is separate from enhancement expenditure, which Ofwat defines as 'a permanent increase or step change in the current level of service to a new 'base' level and/or the provision to new customers of the current service level'. Enhancement funding can be for environmental improvements required to meet new statutory obligations, improving service quality and resilience, and providing new solutions for water provision in drought conditions.

The provision of reliable access to water and wastewater services is fundamental for people; communities; and businesses to thrive. In turn, regular investment in resilient infrastructure assets is essential to ensure the delivery of high quality and reliable water and wastewater services in the long term.

There was large-scale investment in water infrastructure immediately following privatisation. Since then, the rate of investment in the industry has significantly slowed down. Part of this might be explained by the long-lived nature of assets in the water industry. But, over 30 years since privatisation, analysis suggests that assets in the water industry are outdated and, in some cases, are being stretched out over longer time periods than were originally planned for.

It is difficult to identify the 'optimal' level of investment in long-lived assets, because the benefits of investment (or, the costs of underinvestment) may not be directly observable until it is too late (i.e. the asset fails). However, going forward, our customers are clear that they want us to proactively deliver with a view to the long term, to improve river and coastal water quality, ensure greater resilience to drought and to focus on maintaining the supply-demand balance.

Further details are provided in the main document.

Customer and stakeholder priorities

In 2021 we worked with Accent to identify customer and stakeholder priorities to support the development of our updated Strategic Direction Statement that was published in early 2022. We have completed further customer engagement activities (detailed in WSX04) that provided additional insights on the expectations of our customers and allowed us to align our plans with the identified priorities.

Our maintenance investment plans for both water and wastewater services contribute to the delivery of the outcomes identified as high priorities for customers, in particular the operation and maintenance of our water supply and wastewater services.

Table 1: Customer insights

Key customer insight	How our plan addresses the insight
Customers have told us that value for money received by customers as part of their service from Wessex Water is a key driver of satisfaction and to date, Wessex Water have avoided significant negative perceptions relating to price rises.	By continuing to operate our assets appropriately and maintaining them with a lowest whole life cost approach, we will drive up reliability whilst limiting the cost impact to our customers. We will proactively replace or refurbish our assets at the optimal time to ensure limited impact to service and to reduce ongoing operational costs.
Excellent customer service is important to customers. The vast majority are satisfied with the customer experience provided by Wessex Water but want to ensure no deterioration in service.	Increased quality and reliability of our services will reduce customer contacts and improve perception for those impacted by issues. Our Pollution Incident Reduction Plan initiatives will reduce the frequency and duration of spills and lessen the impact on the environment. In addition to this, we will be investing in our call handling and customer billing systems to ensure we give every customer a great experience if they need to contact us.
Customers have stated that the provision of clean, safe drinking water is a core element of Wessex Water's service.	We are spending £150m on our assets across our Water Treatment sites to ensure we can continue to reliably supply outstanding water quality to our customers. This includes replacing 7,000 assets that will reach end of life by 2030 and refurbishing 1,000 more to enable them to continue to perform effectively.
Customers have told us they see the effective functioning of the sewage system as a core aspect of Wessex Water's wastewater service. Increasing sewage and treatment capacity is generally viewed as the favoured solution to improving the reliability and resilience of the wastewater system, despite concerns around disruption and environmental impact.	We are spending £160m on existing sewerage assets to ensure we have sufficient capacity to transport customer waste to our treatment plants. This work will see 23km of rising mains replaced, lining of our sewer network to reduce infiltration, and a proactive sewer rehabilitation programme to reduce sewer collapses. At our Sewage Pumping Stations, we will replace 5,500 assets that will reach end of life by 2030 and refurbish a further 2,500 to enable them to continue to perform effectively.
Customers have become increasingly aware, and therefore concerned, about the water quality of rivers and the sea and are keen for Wessex Water to contribute more toward water quality improvement in these areas.	By proactively replacing and refurbishing our assets, we will reduce the number of asset failures that lead to incidents that impact river and sea water quality.
Customers have told us they want to see efforts from Wessex Water to reduce their greenhouse gas emissions	By operating our assets appropriately and maintaining them proactively, we will not only drive up reliability, but we will benefit from more efficient operation and reduced energy consumption. Increased equipment reliability will also reduce the need for our maintenance

	teams to travel to sites so frequently, further reducing our carbon impact
Customers support Wessex Water's approach that the preferred solution for reducing demand and reliance on abstraction is to tackle leakage	We are planning to spend £77m to replace 0.4% of our water distribution network, enabling us to reduce our current leakage rates. Additional enhancement spend will be used to drive down leakage even further

Performance Commitments

Performance commitments and targets for 2025 - 2030 have been agreed and we will monitor progress against these targets and our long-term outcomes. These are also the high-level drivers for our maintenance planning and investment decision making processes. The table below shows PCs impacted by our maintenance plans with further information available in WSX12, WSX14, WSX16 and WSX18.

Table 2: Performance Commitments

Water Services	Wastewater Services
Water supply interruptions	Internal sewer flooding
Compliance risk index (CRI)	External sewer flooding
Customer contacts about water quality	Operational GHG – waste
Biodiversity	Total pollution incidents
Operational GHG – water	Serious pollution incidents
Leakage	Discharge Permit Compliance
PCC (per capita consumption)	Bathing water quality
Business demand	River water quality (phosphorus)
Mains repairs	Storm overflows
Unplanned outage	Sewer collapses
Customer Service Measure of Experience	Customer Service Measure of Experience

Approach

In developing our maintenance plans we have used our established Wessex Water Asset Management Framework to ensure delivery of our strategies and outcomes, and to ensure objectives are aligned throughout the business. We have also followed the principles of the UKWIR common framework for expenditure decision making for water and sewerage assets and management and general systems.

We use a combination of performance monitoring, forecasting and risk assessment to inform our business cases for each price control, to enable objective decision making. This approach ensures that our plans are based on sound evidence and an understanding of risk, performance and cost.

Where appropriate our plans have been determined using more than one assessment approach so that results can be triangulated. For long life assets such as sewers and water mains, our analysis of future maintenance needs is derived from deterioration modelling. For shorter life assets at our treatment works and pumping stations, our future maintenance demand has been derived using a combination of deterioration modelling and bottom-up assessments, based on observed performance and condition assessments, and corporate risk management systems. A detailed explanation of the assessment approach can be found in section 2.

Our PR24 plans have been subject to several stages of review and consultation during their development and at each stage have been scrutinised and challenged by internal stakeholders.

Performance to date

Section 1 includes performance and asset health information, but more detail of historical performance can be found in WSX12, WSX14, WSX16.

Investment Summary

The table below provides an overview of our planned investment for AMP8.

Table 3: Botex investment summary (22-23 price base), Pre RPE/Frontier shift adjustment and excluding business rates

Base Maintenance	£m @ 2022-23	
	AMP7	AMP8
Base Opex[1]	975.8	1140.7
Infrastructure Renewals and Capital Maintenance[2]	313.4	299.4
Non-Infrastructure Capital Maintenance[3]	520.4	823.6
Botex	**1809.6**	**2263.70**
Underlying increase/decrease on previous AMP		

[1] Opex from Tables CW1a and CWW1a Excluding expensed infra renewals

[2] including expensed infra renewals Table CW2 and CWW2 line 13

[3] including M&G

The table below provides a breakdown of our planned investment for AMP8 by price control, which represents a significant increase across all categories when compared to that for AMP7.

Table 4: Planned vs Historical Capital Maintenance investment (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

Price Control	AMP7 £m	AMP8 £m	AMP9* £m
Water resources	12.0	21.51	34.08
Water Network Plus	275.7	375.07	409.04
Waste Network Plus	320.9	390.13	655.59
Bioresources	82.6	188.41	108.23
M&G	90.6	120.22	173.16
Grand Total	**781.9**	**1095.35**	**1380.10**

**AMP9 figures are based on modelling outputs and have not been constrained. They also include AMP8 deferred spend described in Section 2.5*

We are proposing a significant uplift in investment from our AMP 7 position with most of the increase identified at our Bioresources Centres. We are facing increased regulatory demands around site operation and have become more aware of operational risks, including the possibility of reduced access to landbank in the future. Following the adoption of Process Safety principles, we have identified areas of improvement across all our Bioresources sites which have added £110m to our existing replacement and refurbishment plans.

We pride ourselves on the performance of our Water Treatment Sites, but these assets are also reaching the end of their operating lives. To sustain their excellent performance, we need to invest £29m more than we did in AMP 7. This cost includes proactive asset replacement and refurbishment as well as £50m on disinfection upgrades across a significant number of sites to meet DWI expectations.

Another significant area of spend is at our Water Recycling Centres. This investment is needed as many of our Water Recycling assets have reached or will reach the end of life by 2030. To maintain our current levels of environmental performance, we need to increase our programme of proactive asset replacement and refurbishment.

Future plans for abstraction reduction and an increasing focus on water use efficiency have required us to increase our spend on Water Resources (Non-Infra). In addition to the replacement and refurbishment activities, our near term focus will be on improving our understanding of water resources and use. This area will see a £7m step up from AMP 7 as we look to implement a programme to properly investigate borehole yield and quality issues, utilise more intensive rehabilitation measures (e.g. acidisation), drill new production boreholes to replace redundant/damaged assets, and deal with legacy observation borehole issues.

The increase in Management and General costs are largely due to the changes in our transport fleet, as we replace many of our diesel powered vehicles with electric vehicles, due to the banning of Internal Combustion Engine (ICE) vehicles in 2030. Although we won't be replacing a higher number of vehicles, replacements of small vans and some large vans moving to alternative fuels (or power trains) bring with them a higher cost of purchase. We are including investment in our carbon plans to install EV charging infrastructure to support the EV fleet. We are also increasing investment in our laboratory equipment as many of our analytical machines are now obsolete and life expired.

Due to the size of our enhancement programme and the potential impact on customer bills, we have taken a risk based approach to constrain the overall investment to a deliverable and affordable level. Through consultation with the Board and Exec, we have agreed to defer some elements of the modelled plan. This approach will still allow us to deliver our core services but at the lower end of what we would like to deliver this AMP. This deferral means we will have an even larger investment programme in AMP9 than AMP8.

1. Asset performance and asset health

Drivers for proposed investments and activities are:

- Maintaining a resilient service
- Maintaining environmental performance (pollution incident reduction and sewage treatment works compliance)
- Minimising sewer flooding
- Providing excellent service for customers
- Affordable bills
- Minimising health and safety risks to the public, employees or contractors

Assets have continued to perform well, providing an excellent level of service to customers and to the environment. There are a number of indicators that we use in the management of our water and sewerage services to measure and monitor service performance and asset health. These are introduced below for each service and are a key element in driving delivery of long-term outcomes required by customers and the environment, performance commitments, and to inform risk and maintenance investment decision making.

This section also sets out our asset health expectations.

1.1. Water Services

We supply 1.3 million people across Somerset, Dorset and Wiltshire, and provide excellent customer service and performance as measured by:

- Industry leading compliance with the drinking water quality standards as measured by the CRI
- Industry leading resilience, we have not had to impose any restrictions (temporary use bans – hosepipe bans) on water use since 1976, and managed events like the ‘beast from the east’ and prolonged dry spells and peaks in demand without incident
- we have reduced leakage (three year average) from 79.3Ml/d in 2011/12 to 66.5Ml/d in 2022/23
- we have reduced customer contacts about the appearance, taste and odour of drinking water from the three year average of 2.3 contacts per 1000 population in 2013/14 reducing to 1.3 in 2022/23
- We have reduced supply interruptions to less than 5 minutes, delivering industry leading performance

Our ambition ‘To provide reliable, affordable services for all customers and communities’ will be achieved by delivering several outcomes including ‘Safe and reliable water supply’ and ‘Sustainable abstraction’ and ‘Excellent customer experience’ and ‘affordable bills’.

We face several challenges in delivering these outcomes, with the impact of climate change potentially having the greatest impact over the longer term. We need to focus on resilience within our system to be able to continue to deliver a safe and reliable water supply, irrespective of the environmental challenges.

In developing our programme for the period of 2025 to 2030 and beyond, we have aimed to:

- develop an ambitious business plan that delivers for customers
- adopt a progressive approach incorporating cultural improvements, working practices and innovation
- build on our leading performance
- take a long-term view to ensure resilient and future proofed projects.

Our maintenance plan includes an uplift in maintenance expenditure in the following key areas:

- Groundwater asset management
- Disinfection improvements
- Trunk mains replacement for ATO and DWI Reg 28 on BBO
- Distribution mains replacement for long term asset stewardship (as measured by mains repairs PC)

The following section summarises the service performance and asset health indicators used in the management of our water services. The proposals are considered the lowest possible to provide the required levels of service, environmental performance and asset health, whilst maintaining a broadly stable risk profile.

1.1.1. Compliance risk index (CRI)

The Compliance Risk Index is a performance measure designed to illustrate the risk arising from failures to meet drinking water standards for the parameters specified within the regulations throughout the supply system from source to tap. The Index assigns a value to the significance of the failing parameter, the proportion of consumers potentially affected and an assessment of the company's response. Since the introduction of the Index in 2016 Wessex Water have largely been one of the top performing companies and we aspire to continue to maintain and build upon our industry leading performance.

Our strategy to maintain our industry leading performance is based on the continual improvement and development of our existing approach to risk management through Drinking Water Safety Plans (DWSP) and investment management and asset management strategies.

1.1.2. Customer contacts about water quality (WQC)

Customer contacts about the appearance, taste and odour of drinking water are reported annually by calendar year to the Drinking Water Inspectorate (DWI) and published each year in the Chief Inspector's report and on the discover water website. This data is used for this common PC and we are committed to further reducing the disruption and other negative social impacts for customers from this issue.

There are three main elements to our strategy to reduce customer contacts about water quality. These are asset management (mains replacement), operational performance (mains conditioning and flushing), and customer relationship management. This approach has delivered a significant reduction in the number of consumer contacts over the last decade, with the three year average of 2.3 contacts per 1000 population in 2013/14 reducing to 1.3 in 2022/23, but there is scope for further improvement to improve our performance in this area.

Black, Brown and Orange contacts form the largest sub-category of the Appearance metric and we are one of a several companies that were issued with a DWI Regulation 28(4) Notice in 2021 for the specific purpose of reducing our discolouration (black, brown and orange) customer contacts, both regionally and in specific water quality zones. The Notice requires a reduction in discolouration contacts (compared to 2020 figures) in AMP8.

Therefore we are proposing a significant uplift in capital maintenance base expenditure in AMP8 and beyond to enable the replacement of a number of trunk mains in specific water quality zones to achieve the requirements of our DWI Regulation discolouration 28 Notice. We are also planning to target taste and odour contacts for which we are above the national average.

1.1.3. Water supply interruptions (WSI)

The purpose of this common performance commitment is to incentivise companies to minimise the number and duration of supply interruptions. This is an existing PR19 mandatory PC with a common reporting methodology, and there has been no material changes to the definition for PR24

We have consistently reduced supply interruptions over the last decade and are now delivering Industry leading Water and Sewerage Company (WASC) performance.

We have set ourselves the stretching aspirational target of Zero interruptions of longer than three hours by the year 2050. As detailed in our Long Term Delivery Strategy we are planning to retain our current level of performance in 2025-2030 and 2030 -2035, and to gradually reduce to zero thereafter once new technology and innovation makes this affordable.

1.1.4. Leakage (LEA)

We have a successful track record in leakage management and have reduced leakage (three year average) from 79.3Ml/d in 2011/12 to 66.5Ml/d in 2022/23.

Our view is that maintenance should cover the cost of maintaining leakage and that reducing leakage should be funded from enhancement. Our leakage strategy is driven by our WRMP.

1.1.5. Per capita consumption (PCC) and Business demand (NHH)

These performance commitments are designed to incentivise companies to help customers and business reduce their consumption to benefit our long term water resources supply/demand balance and reduce need for water abstraction. Our strategy for these PCs is driven by our WRMP and reductions funded from enhancement.

1.1.6. Mains repairs (MRP)

The purpose of this common performance commitment is to incentivise companies to maintain and improve the asset health of the below ground water mains network and demonstrate their commitment to its long term asset stewardship for the benefit of current and future generations.

Our current performance is higher than our PR19 target as it did not reflect the increase in proactive (detected) repairs needed to meet our leakage reduction target.

However as shown in the Table below taken from our PR24 Table CW20 Water main asset condition data commentary we have seen a material deterioration in asset condition that cannot alone be explained by the above leakage reduction explanatory factor.

Table 5: Comparison between PR24 and PR09

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
PR24 Potable mains total (%)	53.5%	24.1%	18.7%	3.4%	0.3%
PR09 Potable mains total (%)	57.0%	31.6%	10.0%	1.3%	0.1%

We are proposing an increase to 0.4% per annum in AMP8, with a possible increase to 0.6% per annum in AMP9 with the long term sustainable level likely to be between 0.8% and 1.0%.

We are proposing a cost adjustment claim to base maintenance for this issue, see WSX09 - Annexes - Base cost adjustment claims include CAC2 – Mains replacement costs for further details.

1.1.7. Unplanned outage (UNO)

The purpose of the unplanned outage performance commitment is to incentivise the company to appropriately maintain and improve the asset health of our above ground supply production assets.

Unplanned outage is an existing AMP7 PC, however there is a major change to the definition at PR24 with the PR19 exclusion of outages as a result of raw water quality being removed for PR24. We think the PR19 definition is

appropriate as the purpose of the measure was to quantify the asset health of our supply production assets. Our raw water quality outages are not a measure of our asset health, but rather enable us to provide an efficient service to customers whilst our wider system resilience maintains security of supply.

1.2. Wastewater Services

This section includes details of the indicators used in the management of our wastewater services for Service performance (flooding, pollution and sludge compliance) and Asset health (sewer collapses, rising main bursts and treatment works compliance:

1.2.1. Service performance

- Flooding

The performance commitments related to sewer flooding are; internal flooding and external flooding.

Our performance for the number of internal sewer flooding incidents is industry leading. For external sewer flooding incidents our performance is approaching the upper quartile for the industry. Our bespoke flood risk score remains stable. The population at risk of flooding in a storm is a new common performance commitment.

- Pollution

Our analysis shows that most pollution incidents occur in the sewerage network, and that the clear majority are due to blockages caused by sewer misuse.

We are one of the industry leaders in terms of the number of pollution incidents per 10,000 km of sewers. We have been achieving this high standard for the past 9 years, having less than 100 pollutions (Category 1 - 3) per year.

We are committed to not having any category 1 or 2 pollutions. We also aim to achieve high levels of self-reporting.

- Sludge compliance

Sludge treatment compliance is heavily regulated and compliance forms part of the Environment Agency's annual Environmental Performance Assessment.

We have achieved 100% compliance with the safe Sludge Matrix since 2010/11.

Our performance data suggests that recent operational activity and investment plans have been effective in delivering the company's strategic objectives for biosolids treatment.

1.2.2. Asset health

- Sewer collapses

The main asset health measure for sewers is the sewer collapses common performance commitment. This includes collapses of gravity sewers and rising main bursts.

This performance commitment measure has a new definition, so we are not able to compare ourselves with other WaSCs. The common definition reflects our historically reported definition, but now includes s105a sewers and is normalised.

Our performance in this measure has been stable since the transfer in 2011.

However, keeping a stable level of collapses and bursts is challenging because our sewer deterioration modelling suggests that every year we would expect an additional 10 collapses above the previous year's number of collapses.

We are not expecting a sudden increase in the number of collapses because sewers are long life assets. However, we are concerned that our rising mains are more vulnerable assets. We have therefore included a larger proactive replacement programme for rising mains.

Our sewer deterioration modelling was developed a decade ago and is regularly updated to include recent data and information. It continues to suggest we should be having a step change in proactive sewer rehabilitation to match the deterioration rate, so that we do not pass legacy assets onto future generations. We are again proposing a step toward this.

- Discharge Permit Compliance

WRC compliance is an important indicator of whether investment levels have been sufficient to maintain asset performance and effective treatment capacity.

We have consistently performed as industry leading amongst the Water and Sewerage Companies (WaSCs), with respect to environmental performance. This is evidenced by our Discharge permit compliance, Prosecution record and Environmental pollution record.

2. Maintenance expenditure assessment

2.1. Asset management approach

Asset management contributes to the delivery of the company's corporate aims and values, and delivery of the long-term outcomes expected by our customers and stakeholders.

Our asset management framework (Figure.1) is aligned to ISO55001 and includes policies, strategies, plans, information management, decision-making processes and capital and operational delivery. It provides a number of important functions:

- It provides a clear line of sight so that everybody who works for or on behalf of Wessex Water understands how they contribute towards the delivery of our company objectives. The line of sight translates organisational objectives from our strategic direction statement into asset management policy, strategy, and objectives, which cascade down into more detailed asset management plans and delivery activities.
- It ensures that our senior management decisions, strategies, and plans take into account the bottom-up, fact-based realities i.e. asset capabilities, performance, opportunities and constraints through our risk management and resilience framework and our decision-making governance processes.
- It provides our delivery staff with direct visibility of the purpose of the work they undertake – so they understand why an intervention is needed, not just when and how to do it. This helps with identification and prioritisation of risks as well as encouraging innovation through identifying better ways of achieving objectives.

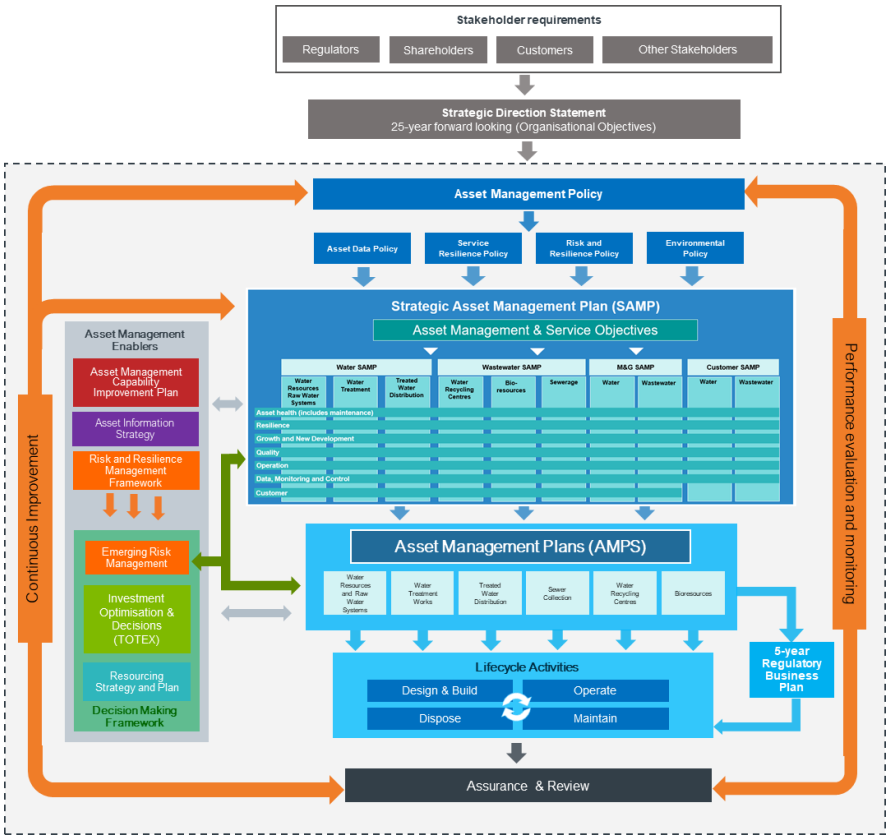

Figure 1. Wessex Water Asset Management Framework

With regards to the AMMA insights and recommendations report (September 2021), we reflected on the recommendations and incorporated them in our continuous improvement programme where we look to build on the existing AMF and increase our asset management capability.

2.2. Maintenance planning principles

Our maintenance planning approach for PR24 incorporates the following principles:

- Compliance with our asset management system, policy and framework,
- Assessment approaches guided by the principles of the UKWIR Common Framework 2014 for Expenditure Decision-making,
- Expenditure plans determined by use of more than one approach wherever possible so that results can be triangulated,
- Planning effort to reflect the size and value of the asset group and materiality of the business case
- Business cases based on sound evidence and understanding of risks, constraints and future changes
- Alignment of maintenance planning objectives for each asset group to deliver Outcomes, Performance Commitments and high level strategic objectives
- Assessment and management of residual risks where expenditure plans are constrained

In developing our forward-looking investment plans for asset maintenance, we follow the principles and stages of the UKWIR Common Framework 2014: Framework for Expenditure Decision-making, shown in the figure below.

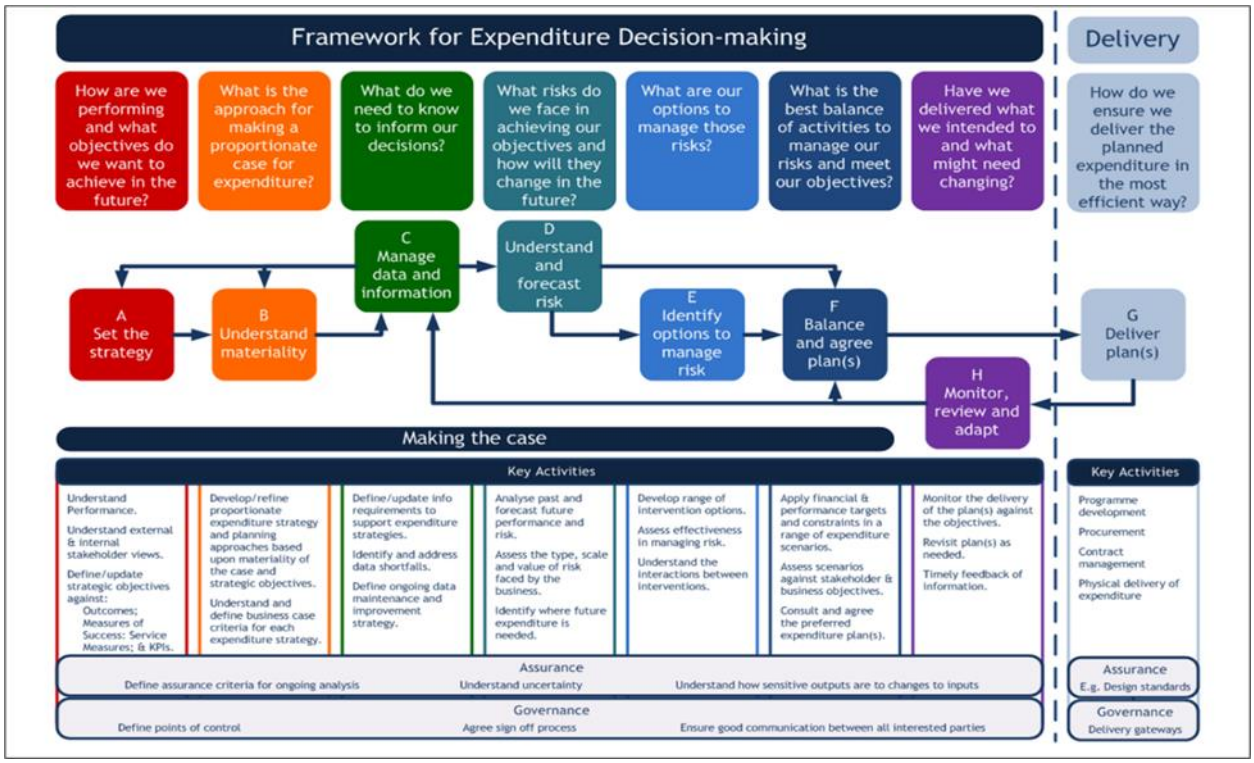

Figure 2. UKWIR Framework for Expenditure Decision-making 2014

This framework sets out a process for underpinning expenditure decisions, from setting the asset strategy to deliver the required business outcomes, assessing current and future risk, cost and service, through to the balancing and delivery of the expenditure plans. Risk management processes embedded in our business ensure a Board-to-shop-floor focus on risk management and support effective asset management and investment decision making.

The size, value and characteristics of the asset group, together with any internal or external drivers for change, will generally determine the materiality of the business case and the level of planning effort required in the analysis.

When assessing the need for investment in the operation, maintenance and improvements of our asset base, the estimation approach differs according to asset characteristics. We have divided our asset portfolio into three distinct categories that correspond with assessment approach, namely: long life assets, short life assets, and management and general. Methodologies for assessing forward looking maintenance requirements for our water and wastewater long life infrastructure and shorter life non-infrastructure asset groups are described in sections 2.3.1 and 2.3.2 respectively. The approach for assessing Management and General assets is described in section 2.5.

2.3. Assessing maintenance – Long life assets

We consider our below ground network assets such as Water mains and Sewers as Long life assets. The below sections describe our approach to assessing maintenance investment in these assets.

2.3.1. Water supply

We have an integrated water distribution network maintenance strategy across our asset groups and performance commitments as detailed in WSX14.

Mains repairs are the lead indicator of the structure condition of our water infrastructure. We continue to invest in our infrastructure, however as shown in the Table below taken from our PR24 Table CW20 Water main asset condition data commentary we have seen a material deterioration in asset condition that cannot alone be explained by the leakage reduction explanatory factor .

Table 6: Comparison between PR24 and PR09

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
PR24 Potable mains total (%)	53.5%	24.1%	18.7%	3.4%	0.3%
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We are *proposing an increase to 0.4% per annum in AMP8, with a possible increase to 0.6% per annum in AMP9 with the long term sustainable level likely to be between 0.8% and 1.0%.*

Customer contacts about water quality (appearance, taste and odour) are also an asset health indicator. We have reduced customer contacts about the appearance, taste and odour of drinking water from the three year average of 2.3 contacts per 1000 population in 2013/14 reducing to 1.3 in 2022/23.

Black, Brown and Orange contacts form the largest sub-category of the Appearance metric and we are one of a several companies that were issued with a DWI Regulation 28(4) Notice in 2021 for the specific purpose of reducing our discolouration (black, brown and orange) customer contacts, both regionally and in specific water quality zones. The Notice requires a reduction in discolouration contacts (compared to 2020 figures) in AMP8.

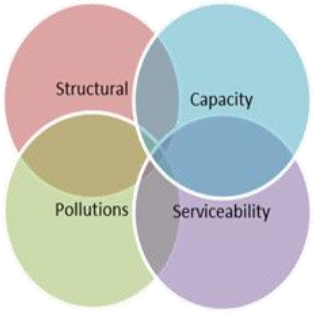
Therefore we are proposing a significant uplift in capital maintenance base expenditure in AMP8 and beyond to enable the replacement of a number of trunk mains in specific water quality zones to achieve the requirements of our DWI Regulation discolouration 28 Notice. We are also planning to target taste and odour contacts for which we are above the national average.

Service pipes are an important asset group and their asset health and asset management is important to meeting service delivery targets and should be included in any future asset health assessment.

2.3.2. Wastewater

We aim to strike the optimal balance between maximising performance, long term asset stewardship and managing risk, subject to affordability constraints.

To effectively manage capital investments and maintenance of the gravity sewer network, Wessex Water has developed a Sewer Risk Model in accordance with common framework principles.



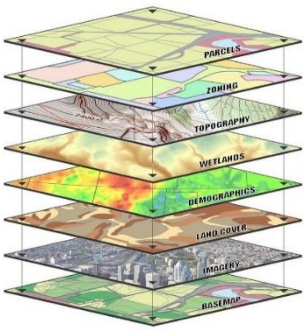
It considers 4 main risk categories as follows:

- **Structural:** Asset condition - long term asset stewardship
- **Pollutions:** Environmental - commitments to PIRP
- **Serviceability:** Customers - preventing escape of sewage
- **Capacity:** Hydraulics - making sure capacity meets the demands

We have a significant amount of data about from asset condition surveys, historical incidents, societal and environmental that our Sewer Risk Model combines all of this available data in a single place to enable analyses. The model provides score values at individual pipe level for each of the categories, as well as producing an overall risk score.

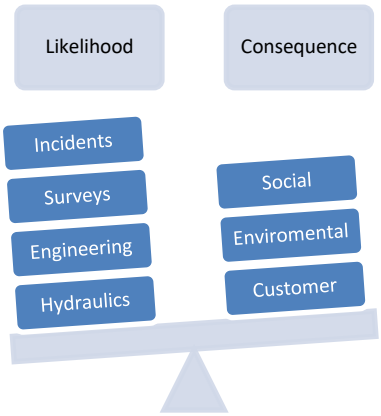
This is an objective way of identifying the most vulnerable parts of our sewer network, efficiently and with relative ease. The flexibility of the model means that, depending on the outcome sought, weightings for risk calculations can be easily varied. The model uses GIS (geographical information systems) to make the best use of all available information, each modelled individually :

- Incidents - collapses, blockages etc.
- Surveys – sewer CCTV inspections
- Engineering - pipe material, depths, size, tunnels
- Hydraulics - low dry weather velocities, predicted surcharge, infiltration
- Social / customer repeats, proximity to hospitals, trees , railway and motorway crossings
- Environmental - SSSI, watercourses, ground conditions



Individual likelihood and consequence models can be improved and developed separately, and when new better data sources become available, they can be added. The model is very robust and flexible to allow different scenarios to be run and compared.

The core of the risk model assigns values for each of the risk categories, using the average weighted sums of all contributing likelihood and consequence factors. The overall risk is the total sum of all 4 risk categories. This is calculated for each pipe, whereby each of the likelihood and consequence factors are modelled separately providing standardised magnitude score values (1 to 5).



The risk model provides outputs that are keystones to our company's framework for sewer capital maintenance investment. It is used in our inspection policy and escape of sewerage programme, to assist in finding and prioritising sewer capital maintenance investment.

There are two stages in the sewer rehab process following the risk modelling.

- Sewer CCTV inspection prioritisation procedure
- Sewer rehab prioritisation procedure

Both procedures use Sewer Risk model results, Cost Benefit Analysis, Whole Life Cost Analysis and Cost Efficient Analysis to produce a prioritisation score.

This determines the short, medium and long-term sewer renovation priorities following a defined policy that is based on risk and sound logic to accurately identify sewer inspection, rehabilitation and maintenance requirements. This will ensure that capital investment is targeted objectively to efficiently across the entire network.

The inspection information gathered is then used to further update and verify asset risk models and to determine capital investment and maintenance programmes. This allows the company to focus its resources more efficiently across all risk factors and sewerage performance commitments.

The prioritisation methodology is a function of the current risk model results, special factors, solutions and spatial distribution, as follows:

Risk	**(R)**	uses the Sewer Risk Model results
Cost Benefit Analysis	**(CBA)**	repair cost factors, special factors and engineering difficulties
Whole Life Cost Analysis	**(WLCA)**	considers rehabilitation methods
Cost Effectiveness Analysis	**(CEA)**	combining structural grades with their spatial distribution

All the factors have a magnitude score (1-5) and associated weighting for each pipe, which is then used to calculate a weighted average.

Table 7: Rehab Scoring matrix

Calculated final rehab priority score	Sub-group
4-5	Urgent rehab within 1 Month
3-4	Short term within 1 year
2-3	Medium within 5 years (current AMP)

1.5-2	Long term within 10 years
1-1.5	Over 10 years re-CCTV inspection policy

The aim is to identify and quantify sewers that require repairs and rehabilitation over the short term 1 year and over the AMP period.

The process is managed within GIS geodatabase - Sewer Investment Management Planning (SIMP), which used to manage the capital investment programmes. Final priority scores are assigned on all sewer lengths in the SIMP geodatabase for each risk category. This determines the short, medium and long-term sewer renovation priority for each of the driving factors and funding blocks.

- Benefits/successes of approach

The sewer risk model is used to underpin and quantify policies for capital investment and maintenance programme. The main benefits from using this modelling is that it allows to have an objective way of identifying the most vulnerable parts of the network - very large asset base spread around a large catchment area.

The model allows us to focus the attention of the asset managers and engineers. Each of the risk categories in the model allows them to identify further investigations and studies to enable capital investment options to be determined and targeted maintenance to be carried out.

- **Sewer CCTV survey inspection policy** – the model results are directly used to identify sewer lengths to be inspected both in a short and long term according to the agreed policy.
- **Sewer rehabilitation** – risk results are used to calculate a prioritisation scores along with other factors that will ensure investments done objectively where needed.
- **Escape of Sewage (EoS)** – flooding, blockages and pollutions
    - Pollutions – reduction of pollutions from the foul gravity network through targeted proactive inspections and then model is used to prioritisation factor for interventions.
    - Flooding – model identifies locations repeated customer incidents like flooding other causes, blockages, restricted toilet use etc. to focus the inspections and to influence the maintenance.
- **DWMP** – provides overall performance indicator on a catchment level for future strategic investment policies.
    - Influences rehabilitation or replacement upsizing options where hydraulic capacity is of a concern.
    - Also aims to identify part of the network which is affected by inflow.

It also aims to aid incident driven studies and investigations which are part of EoS strategy such as SIA and HLA, as well as compliance reporting.

The aim of the prioritisation is to gather sewers which are in need of repair into groups of cohorts so that sewer rehab can be delivered in the most efficient way and at the same time to target the sewers which pose the highest risk.

The Sewer Investment Management Planner (SIMP) geo-database is used to manage and hold appraisals and attribute records. It has the facility to link with CCTV surveys, display priority scores and risk values which then enables investment engineers to make informed decisions for each length that is of interest. Furthermore, it provides the delivery teams with scoped of schedules of works to formulate rehabilitation programme.

The SIMP geo-spatial database contains a wealth of information for the investment engineers to understand the issues, including:

- Proposed and planned investment requirement flag
- Priority scores per risk category
- Detail design comments

- Completed works details
- Other scheme related details
- Status and dates

Our proposal for AMP8 does not change planned investment from the current level of £19m for sewerage rehab. We are confident that the adopted and tried methods , combined with new technologies we could maintain stable level of collapses.

1. Weaknesses of approach

The main weakness of this methodology is that it relies mostly on past and existing incidents for the likelihood modelling as well as actual CCTV observations of the network. It doesn't use forward looking technologies of proactively monitoring the network. This however does not prevent it being a very effective approach at this level of investment. Also it has been designed with being open to new technologies and data as they become available. Those could be simply added to the existing models helping to improve and verify it even further.

2. Improvements of approach

We are continuously looking for ways to improve current modelling, so that allows us to pinpoint failure before occurring and potentially causing service failure or environmental impact. This improvement broadly can be categorised in 3 categories by better use data:

- Data obtained from live monitoring
- New external data sources
- AI optimisations of the available data

The emerging of new technologies to monitor the sewer network continuously in real time would allow learn a lot more about how the network operates, thus allow us to manage it better.

Information obtained externally from other sources such as the European Space Agency (ESA) satellite observations. For example, we recently imported the tree wooded coverage information provided. This already is used to identify parts of the network with increased risk of tree roots, causing blockages. We are also working on incorporating The European Ground Motion Service (EGMS) also provided by ESA.

Further examples include survey data obtained from drones to map sewers, collect manhole data etc.

The advances in machine learning would then allow us to optimise and make sense of all if this data by discovering dependencies and patterns to understand and predict failure incidents

3. Other approaches/works to improve submission for PR29

Adopting all of the above would allow us to update the deterioration modelling of these long life assets and determine the likelihood of failure. This in turn will help with accurate predicting the level of investment required for the short- and long-term.

4. Case studies

We have successfully deployed a new technology that uses AI to code sewer CCTV surveys which eliminates the need for an operator to log the defects onsite during the survey. This dramatically improves the productivity of the crews thus allowing us to increase the length of proactive inspections. This would allow better risk modelling and more accurate prioritisation.

2.4. Assessing maintenance – Short and Medium life assets

We consider our Civil, Mechanical, Electrical and Instrumentation assets at our above ground sites as Short and Medium life assets. The below sections describe our approach to assessing maintenance investment in these assets.

Our forward-looking analysis for shorter life water and wastewater assets sets out to identify emerging needs, the demand for future maintenance investment, and to forecast future levels of renewal expenditure. This excludes assessment of Management and General assets (see Section 2.5).

Our analysis is based on asset deterioration models which provide a longer-term forecast of expenditure and renewal trends, supplemented by bottom-up assessments to validate the short to medium term view of requirements. As a further validation of future trends, a high-level model populated with reported regulatory data can be used to predict the future maintenance impact of prior enhancement investments in short and medium life assets. Details of the assessment methodologies follow.

2.4.1. Deterioration modelling

Enterprise Decision Analytics (EDA) uses our asset data, alongside deterioration and cost models, to generate a profiled investment plan as shown in Figure 3. The deterioration and cost models are reliant on the accuracy of three key pieces of information from our Asset register (Hansen): installation date, size (kW, diameter, length, volume, flow, etc.) and condition grading. Install date and size are the most important data for modelling and are recorded when the asset is created. Condition grading information is provided from the field teams when they carry out inspection and maintenance work on the assets.

The asset installation date is mapped against our deterioration models to provide a time (year) when we would expect to refurbish or replace the asset. Condition data influences our intervention timing and will either reduce expected operating life (if in poor condition) or extend it (if in good condition). The size information is mapped against our cost models to provide us with an expected cost for refurbishing or replacing an asset of that size.

Where size data is missing, EDA infills the gaps with an average value from the existing dataset for that group of assets. See WSX11 – Annexes – Maintaining Our Services Annex 1 (EDA System Implementation Document) for a detailed description of tool and the infill methodology.

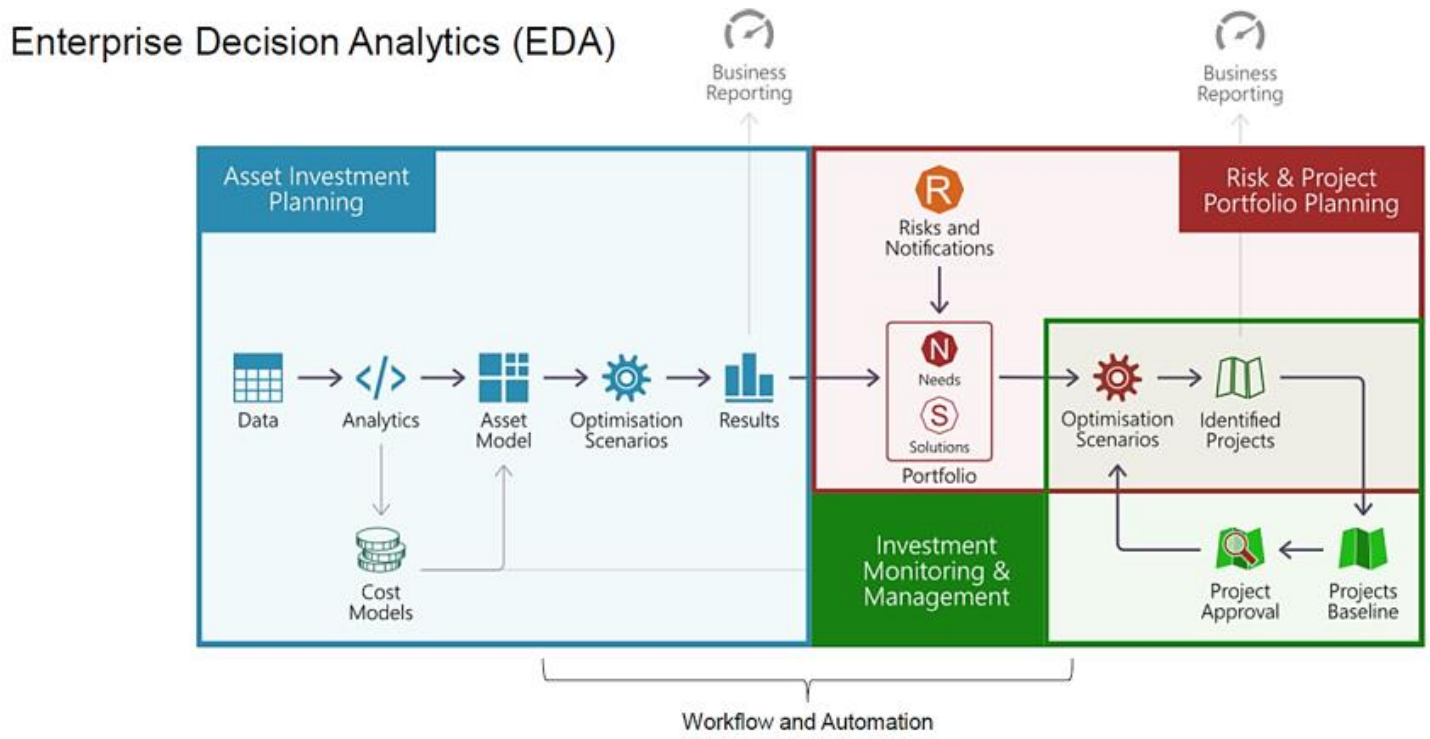


Figure 3. Overview of Enterprise Decision Analytics (EDA) system

The asset deterioration models used in this analysis are based on reliability statistics using Weibull distribution curves. These were developed in-house in 2007 using existing failure data and observations from experienced maintainers and operators. They cover a wide range of equipment and asset types that can be found in both the sewerage and water non-infrastructure sub-services and are used by EDA to provide a distribution for possible future failure probabilities for refurbishment and replacement. They have been updated each AMP with observed asset life information to ensure they reflect the true nature of asset deterioration at Wessex Water. See WSX11 – Annexes – Maintaining Our Services Annex 2 (Deterioration Modelling overview) for an explanation of how the models were developed.

The cost models were created for PR09 by the in-house cost estimating team from a combination of sources such as supplier quotations, historical project costs and TR61 unit cost curves. The models have been updated regularly with new asset types and costings to ensure they represent our installed asset base. Through the development of our PR24 plan, we have worked closely with ChandlerKBS to benchmark our cost models and continue to develop our approach to cost capture to ensure our models remain relevant.

2.4.2. Bottom up assessment

A variety of company data and information sources are used to identify emerging needs, risks and opportunities. Mechanisms for identifying these include:

- direction from the Strategy and Regulation team where multiple investment drivers are known
- business-as-usual corporate and asset risk management processes
- quality and safety compliance meetings
- bad-actor analyses from the Work and Asset Management maintenance management system
- condition and inspections reports
- site optimisation or energy efficiency reviews

2.5. Assessing maintenance – M&G assets

The M&G asset group comprises of a wide range of asset types that, together, provide essential services to ensure the business can deliver its objectives. These asset groups include Information Technology, Transport, Property and the Laboratory. Due to the varied nature of these assets, a range of investment estimation approaches are applied, as outlined in Table 8 below. We have adopted a risk-based approach guided by our risk management systems and the principles described in the UKWIR Report 11/RG/05/31 "The Common Framework and Justifying Investment in Management and General Asset Types". We have also considered, obsolescence and the materiality and proportionality of the business case for each asset group. As a general principle, where the required expenditure is relatively small or no greater than that required historically, a less detailed analysis has been completed.

Table 8: Asset Group characteristics & approaches

Asset Group	Sub-group	Assessment Approach
Information Technology	Software applications / systems Infrastructure hardware	Management frameworks Serviceability indicators
Transport	Company cars Operational vehicles Tools & plant	Least cost replacement interval
Property	Offices & depots Conservation, Access & Recreation (CAR) Others (agricultural holdings, abandoned sites, residential / commercial)	Bottom up site surveys and cost-effective options
Other areas	Laboratory services Digital strategy and services	Laboratory services: projected number of samples, asset life of test equipment and supporting infrastructure. Digital strategy and services: platform support for efficient customer experience

2.6. Base Opex

In order to maintain our services effectively for our customers, as well as focussing on our capital maintenance programme for upgrading and replacing assets, we also need to increase our focus on our BAU activities. This includes our front line resourcing and our base spend on materials an equipment.

During the course of AMP 7, there has been increasing pressure on Operational Maintenance. This has been caused by two significant factors:

- Aging infrastructure. Whilst our capital maintenance plan sets out our proposals to renew and update our infrastructure, there is still a significant number of assets that require additional maintenance than historically given due to their age. In order to provide a continuity of service and performance, additional servicing and monitoring of these assets is required in order to minimise risk of failure and to deliver value for money.

- Extreme weather events. Due to climate change, we have seen a significant increase in extreme weather events - in particular, hotter summers and storms. This has caused additional pressure on the 24/7 service we provide across the operation. Since 2018, we have had a 49% increase in the number of reactive alarms

that have required attendance from our operational teams in order to maintain a continuity of service and to meet our tightening performance targets, particularly with respect to pollutions.

In order to address this, we require additional front line operation and maintenance crews. We have included £77m for this across AMP 8.

2.7. Balancing and agreeing plans

Our plans are subject to several stages of review and consultation during development. At each stage they have been scrutinised and challenged by internal stakeholders representing all functions of the business. We have considered the findings from the historical and forward-looking analyses for each asset group, drawn conclusions on key issues and uncertainties, and proposed investment plan options for potentially different expenditure or business planning scenarios. Specifically, the challenge process considered:

- Affordability
- Effectiveness in delivering business objectives
- Legislative compliance
- Synergies with other programmes and potential for AMP carry over
- Uncertainties and confidence of timing of needs, input costs and innovations
- Organisational deliverability of plans – volume, pace and composition
- Magnitude and management of residual risks
- Rebalancing of investment across asset groups

The output from the planning and review process establishes the likely demand for future maintenance in the form of documented and agreed plans for each asset group, ensuring that they are balanced with respect to risk, performance and expenditure, are acceptable to all stakeholders, and deliver outcomes identified as a high priority for customers.

It is important to note that the modelling activities for above ground assets have identified significantly higher levels of required investment than we have included in our AMP8 plans. Due to the size of our enhancement programme and the potential impact on customer bills, we have taken a risk based approach to constrain the overall investment to a deliverable and affordable level. Through consultation with the Board and Exec, we have agreed to defer some elements of the modelled plan. This approach will still allow us to deliver our core services but at the lower end of what we would like to deliver this AMP. This deferral means we will have an even larger investment programme in AMP9 than AMP8.

3. Water Resources

3.1. Price control summary

3.1.1. Assets and assessment approach

We supply around 340 million litres per day of high quality drinking water to 1.3 million people and nearly 50,000 businesses across Dorset, Somerset and Wiltshire. This water comes from a variety of sources and assets with those in this water resources price control summarised below.

Table 9: Asset Group characteristics & approaches

Functional Group	Asset Group	No.*	Characteristics	Assessment approach
Water Resources	Dams and impounding reservoirs	18	Small asset group by number, subject to detailed statutory inspection regime.	Deterioration modelling not appropriate. Bottom up assessment based on detailed inspection data.
	Raw water pumping stations	9	Small asset group by number, so individual assessment possible.	Deterioration modelling not appropriate. Bottom up assessment based on detailed asset and condition data.
	Raw water mains	113 (km)	Small asset group by length in comparison with distribution mains. Individual assessment possible.	Deterioration modelling not appropriate. Bottom up assessment based on individual asset performance data and risk assessments.
	Boreholes	171	Large and important asset group. Proactive risk-based specialist inspection regime in place.	Deterioration modelling not appropriate. Bottom up assessment based on detailed inspection data.
	Springs	8**		

* Number of sites for which we have a maintenance responsibility
** Number of WTW where we get at least some of the supply from springs, some of which are made up of several groups of springs

However these assets are only part of our water resources system, with the water catchments that we operate within and the communities that live and work in these catchments being vital to the overall sustainability of our water services and the wider water environment.

Due to the hydrogeology of our supply area, and the lack of any large metropolitan areas, we have a large number of relatively small sources for our population served in comparison with other water companies.

3.1.2. Objectives

The key objectives of our water resource asset base can be summarised as follows:

- Maintaining and enhancing drinking water quality
- Maintaining capacity to meet the demand for water
- Maintaining stable asset health

- Compliance with the Reservoirs Act 1975
- Delivery of all outputs agreed with our regulators.
- Minimising health and safety risks to the public, employees or contractors.

Our long-term strategy for maintenance and enhancement of these asset groups is to ensure that the assets perform reliably to the required standards throughout their life and operate in a way that provides cost effective, resilient service to our customers and the environment.

Our revised Water Resources Management Plan indicates that significant new water resource facilities will be needed in the future. We are working as part of West Country Water Resources Group, along with South West Water, and the EA, to support a coordinated approach to water resources planning in the South West of England that transcends water company boundaries. A number of Strategic Resource Options (SROs) are being considered.

All of the cost of the appraisal of these SROs in the AMP8 period is being allocated to the water resources price control under enhancement. Delivery of schemes will be post 2030 and therefore have no impact on maintenance needs for this price control in AMP8.

3.1.3. Performance to date

These asset groups represent our sources of raw water and thus they are critical to providing adequate supply capacity to meet our target headroom with respect to water resources planning. In addition:

- Stream support boreholes provide an essential function in meeting abstraction licence conditions
- The dams associated with impounding reservoirs need to be maintained in an adequate condition such that there is no risk to the people living downstream of them.

Our system is resilient, and the failure of any one raw water main or pumping station should not materially impact on the resilience of our supply to customers as we have redundancy built into our systems. Any failure should be repairable within a relatively short time period.

Recent investment in the Grid and projects to eliminate standalone sources has increased levels of resilience in the network and provides system wide mitigation of the consequences of individual source failure. Despite this investment, the water supply borehole and spring source assets are still critical to service and system resilience.

We are delivering industry leading performance as measured by CRI and Water supply interruptions and the excellent performance of our water resources assets contributes to this. See WSX15 – Annexes – Water Networks Plus Strategy and Investment - Annex A4 for details of some of the recent and future innovations we are adopting to maintain and improve our performance and asset management.

3.1.4. Proposed investment

Our proposed maintenance strategy for this price control can be summarised as:

- A continuation of our proactive inspection and maintenance regime for dams and impounding reservoirs with AMP8 expenditure in line with our current £0.5m/yr.
- A continuation of our reactive and proactive maintenance of raw water pumping stations
- A significant uplift in maintenance of our boreholes and springs

Our maintenance planning approach for PR24 has included developing a “cost of failure framework” which estimates the combined monetised risks associated with non-infrastructure asset failure. These risk value takes account of a range of variables with underlying principles of likelihood and consequence driving the quantum of the risk.

As shown below we are forecasting a significant uplift in expenditure for this price control from AMP7 to AMP8 based on the need to do more proactive maintenance on boreholes in particular.

Table 10: Water Resources planned expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

Water Resources £m @ 2022-23	AMP3	AMP4	AMP5	AMP6	AMP7*	AMP8	AMP9
	3	9.3	10.8	6.2	12.0	20.7	32.5

3.2. Dams and impounding reservoirs

3.2.1. Historical analysis – assets, performance and expenditure

We own 16 Impounding reservoirs, 13 of which are governed by the Reservoirs Act 1975 with capacity greater than 25Ml. Government are consulting on reducing the volume threshold from 25ML to 10ML, and this could occur within the next 7 years so we effectively are managing the 3 smaller reservoir as if they fell under the act.

In addition, we have a maintenance responsibly for two other dams/reservoirs: ✂.

Asset condition and performance is governed by regular inspection and monitoring of our impounding reservoirs to comply with the Reservoirs Act 1975 ensuring that our dams and reservoirs are maintained.

The Reservoirs Act 1975 is the principal legislation aimed at ensuring the safety of people downstream of dams. Wessex Water is fully compliant with the Reservoirs Act 1975. We also apply the principles of the Reservoirs Act to our smaller non- statutory reservoirs. The act is enforced by the Environment Agency.

3.2.2. Maintenance planning objective

The main measure of serviceability performance is satisfactory compliance with the Reservoir Act 1975. Serviceability with respect to dams has been stable since AMP2. Our current risk position is to ensure full compliance with the Reservoirs Act and this position has not changed over time

The consequences of not maintaining our dams and impounding reservoirs would be an increased risk of water quality failures and an increased risk of not being able to produce sufficient water to meet customers' demand.

Our Strategic Direction Statement includes an outcome related to resilience and highlights that we will continue to maintain our dams and reservoirs in the most effective way to ensure satisfactory performance to meet the long-term needs of all our customers.

The Flood and Water Management Act 2010 introduced a more risk-based approach to reservoir regulation. The main changes proposed were a reduction in the capacity at which a reservoir will be regulated from 25ML to 10ML and that only those reservoirs assessed as a higher risk are subject to regulation. There were also changes related to registration, inspection reports, flood plans and incident reporting.

Following consultation with the industry and stakeholders Defra have decided to implement the changes in two phases:

5. Phase 1 will apply only to reservoirs that are currently regulated i.e. those with a capacity greater than 25ML. For these reservoirs the Environment Agency will determine whether a reservoir is high risk or not high risk, with the existing inspection regime only applicable to high risk reservoirs.

6. Phase 2, for which the timetable is not yet decided, will include the lowering of the threshold to 10ML, dealing with cascades of reservoirs and clarification of the abandonment process.

In practice the changes will make very little difference to our approach because we already apply the principles of the Reservoirs Act to our smaller non-statutory reservoirs. The changes, when implemented by Defra, will be undertaken through this base maintenance programme.

Performance Commitments

Compliance Risk Index (CRI) – Safe and reliable water supply

This is a common performance commitment stipulated by Ofwat and is the headline drinking water quality measure. Our proactive catchment management approach is integral to our excellent performance for this metric.

Unplanned Outage – Safe and reliable water supply

This is a common performance commitment which aims to show the extent to which unplanned events lead to a reduction in the maximum sustainable production capacity including the length of time and impact of those events.

It is defined as the total unplanned outage as a proportion of total production capacity (%); where unplanned outage is a temporary loss of maximum production capacity or reduction in capacity.

3.2.3. Historical capital maintenance expenditure

Table 11: Impounding reservoirs and dams expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Impounding reservoirs and dams	1.11	5.43	5.65	2.32	4.27	3.76

* *Forecast*

Large one-off schemes occurred in both AMP4 and AMP5 and we are not expecting any similar one-off schemes for AMP7.

3.2.4. Historical performance

The performance of our reservoirs and dams is generally excellent.

There is an increasing emphasis on emergency planning in relation to reservoirs. Aspects of the emergency plans will become statutory requirements under The Flood and Water Management Act 2010. On-site plans, detailing the action to be taken at the reservoirs in the event of a problem, have been prepared for all our reservoirs based on a template issued some years ago. Inundation maps have been prepared by the Environment Agency and issued to undertakers for emergency planning purposes.

3.2.5. Capital maintenance forecasting

The level of maintenance is governed by the outputs of regular inspection and monitoring to comply with the Reservoirs Act 1975.

We maintain a 10 year look ahead for all our dams and impounding reservoirs and based on all planned inspections and foreseeable needs we anticipate expenditure in AMP8 to be similar to the £0.5m/yr. in AMP7.

Although some of our dams are over 100 years old with corresponding rates of deterioration and the risk regime imposed by the Reservoirs Act continues to tighten, our assessment is that an increase in expenditure is not required.

Capital costs have been estimated by reference to similar projects or through discussions with the Inspecting Engineers and Supervising Engineers. There will not be any on-going operating costs associated with these schemes.

The schemes are justified on the basis that the company is required to comply with the Reservoirs Act. There is no overlap with the enhancement programme. Due to the level of scrutiny of Inspecting Engineers we are confident that the interventions will deliver the stated benefits.

We consider that our planned investment for Dams and Impounding Reservoirs maintains an acceptable and stable level of risk.

3.2.6. Conclusions

Asset condition and performance is governed by regular inspection and monitoring of our impounding reservoirs to comply with the Reservoirs Act 1975. Our proposed level of expenditure for AMP8 is based on a bottom-up approach, and is line with AMP7, and maintains an acceptable and stable level of risk.

Table 12: Impounding reservoirs and dams planned expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP7	AMP8	AMP9
Dams and impounding reservoirs	4.27	4.4	4.4

3.3. Raw water pumping stations

3.3.1. Asset inventory

Raw water pumping stations are defined as stations that pump water directly from rivers, canals and impounding reservoirs. This asset group excludes all raw water or partially treated water pumping stations which take water from wells, boreholes and springs and excludes all pumping stations located within or very close to Water Treatment Works (WTWs).

We own 8 sites defined as raw water pumping stations, of which only 5 are currently in use. There is a large range of capacities from <5Ml/d up to 50Ml/d.

✂

In general, the impact of asset failure is limited as there is resilience within the supply network and most of the raw water pumping stations deliver to impounding reservoirs that provide many months of storage.

3.3.2. Maintenance planning objective

There are no applicable serviceability indicators connected with capital maintenance expenditure for this asset group so, investment in maintaining asset resilience and stable risk will be managed through our Drinking Water Safety Plan risk management system.

The condition and performance of individual assets in this group has a marginal impact on performance commitments given the level of redundancy in these systems.

Performance Commitments

Unplanned Outage – Safe and reliable water supply

This is a common performance commitment which aims to show the extent to which unplanned events lead to a reduction in the maximum sustainable production capacity including the length of time and impact of those events.

It is defined as the total unplanned outage as a proportion of total production capacity (%); where unplanned outage is a temporary loss of maximum production capacity or reduction in capacity.

3.3.3. Historical capital maintenance expenditure

As shown below our historic capital maintenance expenditure on this small group of assets is relatively stable.

Table 13: Raw Water Pumping Stations expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Raw Water Pumping Stations	0.2	1.1	1.7	0.1	0.2	0.7

* *Forecast*

3.3.4. Historical performance

The sites are generally considered to be in a fair to good condition and the current level of risk is stable.

The failure of any one pumping station should not materially affect the resilience of our supply to customers as we have adequate redundancy built into our systems and any failure should be repairable within a relatively short time period.

The status of our raw water pumping stations is summarised in the following table.

Table 14: Raw Water Pumping Station status

✂

3.3.5. Capital maintenance forecasting

Our assessment has focused on meeting our planning objectives by maintaining a suitable balance of risk and service through our DWSP (Drinking Water Safety Plan) system.

✂, we anticipate AMP8 costs will be in line with historical average expenditure of £1.3m to address reactive repairs, asset improvements, H&S and asset replacement as needs arise over future years due to asset deterioration.

We consider that our planned investment for Raw Water Pumping Stations maintains an acceptable and stable level of risk.

3.3.6. Conclusions

The proposed AMP8 plan has been developed based on individual site assessments in conjunction with a review of historical expenditure.

The AMP8 proposal is in line with the long-term average, ✂.

Table 15: Raw Water Pumping Stations planned expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP7	AMP8	AMP9
Raw Water Pumping stations	1.3	4.2	4.5

3.4. Raw water mains & conveyors

3.4.1. Asset inventory

We have just over 113 km of raw water mains allocated to the water resources price control, most of which is made up of a small number of major systems, with most of the remaining length being smaller diameter spring collection mains. All our raw water mains and conveyors in the Wessex Water area are pipes, we do not have any tunnels or brick conduits or similar.

3.4.2. Maintenance planning objective

None of the water PCs provide a good metric on which to focus our capital maintenance assessment of raw water mains. Our assessment is therefore focused on meeting our planning objectives by maintaining a suitable balance of risk to service through our DWSP system.

3.4.3. Historical capital maintenance expenditure

Table 16: Raw Water Mains & Conveyors historical expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m (22/23 Price Base)	AMP3	AMP4	AMP5	AMP6	AMP7*	Average

Raw Water Mains & Conveyors	0.03	0.15	0.54	0.04	0.05	0.16

* *Forecast*

This summary of historical capital expenditure shows very little expenditure on raw water mains. This is because in most cases major historical capital expenditure on the raw water mains was part of a bigger scheme related to the associated WTW. Reactive maintenance has been limited to several localised repairs.

3.4.4. Historical performance

We do not have a large asset stock in this category and the probability of failure can be estimated from historical failure/repair records.

In general, the consequence of failure is limited as we have redundancy within our supply systems and given the characteristics of our pipes there is no reason why a pipe failure cannot be repaired within 18 hours.

3.4.5. Capital maintenance forecasting

We undertake individual asset condition and criticality assessments for each of the major systems to identify any potential investment needs and record the likelihood and consequence of failure data within our DWSP system.

We consider that our planned investment for Raw Water Mains maintains an acceptable, stable level of risk.

3.4.6. Conclusions

Our proposed investment strategy for PR24 is a continuation of our existing proactive and reactive strategy with a similar level of investment to the current AMP.

Table 17: Raw Water Mains & Conveyors expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m (22/23 Price Base)	AMP7*	AMP8	AMP9
Raw Water Mains & Conveyors	0.05	0.06	0.07

3.5. Boreholes and springs

3.5.1. Asset inventory

Around 75% of the water we supply comes from groundwater sources, mostly from boreholes with less than 5% from springs.

There are 171 boreholes currently in supply that can be categorised by the geology of the aquifer, chalk or upper greens and/other. Chalk boreholes are the simplest and normally comprise an unlined hole with 15-20m of permanent mild steel casing grouted into place at the top of the borehole to prevent surface water ingress. Upper greensand/other require additional screens and gravel pack within the hole to keep the borehole open and prevent the ingress of fines/iron deposits.

The borehole assets can be further sub-divided by their function. This could be for public water supply only, stream support only, supply and stream support (from separate pumps in the same borehole), as summarised below.

Many Wessex Water boreholes are between 50 and 100 years old and still operating efficiently and catastrophic borehole collapse is uncommon; two occurrences in 22 years.

More common is the reduction in efficiency of boreholes by clogging of screens and gravel packs, most commonly by iron. This occurs in boreholes in the Upper Greensand, Yeovil Sands or other granular aquifers across the region.

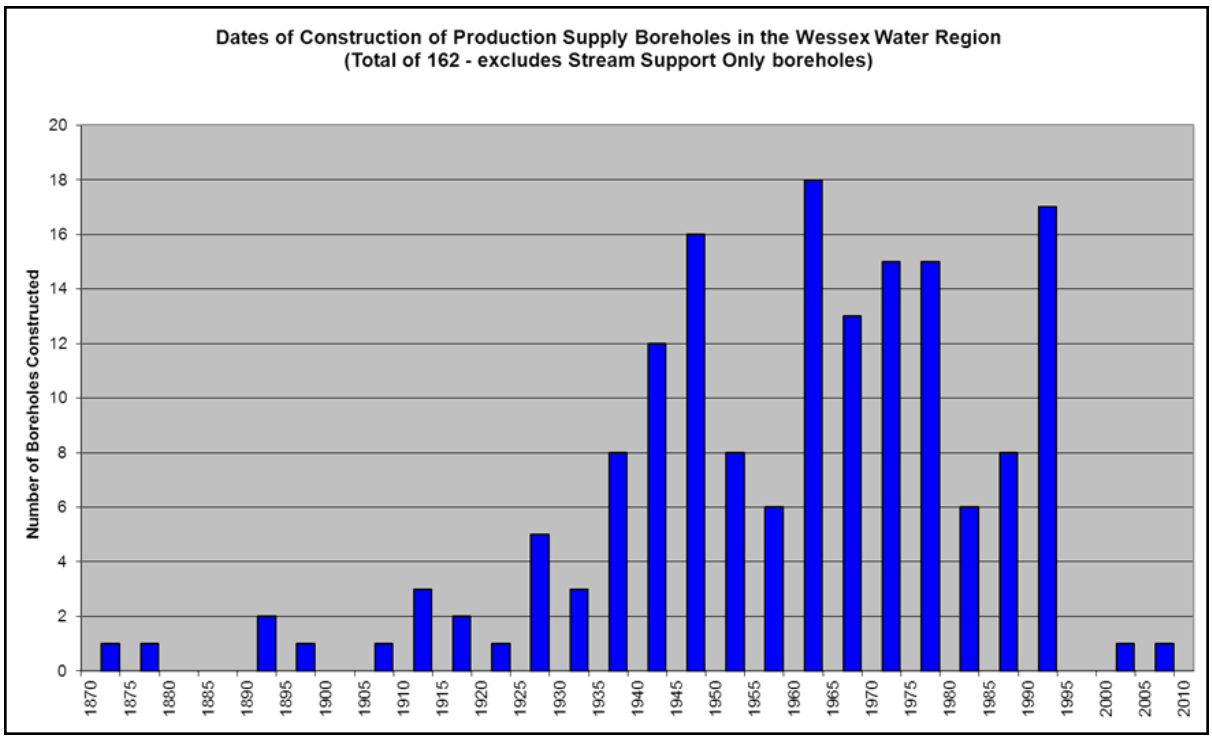


Figure 4 - Borehole age profile

The number of operational spring sources has been reduced significantly since privatisation, with only 8 WTW still supplied at least in part from springs. Many of our spring fed sources are supplied by multiple groups of springs. Springs are always located in areas that tend to be geologically unstable (at the groundwater – surface water interface) and as a result there is constant movement and erosion of the ground, it is therefore recognised that maintenance of springs is an ongoing activity.

3.5.2. Maintenance planning objective

Maintenance objectives are to maintain overall capacity and quality of the sources to avoid the risk of multiple and simultaneous failures. Stream support boreholes are also critical assets in that they are required to operate reliably on demand for extended periods to prevent loss of aquatic life and ensure compliance with abstraction licences.

It is vital that the boreholes and springs consistently deliver the appropriate quantity and quality of water to ensure that the supply network and treatment processes are optimised to:

- remain open to accept an appropriate size of submersible pump to provide the required yield
- provide their design yield with no deterioration in efficiency or performance (i.e. that pumped water levels do not increase over time for equivalent yield).
- provide groundwater of the highest possible quality with no deterioration

Utilisation of springs is generally maximised within the water resources strategy as spring sources have a low unit cost.

Concerns about water quality, such as cryptosporidium and turbidity, can also limit the utilisation of spring sources.

Performance Commitments

Compliance Risk Index (CRI) – Safe and reliable water supply

This is a common performance commitment stipulated by Ofwat and is the headline drinking water quality measure. It is a relatively new measure introduced by the DWI in 2016.

Unplanned Outage – Safe and reliable water supply

This is a common performance commitment which aims to show the extent to which unplanned events lead to a reduction in the maximum sustainable production capacity including the length of time and impact of those events.

It is defined as the total unplanned outage as a proportion of total production capacity (%); where unplanned outage is a temporary loss of maximum production capacity or reduction in capacity.

3.5.3. Historical capital expenditure

Table 18: Boreholes & Springs historical expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Boreholes & Springs	1.8	3.7	4.7	3.7	7.5	4.3

* *Forecast*

Service and asset performance is monitored by a programme of proactive inspection of the boreholes. The regime includes:

- Direct monitoring of the borehole condition comprising visual inspection by CCTV and geophysical logging
- Indirect monitoring such as measuring of pumped water levels or pump tests to assess the performance of the borehole
- Water quality monitoring, as increases in turbidity could be due to degeneration of the lining or structural issues within the borehole.

The specialist nature of borehole work, the limited number of experienced contractors and the large physical dimensions (diameter and depth) of public water supply boreholes (as opposed to small private boreholes) mean that any works carried out are expensive.

In 2006 a major programme of springs refurbishment was undertaken. Since then further refurbishment schemes have been driven by cyclical inspection and maintenance.

3.5.4. Historical performance

The borehole assets within Wessex Water are robust and continue to provide excellent service. However, regular inspection is required and increasingly so as the boreholes age.

There are concerns over those boreholes which, for example, penetrate both the Chalk and the Upper Greensand. Historically, the construction method was to leave the Chalk (upper) section unlined and add a “drop set” screen into the Upper Greensand section.

Inspection shows that loose blocks of Chalk and even relatively small flints, can fall out of the unlined section and wedge the pump into the “drop set” or damage the screen below.

Regular borehole inspection with a view to the possible addition of casing through the chalk section will be carried out for early identification of weakness in the unlined sections of the boreholes.

3.5.5. Capital maintenance forecasting

The proposed AMP8 plan of £6.3m is much higher than the long-term average of £4.5m and aims to further improve the understanding of the condition and performance of the assets to better inform decisions on the level of proactive maintenance interventions required to meet the maintenance objectives.

In addition, top-down budget allocations derived from historical costs and lifecycle modelling assumptions, have been forecast for inclusion in our AMP8 plans.

Proposed activities include cyclical maintenance and cleaning activities at spring sources and greensand boreholes, borehole pump replacements, casing and head plate relining/replacement and an allocation for major refurbishment or rehabilitation of boreholes and spring sources as informed by the inspection programme.

Detailed bottom up annual programmes of work will be developed for the above activities in each year of subsequent AMP based on the findings of an annual condition inspection programme and through ongoing monitoring of source yield and water quality.

We consider that our planned investment for Boreholes & Springs maintains an acceptable, stable level of risk.

3.5.6. Conclusions

Our AMP8 plan is for a significant increase in expenditure in this area as we are proposing to take a more proactive approach to our borehole maintenance activities.

Table 19: Boreholes and Springs planned expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP7	AMP8	AMP9
Boreholes and Springs	7.5	13	15

3.6. Water Resources Base Operating expenditure

We are expecting the base operating expenditure for this price control to remain relatively consistent for this price control, having incorporated the enhancement opex from AMP7 to arrive at a consistent value per annum. Other operating costs and power costs show some fluctuations and these minor decreases, all less than £0.1m year on year, are the result of the expected efficiencies and real price effects in this price control. Please see WSX08 for more details on the calculation and application of real price effects and frontier shift.

Local authority rates, as per other price controls, are forecast to show step change increases in costs in 2026-27 and 2029-30 as a result of the Valuation Office Agency's triennial review for the business rates at these points in time, as is documented in WSX02.

We consider these movements and the remaining underlying base position to be reasonable given that the majority of capital expenditure in AMP8 is enhancement capex and hence will incur enhancement operating expenditure in AMP8. We are not expecting any further amendments to our base practices and approaches in AMP8.

4. Water Network Plus

4.1. Price control summary

4.1.1. Assets and assessment approach

We supply around 340 million litres per day of high quality drinking water to 1.3 million people and nearly 50,000 businesses across Dorset, Somerset and Wiltshire. This water comes from a variety of sources and assets with those in this water network plus price control summarised below.

Table 20: Asset Group Characteristics & Approach

Functional Group	Asset Group	No.	Characteristics	Assessment approach
Raw Water Transport	Mains	124 km	Small asset group by length in comparison with distribution mains. Individual assessment possible.	Deterioration modelling not appropriate. Bottom up assessment based on individual asset performance data and risk assessments.
	Pumping stations	2		
Water Treatment	Water Treatment Works	64	Large and varied asset group	A combination of deterioration modelling, bottom up capital expenditure assessment, asset performance data and risk assessments used to generate AMP8 spend and forecast longer term trends
Treated Water Distribution	Trunk Mains (diameter > 320mm)	970 km	Large asset group but with few failures	Deterioration modelling not appropriate. Bottom up assessment based on individual asset performance data and risk assessments.
	Service Reservoirs & Water Towers	311	Large asset group, but primarily long life civil assets. Proactive risk-based inspection regime in place.	Deterioration modelling not appropriate. Bottom up assessment based on individual asset performance data, surveys and risk assessments.
	Booster Pumping Stations	293	Large asset group by number, primarily mechanical and electrical plant.	A combination of deterioration modelling, bottom up capital expenditure assessment, asset performance data and risk assessments used to generate AMP8 spend and forecast longer term trends
	Distribution Mains	11,146 km	Large asset group.	Deterioration modelling.
	Service Pipes	600,000	Large asset group.	Historical analysis.
	Meters	479,000	Large asset group by number of similar assets.	Reactive replacement on failure & proactive replacement on age and synergy with proposed smart metering strategy.

4.1.2. Objectives

Our long-term strategy for maintenance of these asset groups is to ensure that they perform reliably to the required standards throughout their life and operate in a way that provides cost effective, resilient service to our customers and the environment.

The key objectives can be summarised as follows:

- Maintaining and enhancing drinking water quality
- Maintaining capacity to meet the demand for water
- Maintaining availability of supply
- Maintaining stable asset health
- Delivery of all outputs agreed with our regulators
- Minimising health and safety risks to the public, employees or contractors

4.1.3. Performance to date

We provide excellent customer service and performance as measured by:

- Industry leading compliance with the drinking water quality standards as measured by the CRI
- Industry leading resilience, we have not had to impose any restrictions (temporary use bans – hosepipe bans) on water use since 1976, and managed events like the ‘beast from the east’ and prolonged dry spells and peaks in demand without incident
- we have reduced leakage (three year average) from 79.3Ml/d in 2011/12 to 66.5Ml/d in 2022/23
- we have reduce customer contacts about the appearance, taste and odour of drinking water from the three year average of 2.3 contacts per 1000 population in 2013/14 reducing to 1.3 in 2022/23
- We have reduced supply interruptions to less than 5 minutes delivering industry leading performance

See WSX15 – Annexes – Water Networks Plus Strategy and Investment - Annex A4 for details of some of the recent and future innovations we are adopting to maintain and improve our performance and asset management.

The following sections detail our asset inventory, performance and strategy for the principal asset groups that make up this price control subcategory.

4.1.4. Proposed investment

This is a significant asset group with a large proportion of long life assets requiring regular maintenance and we proposed an increase in expenditure to maintain an acceptable level of risk.

Our maintenance planning approach has included developing what we have called a “cost of failure framework” which estimates the combined risks associated with non-infra asset failure. The risk value takes account of a range of variables with underlying principles of likelihood and consequence driving the quantum of the risk. This was used to rank and prioritise needs.

Our long-term plan for water distribution is to maintain stable asset health. We have just over 12,000km of water mains in our network and plan to increase our proactive mains replacement programme to 0.4%p.a. in AMP8 and anticipate further increases may be required in AMP9 and beyond. Prioritisation of mains replacement is based on and integrated approach looking at mains repairs and bursts, supply interruptions, leakage, and customer contacts about water quality, and water quality compliance risks.

Over the long term operational costs for managing our water network assets have increased in line with tighter service performance targets. Looking forward, expenditure for operating and maintaining our water network and

water treatment assets will continue to rise and will be influenced in AMP8 and AMP9 by the upwards cost pressures associated with:

- further increases in service performance
- increases in energy and chemical costs above inflation
- the revenue effect of growth and enhancement schemes completed in AMP7 and those planned for implementation in AMP8.

Our proposed operational plans build on existing energy efficiency and system optimisation activities for the management of our network and treatment assets which will in part offset these upwards cost pressures.

Non-Infrastructure summary

For the largest asset group (Water Treatment Centres) we are planning to further increase the high level of investment as these assets are critical to delivering a safe and reliable water supply. The largest investment programme covers disinfection upgrade works across a significant number of sites.

Booster Pumping Stations and Service Reservoir investment is broadly aligned with investment in previous AMPs.

Infrastructure summary

We are proposing a significant increase in investment, primarily driven by an increase in our proactive mains replacement programme to achieve a 0.4% pa replacement rate.

4.2. Raw Water Transport & Storage

We do not have many assets that fall within these price control sub-category, and are not proposing any enhancement expenditure in this area. Our investment strategy over the next five years can be described as business as usual reactive and proactive like for like replacement as and when required.

As shown in PR24 Table CW4 we only have two raw water transport stations with a total capacity of 55kW and are not forecasting any change over the five year period. We are forecasting a very small increase in raw water transport mains over the five year following the trend reported in the APR over the last three years, mainly as a result of result of treatment improvement projects.

✂

The Strategic Resource Options (SROs) may result in new raw water transport & storage assets being created, although these will not be delivered until AMP9 at the earliest, and in the case of Cheddar 2 and Mendips quarries are unlikely to be vested in Wessex Water.

4.3. Water Treatment Works

4.3.1. Asset inventory

At present we have 64 Water Treatment Works in service. Our five surface works provide around 25% of our total supply with the rest from our groundwater sources. We currently do not have any artificial recharge (AR), aquifer storage and recovery (ASR), saline abstractions or water reuse schemes.

We will continue to implement our drinking water safety plan approach to prioritise and proactively maintain our water treatment works using the latest technology and innovation where appropriate to maintain excellent quality drinking water into the future. Our design standards are evolving to meet the latest regulatory expectations for disinfection.

4.3.2. Maintenance planning objective

Our long-term strategy for maintenance and enhancement of this asset group works is to ensure that the assets perform reliably to the required standards throughout their life and operate in a way that provides cost effective service to our customers and the environment.

The key objectives can be summarised as follows:

- Maintaining and enhancing drinking water quality
- Maintaining capacity to meet the demand for water
- Maintaining stable asset health
- Delivery of all outputs agreed with our regulators.

Performance Commitments

Compliance Risk Index (CRI) – Safe and reliable water supply

This is an Ofwat common performance commitment and is the headline drinking water quality measure. It is a relatively new measure introduced by the DWI in 2016.

Unplanned Outage – Safe and reliable water supply

This is a common performance commitment which aims to show the extent to which unplanned events lead to a reduction in the maximum sustainable production capacity including the length of time and impact of those events.

It is defined as the total unplanned outage as a proportion of total production capacity (%); where unplanned outage is a temporary loss of maximum production capacity or reduction in capacity.

Historical capital maintenance expenditure

Table 21: Water Treatment Works historic expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m (22/23 Price Base)	AMP4	AMP4	AMP5	AMP6	AMP7*	Average
Water Treatment Works	20.85	43.64	51.31	94.59	95.78	61.24

* *Forecast*

Over the past four AMPs approximately £114m of new water treatment assets have been added to meet the requirements of quality and capacity enhancement obligations.

A high proportion of these assets are short to medium life assets which are required to meet tighter quality standards, including advanced treatment processes such as membranes, ion exchange and granular activated carbon.

4.3.3. Historical performance

Our water treatment works assets are stable and previous investment and operational activities have been successful in contributing to delivery of our overall strategic objectives of maintaining water quality capacity.

All of our surface water treatment works are performing well, providing good quality water as demonstrated by our consistently low CRI score, but all require continual investment to ensure their reliability and maintain this performance. ✂

4.3.4. Capital maintenance forecasting

With such a large asset base our view is that it is necessary to have rolling programmes of site refurbishments carried out proactively to reduce the risk of multiple, simultaneous failures to maintain a satisfactory stable risk position and resilient service.

Our proposed level of maintenance expenditure is constrained compared to our modelled assessment and our PR24 plan will aim to strike a balance between environmental performance, risk and long-term value, subject to regulatory and affordability constraints.

Our proposed maintenance expenditure for AMP8 is more than AMP7 and is based on a combination of an increase in our BAU maintenance as well as our disinfection improvement programme.

4.3.5. Conclusions

The resulting projection for future capital maintenance expenditure is given in the table below.

Table 22: Water Treatment Works planned expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP7	AMP8	AMP9
Water Treatment Works	95.78	139.7	143.6

This significant uplift in investment set out for this asset group is essential if we are to do the right thing for customers and the environment, within the current policy and regulatory framework. We have carefully prioritised and only included what we need to do to meet legislative and regulatory expectations and deliver the outcomes our customers and communities support.

4.4. Trunk mains

4.4.1. Asset inventory

Trunk mains can be defined in a number of ways, by diameter, by function (moving water from one location to another, not feeding customers) and for leakage as all mains not within DMAs,

Wessex is a small predominantly rural area with no major conurbations, and therefore using the >320mm diameter size banding used in regulatory reporting we have a total of 970km of trunk mains at 31 March 2023, Of which 570km are in the >320mm and ≤ 450mm size band, and 316km in the >450mm and ≤610mm size band and only 84km > 610mm. Our largest trunk main is 800mm.

These are critical assets as their failure can lead to the loss of service to many customers.

4.4.2. Maintenance planning objective

The main measure of serviceability is a combination of customer facing measures:

- Meeting our ambitious leakage reduction target
- Meeting the industry upper quartile target for customer (water quality) contacts
- Meeting the industry upper quartile target for total supply interruptions
- Meeting the water quality compliance target
- Maintaining and enhancing the resilience of our water supply
- Maintaining stable asset health for the longer term.

Performance Commitments

Volume of Water Leaked – Safe and reliable water supply

This is a common performance commitment that measures the amount of water lost from companies' water supply systems (leakage). It is defined as the percentage reduction in leakage reported as a three-year average.

Water Supply Interruptions – Safe and reliable water supply

This is one of 14 common measures outlined by Ofwat with a cross company target. It is defined as the number of minutes lost per property due to supply interruptions greater than three hours including planned, unplanned and third-party interruptions.

Mains Repairs – Safe and reliable water supply

This is a common performance commitment focusing on the long-term asset health of our pipe network. It is defined as the number of repairs on water mains per year per 1,000 km.

Water Quality Customer Contacts – Safe and reliable water supply

This is a performance commitment using the established DWI metric which measures the number of customer contacts each year about the quality of drinking water per 1,000 population.

For PR24 we have set a challenging target to reduce leakage and plan to maintain our industry leading performance on supply interruptions. The maintenance of our trunk mains and associated monitoring and data systems is essential to achieving these targets. This is discussed in more detail in the section on distribution mains as this is the predominant asset group influencing leakage and supply interruptions.

4.4.3. Historical capital maintenance expenditure

Table 23: Historical Trunk Main expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m (22/23 Price Base)	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Trunk Mains	4.21	9.92	28.89	27.23	21.71	18.39

* *Forecast*

Forecast AMP 7 expenditure is slightly below the two previous AMPs as we have not had any "lumpy" investment in trunk mains rehabilitation for water quality driven by a DWI undertaking.

4.4.4. Historical performance

The condition of our trunk mains is stable and previous investment and operational activities have been successful in contributing to delivery of our overall strategic objectives of improving resilience, maintaining water quality and reducing leakage.

4.4.5. Capital maintenance forecasting

Our forward-looking risk management systems indicate that trunk main replacement in AMP8 in line with the long-term average should be sufficient to maintain this asset group in a stable condition.

Our planned expenditure is based on the bottom up assessment which is in line with the optimal expenditure predicted by the modelling.

We don't have any named trunk main replacement schemes. We prioritise our structural and water quality driven mains replacement programmes on an annual basis and our forward-looking risk-based prioritisation will identify some trunk mains for replacement in the five-year period. Some expenditure will be reactive.

Our combined leakage and supply interruptions reduction strategy will necessitate some proactive expenditure but most of this will not be infrastructure renewal. We will invest in additional continuous monitoring points and associated knowledge management and decision support tools to help achieve these stretch targets.

4.4.6. Conclusions

These are critical assets as their failure can lead to the loss of service to many customers. We have assessed the criticality of each individual trunk main system and developed appropriate risk mitigation plans to minimise the risk of failure and reduce the consequence of failure through enhanced response plans.

We will continue to invest in trunk main replacement to ensure this asset group is maintained in a stable condition both now and in the future. Our water mains performance continues to be good and we are monitoring trends in asset performance closely, and plan to continue to replace water mains at the rate at which they are deteriorating.

Whilst in the long run we may need to increase the replacement rates, we recognise that customers and the environment will see minimal improvement in service from an increase in expenditure above the average in the short term.

The resulting projection for future capital maintenance expenditure is given in the table below.

Table 24: Planned Trunk Main expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP7	AMP8	AMP9
Trunk Mains	21.71	44.37	41

This significant uplift in investment set out for this asset group is essential if we are to do the right thing for customers within the current policy and regulatory framework. We have only included what we need to do to meet legislative and regulatory expectations and deliver the outcomes our customers and communities support.

4.5. Service reservoirs

4.5.1. Asset Inventory

The table below shows our asset inventory and forecast changes over the AMP8 period as reported in Table CW5.

Table 25: Service Reservoir and Water Tower asset inventory and forecast

	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30

Service Reservoirs (Nr)	300	299	299	298	298	297	297	296
Service Reservoirs total volume (Ml)	628.8	628.7	628.7	628.6	628.6	628.5	628.5	628.4
Water Towers (Nr)	11	11	11	11	11	11	11	11
Water Tower total volume (Ml)	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0

At the end of March 2023 we had 300 service reservoirs in service, this is a very large number for a company of our size, i.e. with less than 650,000 connected properties. This is a legacy issue arising from the hydrogeology of our area which allowed a large number of small local sources being developed each requiring one or more service reservoirs. Whist many of these local sources have subsequently been abandoned the service reservoirs and pipe network configuration are largely unchanged. As shown below we have a very large proportion of very small reservoirs.

Table 26: Service Reservoir Capacity breakdown

	<0.5 Ml	0.5 to <1 Ml	1 to <5 Ml	5 to <10 Ml	> 10 Ml
Service Reservoirs (Nr)	101	42	119	31	7
%	34%	14%	40%	10%	2%

Whilst the majority of our service reservoir are of modern reinforced concrete construction we still have a significant minority of legacy structures using brick and mass concrete etc.

At privatisation we had around 25 Water Towers in use, but many have been abandoned over the years and we only have 11 left in service. Our remaining water towers are a diverse group ranging from 1928 to 1996, from 0.14Ml to 3.0Ml, although all the remaining structures are of reinforced concrete construction apart from the three smallest which are steel.

4.5.2. Asset strategy

We have a proactive internal and external inspection regime, with all structures fully surveyed at least once every six years. Issues arising from these surveys are fed back into our maintenance prioritisation system. We have a rolling programme of service reservoir and water tower refurbishment works to ensure these importation asset group is kept in good condition.

Based on analysis of historic activity and current planning we anticipate the number of service reservoir will reduce by 1 site 0.1Ml in 23/24, no change in 24/25, and then in the AMP8 period it is assumed that 3 sites will be abandoned each with a capacity of 0.1Ml as summarised above and in Table CW5.

We do not anticipate abandoning any Water Towers in the AMP8 period based on recent inspections of our remaining in use assets, but should any unforeseen issue arise then we would always consider the abandonment option in any refurbishment appraisal. We think it unlikely that any new Water Towers will be built in the Wessex region.

The environmental destination for sustainable abstraction is likely to lead to significant changes to our treated water distribution system which may include additional service reservoirs but this will not occur until AMP9 at the earliest

4.5.3. Maintenance planning objective

Our planning objectives for this asset group can be summarised as follows:

- Meeting the industry upper quartile target for customer (water quality) contacts
- Meeting the water quality compliance target
- Maintain the asset base in a stable condition
- Provide adequate physical security to prevent contamination
- Provide sufficient storage capacity where it is needed to ensure the security of supply
- Remove redundant structures and risks to water quality from the supply system.

Our forward-looking analysis is based on a proactive inspection regime, with the default being that all structures are inspected both internally and externally at least once every ten years.

Every AMP period over half of all reservoirs are inspected and the outcome is an indication of maintenance needs now and in the future.

Every Service reservoir is a critical asset safeguarding water quality and providing storage to ensure the resilience of our water supply.

Performance Commitments

Compliance Risk Index (CRI) – Safe and reliable water supply

This is a common performance commitment stipulated by Ofwat and is the headline drinking water quality measure. It is a relatively new measure introduced by the DWI in 2016.

4.5.4. Historical capital maintenance expenditure

Table 27: Historical Service Reservoirs expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m (22/23 Price Base)	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Service Reservoirs	6.65	17.45	8.53	18.59	21.48	17.3

* *Forecast*

We have an annual proactive risk based inspection and maintenance programme to ensure the serviceability of these critical assets.

Capital maintenance expenditure on service reservoirs has averaged at around £17m/year and funding for service reservoir maintenance is reviewed annually based on the latest survey data to ensure this asset group is maintained in a stable condition.

4.5.5. Historical performance

Our proactive inspection and maintenance strategy has delivered significant improvement in performance of our service reservoirs as measured by our industry leading CRI score and the low level of failures recorded at service reservoirs.

The improved performance is also attributable to the continual improvement in systems and processes.

4.5.6. Capital maintenance forecasting

The service reservoir maintenance programme is generated and prioritised from the inspection programme. The programme therefore has a degree of flexibility to take account of emerging, higher priority needs if and when they arise.

Our bottom up assessment suggests that we should be investing in the order of £18m.

The resulting projection for future capital maintenance expenditure shows a small dip in AMP 8 and a further rise in AMP9 which could be described as a BAU variation from one AMP to the next for these kinds of long-life assets.

Table 28: Planned Service Reservoirs expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP7	AMP8	AMP9
Service Reservoirs	21.48	18	23.6

4.5.7. Conclusions

Every Service reservoir is a critical asset safeguarding water quality and providing secure storage to ensure the resilience of our water supply. We have a proactive inspection and maintenance programme to ensure the serviceability of these critical assets and to inform investment decision making.

Funding for service reservoir maintenance will be reviewed annually based on the latest survey data to ensure this asset group in maintained in a stable condition to minimise the risk of compliance failures.

We consider that the investment proposed for Service Reservoirs is the minimum level that we can allow to maintain an acceptable, stable level of risk.

4.6. Booster pumping stations

4.6.1. Asset Inventory

The table below shows our asset inventory and forecast changes over the AMP8 period as reported in Table CW5.

Table 29: Pumping Station asset inventory and forecast

	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
Total installed power (kW)	28,724	28,749	28,774	28,799	28,824	28,849	28,874	28,899
Pumping stations that pump into and within the treated water distribution system	293	294	295	296	297	298	299	300
Number of potable water pumping stations delivering treated groundwater into the treated water distribution system	54	54	54	54	54	54	54	54
Number of potable water pumping stations delivering surface water into the treated water distribution system	5	5	5	5	5	5	5	5

Number of potable water pumping stations that re-pump water already within the treated water distribution system	232	233	234	235	236	237	238	239
Number of potable water pumping stations that pump water imported from a 3rd party supply into the treated water distribution system	2	2	2	2	2	2	2	2

We undertook an Average Pumping Head (APH) data quality improvement project for APR23 ahead of PR24 which led to a number of changes to our pumping station asset inventory. Hence we are confident that our data for 22/23 represents the best possible starting point for forecasting these lines.

4.6.2. Asset strategy

We have a proactive and reactive maintenance strategy for this asset group. Generally most pumping stations have a duty - standby configuration or similar that enables one pump to be out of service whilst maintaining supply and similarly we have a resilient system that enable bigger issues to be manged without any significant impact to customers. Our reactive and proactive inspection, maintenance, repair and replacement programmes enable us to manage this asset group, the most significant issue be the lead times for new bigger pumps and we have established a specific proactive programme to mitigate this risk.

Maintenance of this asset group in AMP8 can best be described as business as usual maintenance, with no major projects planned, and our proactive programme for long lead time bigger pumps continuing.

As detailed in Table CW5 commentary based on activity in recent years we forecast an additional 1 pumping station per year in line 19 (pumping stations that re-pump water already within the treated water distribution system) as a consequence of new development with an average increase in total installed power of 25kW per station.

Based on our known capital programme for the remainder of AMP7 and in AMP8 we can be confident that we do not expect any changes the remaining pumping station data, all remaining activity is anticipated to the BAU like for like replacement.

The environmental destination for sustainable abstraction is likely to lead to significant changes to our treated water distribution system which may include additional pumping station but this will not occur until AMP9 at the earliest

4.6.3. Maintenance planning objective

The main measure of serviceability is a combination of customer facing measures:

- to maintain and improve the resilience of supplies
- to maintain capacity, so that we can meet the demand for water
- to maintain stable asset health – serviceability.

Performance Commitments

Volume of Water Leaked – Safe and reliable water supply

This is a common performance commitment that measures the amount of water lost from companies' water supply systems (leakage). It is defined as the percentage reduction in leakage expressed as a three-year average.

Mains Repairs – Safe and reliable water supply

This is a common performance commitment focusing on the long-term asset health of our pipe network. It is defined as the number of repairs on water mains per year per 1,000 km.

Water Supply interruptions – Safe and reliable water supply

This is one of 14 common measures outlined by Ofwat with a cross company target. It is defined as the number of minutes lost per property due to supply interruptions greater than three hours including planned, unplanned and third-party interruptions.

Our biggest booster pumping stations provide intra-zonal water resource transfers and the inherent resilience within our network means that supplies can be maintained elsewhere for the relatively short time it should take to resolve any booster pumping station failure.

The maintenance and smooth operation of our booster pumping stations also contributes to the mains bursts and leakage performance commitments.

4.6.4. Historical capital maintenance expenditure

Table 30: Historical Booster Pumping Stations expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m (2022/23 Price Base)	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Booster Pumping Stations	2.11	3.70	7.00	2.72	3.37	3.78

** Forecast*

Typical expenditure on booster stations comprises reactive replacement on failure of individual items of plant together with maintenance of buildings etc. It also includes the proactive refurbishment of entire pumping stations based on the assessed level of risk to the security of supply to our customers from our DWSP system.

4.6.5. Historical performance

The condition of our booster pumping stations is stable.

Reactive maintenance is undertaken immediately in response to Telemetry warning of a pump failure or contacts from customers advising of a drop in pressure, or on rare occasions, a loss of supply.

Boosters that rate as high risk are usually where a major refurbishment is required, outside the remit of standard repair and maintenance. The most common cause of the above is aging control panels and pumps that become unsupportable due to unavailability of spares, or opportunities to improve system efficiency.

4.6.6. Capital maintenance forecasting

In general, we have duty / standby facilities for the primary assets at booster pumping stations and therefore critical assets tend to be the control systems which can generally be repaired within a relatively short timescale.

Major refurbishment is driven by aging control panels and pumps that become unsupportable due to unavailability of spares.

4.6.7. Conclusions

The table below shows the modelled forecast for capital maintenance expenditure from AMP7 to AMP9.

Table 31: Planned Booster Pumping Stations expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP7	AMP8	AMP9
Booster pumping stations	3.37	3.61	4.04

Investment is broadly similar to historic average spend and is deemed essential if we are to do the right thing for customers and the environment, within the current policy and regulatory framework. We have carefully prioritised and only included what we need to do to meet legislative and regulatory expectations and deliver the outcomes our customers and communities support.

4.7. Distribution mains

4.7.1. Asset Inventory

Distribution mains are the biggest asset group by value within this price control. Our total length of distribution mains at 31 March 2023 was 11,146km, of which 80% were ≤ 165mm in diameter.

Material and age information is provided in the following tables.

Table 32: Distribution main material breakdown

Cast Iron	PE	PVC	Asbestos Cement	Ductile Iron	Other
36%	26%	18%	11%	8%	1%

Table 33: Distribution main age breakdown

-1920	1921 - 1940	1941 - 1960	1961 - 1980	1981 - 2000	2001 - 2020	2021
7%	13%	19%	22%	22%	16%	1%

4.7.2. Asset Performance/strategy

The performance of our distribution network is good:

- Industry leading compliance with the drinking water quality standards as measured by the CRI
- Industry leading resilience, we have not had to impose any restrictions (temporary use bans – hosepipe bans) on water use since 1976, and managed events like the ‘beast from the east’ and prolonged dry spells and peaks in demand without incident

- we have reduced leakage (three year average) from 79.3Ml/d in 2011/12 to 66.5Ml/d in 2022/23
- we have reduce customer contacts about the appearance, taste and odour of drinking water from the three year average of 2.3 contacts per 1000 population in 2013/14 reducing to 1.3 in 2022/23
- We have reduced supply interruptions to less than 5 minutes delivering industry leading performance

Table 34: Mains condition grading comparison between PR24 and PR09

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
PR24 Potable mains total (%)	53.5%	24.1%	18.7%	3.4%	0.3%
PR09 Potable mains total (%)	57.0%	31.6%	10.0%	1.3%	0.1%

4.7.3. Maintenance planning objective

The key objectives can be summarised as follows:

- Maintaining and enhancing the resilience of our water supply network
- Maintaining and enhancing drinking water quality
- Providing capacity to meet the demand for water
- Maintaining stable asset health for the longer term
- Reducing leakage.

Performance Commitments

Water Supply interruptions – Safe and reliable water supply

This is one of 14 common measures outlined by Ofwat with a cross company target. It is defined as the number of minutes lost per property due to supply interruptions greater than three hours including planned, unplanned and third-party interruptions.

Mains Repairs – Safe and reliable water supply

This is a common performance commitment focusing on the long-term asset health of our pipe network. It is defined as the number of repairs on water mains per year per 1,000 km.

Volume of Water Leaked – Safe and reliable water supply

This is a common performance commitment that measures the amount of water lost from companies' water supply systems (leakage). It is defined as the percentage reduction in leakage expressed as a three-year average.

Water Quality Customer Contacts – Safe and reliable water supply

This is a performance commitment using the established DWI metric which measures the number of customer contacts each year about the quality of drinking water per 1,000 population.

We have set challenging targets to reduce leakage and supply interruptions, and the maintenance of our distribution mains and associated monitoring and data systems is essential to achieving these targets.

Our combined leakage and supply interruptions reduction strategy will necessitate some proactive expenditure but most of this will not be infrastructure renewal. We will invest in additional continuous monitoring points and associated knowledge management and decision support tools to help achieve these stretch targets.

We will continue to invest in our infrastructure to ensure it is maintain in a stable condition both now and in the future. Our water mains performance continues to be good and we are monitoring trends in asset performance closely, and plan to continue to replace water mains at the rate at which they are deteriorating. Whilst in the long run we may need to increase the replacement rates, we recognise that customers and the environment will see minimal improvement in service from an increase in expenditure in the short term.

4.7.4. Historical capital maintenance expenditure

All maintenance on our treated water distribution network is reviewed and optimised throughout each year. Our Drinking Water Safety Plans and predicted performance against performance commitments are used to prioritise our maintenance expenditure. Our business as usual asset management framework and the findings of the deterioration models have been used to formulate long term investment programme.

Our mains replacement programme is directed towards our mains bursts performance commitment and our mains rehabilitation programme is directed towards our customer acceptability performance commitment.

Table 35: Historical Distribution Mains expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m (2022/23 Price Base)	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Distribution Mains	42.27	61.52	70.68	74.71	97.65	69.36

** Forecast*

4.7.5. Capital maintenance forecasting

Future risks and needs are captured through our Drinking Water safety plan system.

All maintenance on our treated water distribution network is reviewed and optimised throughout each year. Our Drinking Water Safety Plans and predicted performance against performance commitments are used to prioritise our maintenance expenditure. Our business as usual asset management framework and the findings of the deterioration models have been used to formulate long term investment programme.

Our mains replacement programme is directed towards our mains bursts performance commitment and our mains rehabilitation programme is directed towards our customer acceptability performance commitment.

We are proposing to increase our proactive mains replacement to 0.4% per annum and this may need to rise further to 0.6% per annum in AMP9 and possibly to between 0.8% and 1.0% in the long term future to maintain this asset group in a stable condition.

We have business as usual maintenance, repair and replacement, to maintain stable asset health, with risks and needs captured through our Drinking Water safety plan system with reporting available via a QlikView risk reporting application for investment prioritisation.

We have specific plans for leakage, supply interruptions and drinking water appearance as detailed below.

Leakage

Our business plan is based on maintaining leakage through maintenance expenditure and reducing leakage through enhancement expenditure, see WSX14 for further details.

Supply interruptions

We are delivering industry leading performance and our plan is to maintain the current performance for the next five years as we await innovation and new technology to enable further reductions in a cost effective manner in the future.

Drinking water appearance, taste & odour

We plan to continue to reduce customer contacts about the appearance, taste and odour of drinking water through the continuation and optimisation of our existing strategies of operational improvements and asset renewal.

4.7.6. Conclusions

We will continue to invest in our infrastructure to ensure it is maintained in a stable condition both now and in the future. Our water mains performance continues to be good and we are monitoring trends in asset performance closely, and plan to continue to replace water mains at the rate at which they are deteriorating.

Whilst in the long run we may need to increase the replacement rates, we recognise that customers and the environment will see minimal improvement in service from an increase in expenditure in the short term.

We are proposing challenging targets to reduce leakage, supply interruptions and customer contacts about the appearance of drinking water. We will not be able to achieve these stretch targets with current base maintenance funding.

Table 36: Distribution Main planned expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m (2022/23 Price Base)	AMP7*	AMP8	AMP9
Distribution Mains	98	138	158

** Forecast*

We predict that an ongoing uplift in investment for this asset group is essential for at least 3 price control periods if we are to do the right thing for customers and the environment. We have carefully prioritised and only included what we need to do to meet legislative and regulatory expectations and deliver the outcomes our customers and communities support.

4.8. Service pipes

4.8.1. Asset Inventory

The service pipe is made up of the Company owner communication pipe from the main in the street to the stop tap or Meter Valve Unit (MVU) close to the boundary of public and private land (footpath – garden wall); and the customer owned supply pipe to the wall of the property/building.

We have undertaken a major data improvement project on service pipe asset inventory In preparation for PR24. This has resulted in a significant uplift from our previous estimates of lead and galvanised iron communication pipes.

At 31st March 2023 there were just over 600,000 communication pipes with an estimated length of 3,500km and just under 640,000 supply pipes with an estimated length of 4,500km, the difference in totals being due to shared services, i.e. single communication pipes that supply more than one property.

Hence the total service pipe length of 8,000km is two thirds of our current mains length of just over 12,000km and so these assets are a very significant element of our treated water distribution system.

4.8.2. Asset strategy

A lot of activity is occurring on our service pipes, the most common of which is leak repairs. We repair over 10,000 leaks on service pipes each year, including 4,000 on customers supply pipes. We estimate that around 40% of all leakage is from service pipes and their connection to the main, and/or fittings on the service such as the meter or stop tap. The customer supply pipe is not our asset, but our leakage policy for service pipe replacement means that for household customers in most cases we treat these assets as if they were our own.

In addition, service pipes can be the root cause of customer contacts about the Appearance or Taste & Odour of drinking water and our investment towards this PC includes work on service pipes, both company owned communication pipes and customer supply pipes in some circumstances.

Expenditure on both of the above is maintenance. We are also proposing significant investment in lead pipe replacement, but this is funded from enhancement.

We do undertake some work on the separation of shared services, (one communication pipe supplying several customer supply pipes), mainly due to low pressure complaints and property development but the investment level is not material. This is funded from maintenance.

Service pipes are the critical final link from our sources to the customers tap and their maintenance is essential to the delivery of our water services.

All service pipes have been mapped within our GIS environment using a logical connection from properties to the nearest distribution main with the exact location, material and condition of service pipes from the 10,000 repair/replacement jobs undertaken each year being mapped back to GIS to update the logical connection.

4.8.3. Maintenance planning objective

The key maintenance objectives are maintaining and reducing leakage, and maintaining and enhancing drinking water quality. These objectives are measured by the following common PCs.

Volume of Water Leaked – Safe and reliable water supply

This is a common performance commitment that measures the amount of water lost from companies' water supply systems (leakage). It is defined as the percentage reduction in leakage expressed as a three-year average.

Compliance Risk Index (CRI) – Safe and reliable water supply

This is an Ofwat common performance commitment and is the headline drinking water quality measure. It is a relatively new measure introduced by the DWI in 2016.

Water Quality Customer Contacts – Safe and reliable water supply

This is a performance commitment using the established DWI metric which measures the number of customer contacts each year about the quality of drinking water per 1,000 population.

4.8.4. Historical capital maintenance expenditure

Table 37: Service Pipe historic expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m (2022/23 Price Base)	AMP3	AMP4	AMP5	AMP6	AMP7*	Average

Service Pipes	15.43	12.27	14.79	27.53	27.24	19.59

* *Forecast*

Maintenance expenditure on service pipes can be broken down into the following categories:

- Leak repair
- Leakage driven replacement
- Stop tap replacement for leakage or if not operable
- Water quality driven replacement
- Hydraulic capacity driven replacement.

4.8.5. Capital maintenance forecasting

Our current asset management strategy for service pipes is summarised in the service replacement policy and our lead strategy and leakage management strategies.

We are unable to undertake any specific service pipe deterioration modelling primarily because we don't have robust data on location, age and material. We have been mapping back repair and replacement activity on service pipes for around some years now and we hope to do some deterioration modelling for PR29 when we should have sufficient data to give statistical validity.

The key objective for water infrastructure capital maintenance is to deliver the highest quality drinking water without unexpected interruption. Our performance against this overriding objective is monitored through our performance commitments.

4.8.6. Conclusions

Our approach to the maintenance of service pipes is very much a business as usual approach with proposed maintenance expenditure broadly in line with historical levels but showing a small increase over time.

There is very little scope for further efficiencies as our existing approach is reactive to failure or new information with targeted intervention.

Government has previously consulted on the future ownership of private water supply pipes, but we do not anticipate any change in this area for the foreseeable future and have not made any additional allowances for this.

Table 38: Service Pipes planned expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m (2022/23 Price Base)	AMP7*	AMP8	AMP9
Service Pipes	27.24	27.59	35

* *Forecast*

All of the investment set out in this plan is essential if we are to do the right thing for customers and the environment, within the current policy and regulatory framework. We have carefully prioritised and only included what we need to do to meet legislative and regulatory expectations and deliver the outcomes our customers and communities support.

4.9. Meters

4.9.1. Asset Inventory

At the end of March 2023 we had 479,000 meters which can categorised as follows.

Table 39: Meter Asset Inventory

Type	Function/Location	Number
Revenue	Household	433,000
	Non household – small	37,000
	Non household – large (>25mm)	4,000
Non-Revenue	At WTWs and in the network	5,000
	Total	479,000

For Water Treatment Works (WTWs) the above generally only includes raw water abstraction meters and treated water distribution input meters, flow meters used within the WTW processes are included in the Water treatment sub-category.

Household meter penetration is forecast to increase from 72% in 2022/23 to 77% in 2029/30, hence we anticipate the total number of meters to increase to around 515,000 by 2029/30.

At present all our revenue meters are basic (manually read), except for a small number of AMR (Automatic Meter Reading) units. Our proposed smart revenue metering programme will result in around 150,000 basic meters being replaced with AMI (Advanced Metering Infrastructure) units over the AMP8 period.

4.9.2. Revenue metering maintenance strategy

Our previous strategy for revenue meter replacement was a combination of reactive on failure and age related (> 15 year) proactive replacement avoiding excessive cost (limited to only external screw in meters without any complications, but including household and non-household meters).

Expenditure in this area was relatively modest at less than £1m/yr. The future is very different to the past, with our proposed smarter metering strategy resulting in a significant uplift in meter replacement activity, see WSX14 for further details.

4.9.3. Non Revenue metering maintenance strategy

Our 5,000 non revenue meters are made up of a mix of sizes, types and functions, and our business as usual management of this asset group comprises both reactive and proactive maintenance.

Our proposed leakage reduction strategy does include for some additional meter installations but this is not significant.

4.9.4. Maintenance planning objective

Revenue meters – to ensure customers water delivered is measured accurately.

Non-revenue meters – to ensure water entering our distribution network is accurately measured in such a way that both leakage and supply interruptions can be reduced to the minimum possible with current technology.

Performance Commitments

Volume of Water Used per Person – Safe and reliable water supply

This is a common performance commitment that measures average household water use in our region. Significant enhancement expenditure is included in our AMP8 plan for both smarter metering and more selective meter and our water efficiency work to achieve the reducing PCC (per capita consumption) expected from our regulators Our ongoing maintenance activities are also critical to achieving this objective.

Volume of Water Used by Business – Safe and reliable water supply

This is a common performance commitment that measures average business water use in our region.

Volume of Water Leaked – Safe and reliable water supply

This is a common performance commitment that measures the amount of water lost from companies' water supply systems (leakage). It is defined as the percentage reduction in leakage expressed as a three-year average.

Significant enhancement expenditure is included in our AMP8 plan for both smarter metering and more selective metering which will contribute to achieving the reduced leakage expected from our regulators. Our ongoing maintenance activities are also critical to achieving this objective.

4.9.5. Historical capital maintenance expenditure

Table 40: Water Meters historical expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m (2022/23 Price Base)	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Water Meters	4.48	5.69	7.33	8.04	7.79	6.67

* *Forecast*

Revenue meters

We have always had a reactive policy of replacement on failure for all revenue meters. We have varied our policy of proactive replacement of revenue meters over the years.

Non-revenue meters

As we drive down leakage lower, and reduce supply interruptions, we will need to ensure all our non-revenue meters are well maintained and providing quick and reliable data.

4.9.6. Historical performance

Revenue meters

We have always had a reactive policy of replacement on failure for all revenue meters. We have varied our policy of proactive replacement of revenue meters over the years as detailed previously to ensure this asset group enables us to measure consumption accurately.

Non-revenue meters

The maintenance of this asset group has been essential to the good management of our network and the achievement of our leakage targets.

4.9.7. Capital maintenance forecasting

Revenue meters

Our current policy is reactive replacement on failure, together with an age related proactive replacement older (>15 years) small revenue meters, limited to only external screw in meters without any complications, but including household and non-household meters.

Our smart revenue metering enhancement project will result in a significant number of basic meters being replaced with smart meters which will reduce our revenue meter replacement maintenance expenditure in AMP8 and beyond.

We have a dedicated team within our engineering utilities team to deliver this work and ensure the best possible customer journey and data collection.

Non-revenue meters

To achieve our challenging target for reducing leakage and maintaining our excellent supply interruptions performance we will need to ensure a high level of reliable and accurate data on the water entering our distribution network.

For measuring abstraction and distribution input we need to maintain our strict policy of replacement to ensure compliance with statutory obligations. For trunk mains meters we have a forward programme of replacement and new installations to ensure the coverage needed to deliver our challenging targets for reducing leakage.

For DMA meters we are looking at proactive age-related replacement and/or meter right sizing to ensure night flows are being accurately as possible.

4.9.8. Conclusions

The maintenance of this asset group is essential to accurately measuring the water delivered to customers and managing leakage and supply interruptions within our network and we have robust management systems in place to ensure this happens.

Table 41: Water Meters planned expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m (2022/23 Price Base)	AMP7*	AMP8	AMP9
Water Meters	7.79	3.5	3.5

Our proposed maintenance expenditure is less than historic levels due to the impact of our smart metering enhancement programme which will result in a significant number of basic meters being replaced with smart meters which will reduce our revenue meter replacement maintenance expenditure in AMP8 and beyond.

4.10. Water Network Plus Base operating expenditure

We consider that Water Network Plus base OPEX will increase from AMP7 due to the incorporation of enhancement OPEX into base in 2025-26. As per the Water Resources price control, see section 3.6, there are two notable step changes in business rates in 2026-27 and 2029-30 for the respective triennial reviews in those years.

Power decreases across AMP8 and there are further savings in other operating expenditure as a result of expected efficiencies and real price effects achieved across the 5 years of AMP8. Please see WSX08 for more details on the calculation and application of real price effects and frontier shift.

We also anticipate additional base opex to be incurred in this price control as a result of additional EA permitting requirements and risks and undertake health and safety initiatives. This will primarily relate to the employment of additional staff, the purchase of materials and consumables and additional regulatory costs associated with the new permitting requirements. This will impact other operating expenditure, incurring at least £3m additional base operational expenditure per annum in each year of AMP8.

In line with the capital maintenance profiles discussed in the earlier sections regarding this price control, we would expect the age-based deterioration of assets to also impact base operating expenditure where maintenance is not considered to be capital as it will incur additional costs at a higher frequency and potentially greater cost in the instance of more significant failures that we have seen in AMP7. This is also contributing to the increased expenditure noted in the previous paragraph.

5. Wastewater Network Plus

5.1. Price control summary

5.1.1. Asset Inventory

Table 42: Asset Group Characteristics & Approach

Functional group	Asset group	No	Assessment approach
Sewage collection	Sewers	34,944 km	Large asset group with assets of differing construction materials, age and condition Deterioration modelling to understand required rate of rehabilitation, risk based approach to targeting interventions – unit rate analysis to forecast costs
	Combined sewer overflows (CSOs)	1,486	Large asset group including 992 with monitoring and 224 with consented screening installations A combination of deterioration modelling, bottom up capital expenditure assessment, asset performance data and risk assessments used to generate AMP8 spend and forecast longer term trends
	Sewage pumping stations	2,100	Large asset group of limited asset types but wide size range A combination of deterioration modelling, bottom up capital expenditure assessment, asset performance data and risk assessments used to generate AMP8 spend and forecast longer term trends
	Rising mains	1,208 km	Small asset group by length in relation to sewer network Bottom up assessment based on individual performance, material analysis. Cross-checked with historical expenditure
Sewage treatment	Sewage treatment works	398	Large asset group with varying complexity, comprising long life civil and shorter life process and EMI assets operating in aggressive environments with tightening consents A combination of deterioration modelling, bottom up capital expenditure assessment, asset performance data and risk assessments used to generate AMP8 spend and forecast longer term trends

5.1.2. Proposed investment

Our proposed capital maintenance investment plans for AMP8 and AMP9 address the following challenges we face in maintaining service levels and a stable risk position:

- within our sewerage network, maintaining the reliability of transferred private sewers and sewage pumping stations
- maintaining the reliability and availability of an increasing volume of ageing sewage pumping station assets that have doubled in number since 1990 through adoptions and enhancement obligations
- maintaining an increasing volume of aging shorter life assets at STW that were installed post privatisation to meet growth and new quality enhancement obligations
- maintaining the capacity and integrity of STW processes in an environment of tightening regulatory standards and performance targets
- managing obsolete and unsupportable equipment, particularly that required for control and monitoring of asset performance and UV treatment for Bathing water sites
- managing the gap between deterioration and rehabilitation rates of our longer life sewer assets
- affordability and the need to constrain investment subject to internal risk review and challenge

Over the long term operational costs for managing our sewerage assets have increased in line with the growth in sewerage network assets and sewage treatment process assets added to meet new environmental standards and provide new capacity in line with population growth.

Looking forward, expenditure for operating and maintaining our sewerage network and sewage treatment assets will continue to rise and will be influenced in AMP8 and AMP9 by the upwards cost pressures associated with:

- increases in energy and chemical costs above inflation
- the revenue effect of adopted pumping stations
- the revenue effect of growth schemes and enhancement schemes completed in AMP7 and those planned for implementation in AMP8
- maintaining increased levels of network monitoring equipment.

Our proposed operational plans build on existing energy efficiency and system optimisation activities for the management of our network and treatment assets which will in part offset these upwards cost pressures. See WSX15 – Annexes – Water Networks Plus Strategy and Investment - Annex A4 for details of some of the recent and future innovations we are adopting to maintain and improve our performance and asset management.

Our expenditure plan for Wastewater Network Plus through to 2030 is as detailed in the following sections (5.2 to 5.6).

5.1.3. Asset health

Asset health is considered capital maintenance. However we will need a step change in asset heath to match the rate of deterioration we have been reporting for the last 15 years in our business plan submissions. This is so we do not pass a legacy onto future generations.

However, due to concerns on affordability and financing issues of the AMP8 programme (e.g. nutrient removal and storm overflows), now is not the time for that step change. We are therefore proposing to maintain the same level of investment for proactive sewer rehabilitation and a slight increase in proactive rising main replacement. A significant increase in maintenance of Water Recycling Centres (WRCs) is proposed though, mainly due to the fact that various elements for process plant installed 20+ years ago needs to be replaced. They are now unsupported and require increasing interventions to keep them in operation, combined with an increasing lack of spare parts – risk and consequence of failure are considered high.

5.2. Sewers

5.2.1. Asset inventory

We currently maintain and operate about 35,000km of sewers across our network which covers 401 drainage catchments. Approximately half of these are Section 105A (s105A) sewers which became our responsibility in October 2011. This asset group also includes tunnels and trunk sewers in urban areas, which are the main strategic assets of the sewer network, inverted syphons, pipe bridges and long sea outfalls.

The asset group is reasonably low risk, with a long-life expectancy. The main strategic components of this asset group includes tunnels and trunk sewers in urban areas, plus other features such as inverted syphons, pipe bridges and long sea outfalls. Approximately half of our sewer asset portfolio comprises privately owned sewers which were adopted by water companies in 2011 under section 105a of the Water Act 2003.

Sewers range in size from 100mm lateral drains, often less than one metre deep, to 4.8m diameter tunnels up to 70 metres underground.

Sewers may be long term assets, but even traditional materials such as vitrified clay will not last 500 years. Less robust materials such as uPVC pipes (introduced in the 1970's) are known to deteriorate more rapidly and may have a 60 years life expectancy. More recently, plastic pipes have become widely used across the water sector as they are lighter and cheaper than clay pipes. Time will tell whether their longevity is more than 60 years.

The transfer of private sewers to water company ownership in 2011 roughly doubled our asset stock overnight. These 'section 105a' assets were thought to be easy to repair, because they are generally small diameter and shallow pipes. However, since the transfer we have found that the cost of repair is higher than expected because of reinstatement costs and access difficulties in working in our customers gardens. We are proposing to undertake more proactive work in 2025-2030 (see Section 5.4) on the transferred assets by inspecting high likelihood, low consequence assets and repairing them before they fail or cause loss of service.

The performance of our sewerage infrastructure assets is still good (circa 200 collapses per year, including s105a) and consequential customer and environmental service from the assets remains high. However, modelling shows that the sewerage asset base it is deteriorating faster than the current rate of rehabilitation can support and we will need to significantly step-up resources to deliver increased levels of rehabilitation in the long term to maintain service levels and ensure network resilience.

Rising mains have a more significant impact when they fail. We have developed a Pollution Reduction Strategy which is proposing to have a larger step change in proactive replacement of rising mains in AMP8. Our DWMP provides more detail of our proactive replacement and burst detection monitoring proposals[1].

5.2.2. Maintenance planning objectives

The business strategic outcomes and performance commitments influenced by the condition and performance of assets in this asset group are:

[1] https://www.wessexwater.co.uk/environment/drainage-and-wastewater-management-plan. See also WSX60.

Table 43: Performance Commitments

Outcome	Performance commitment
Excellent river and coastal water quality	Wastewater pollution incidents
An effective sewerage system	Customer property sewer flooding (internal) Customer property sewer flooding (external) Sewer collapses
Excellent Customer Experience	Customer measure of experience

To deliver these corporate strategic objectives and performance targets, our maintenance planning objective for this asset group is: to understand the life expectancy of the sewers through deterioration modelling and inspection and to prioritise investment at a level of acceptable risk

Our modelling shows that our sewerage infrastructure asset base is deteriorating faster than the current rate of rehabilitation allows, and national research corroborates this. However, performance of the assets is still good (circa 200 collapses per year, including s105A) and consequential customer and environmental service from the assets remains high.

We will need to significantly step-up levels of rehabilitation in the long term, but for AMP8 we are proposing to stay at the AMP7 rate of 23 km per year. This is mostly to increase replacement on transferred s105a assets.

We will also be undertaking more proactive surveys of high likelihood sewers. As described above, these are more likely to be s105a sewers. These inspections will increase the amount of proactive investment need on the transferred assets.

5.2.3. Historical capital maintenance expenditure and performance

Historical maintenance expenditure is given below and includes both proactive and reactive maintenance activities:

Table 44: Sewers historical expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m (22/23 Price Base)	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Sewers	36.46	52.58	84.91	91.29	135.66	80.18

Our asset performance remains stable with a 5-year average rate of 5.75 collapses per 1000km per year.

Table 45: Sewer Collapse rates

	Number of collapses				
	2018	2019	2020	2021	2022
Sewer collapses	219	182	214	207	183*
Number of sewer collapses per 1,000 km of all sewers	6.30	5.20	6.12	5.91	5.22*

** Forecast*

5.2.4. Capital Maintenance forecasting

We are proposing to continue with proactive sewerage investment in both sewer rehabilitation and pumping mains.

1. Sewer rehabilitation

- More proactively inspected high risk and critical sewers
- More proactively targeted investment to repair high likelihood sewers before they collapse

Each year we identify a list of priority locations to survey using CCTV cameras to check the condition of the sewers. This prioritisation uses many factors to decide which sections we are going to take a closer look at. These include, but are not limited to, sewer age, sewer material, past performance including number of blockages or past pollutions, proximity to sensitive areas such as rivers and environmentally sensitive locations, soil condition, food outlet density and tree cover density (due to the impact of tree roots on sewers). Following the survey, the footage is currently viewed by a person to see if there is any damage or anything else to address such as fatbergs. This manual viewing results in a condition grade being assigned for each individual length of sewer.

We are also focusing our repairs on sewer lining techniques that allow us to complete the work in a shorter time and with less disruption to customers, as we don't have to dig trenches to gain access to our assets but make the repairs through existing manholes using trenchless technologies.

We have assessed the impact of the sewer rehabilitation by comparing before and after incident rates within the immediate area of the repair works carried out. This shows a downward trend for number of pollutions, blockages, and flooding incidents for 1 year after work has been completed (compared to 1 year before the work was completed). This downward trend indicates an improving position within the specific area as shown in Figure 4 below.

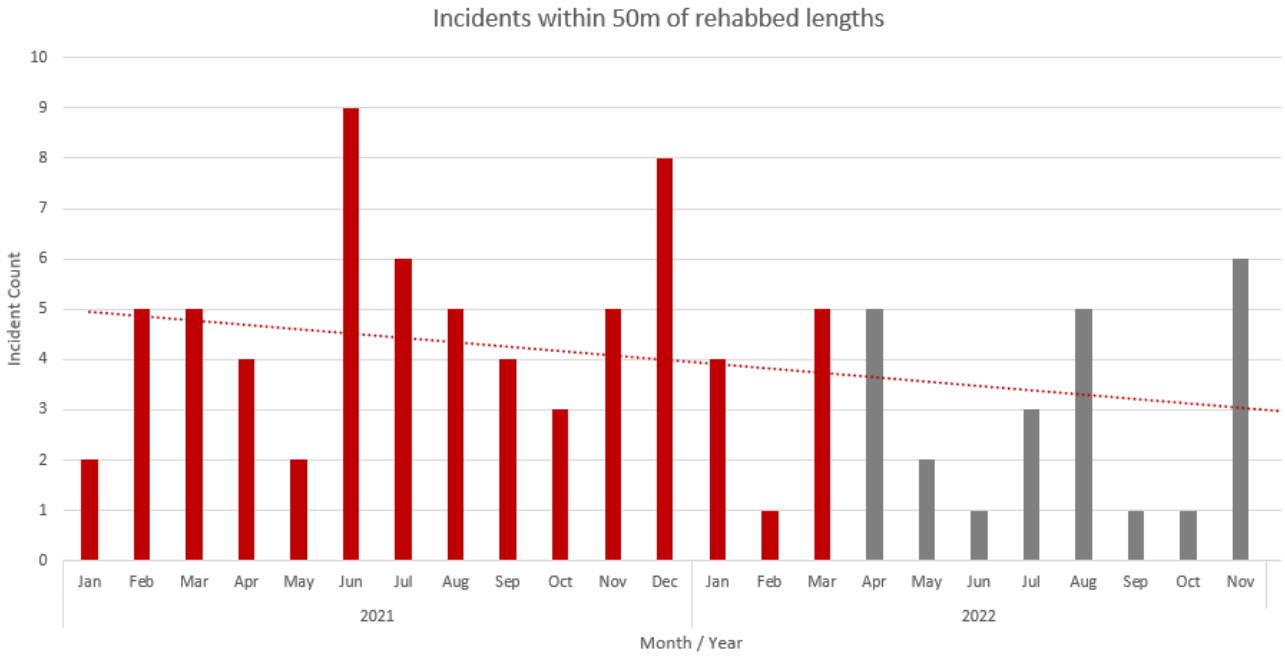


Figure 5 - Trend in the reduction of incidents following sewer rehabilitation

We continue to refine our risk tools which help prioritise the sections of sewer that we need to survey, and this continues to target our work in the areas with the likelihood of the greatest need. This CCTV programme will identify immediate needs, work for future programmes, areas to be monitored and sections that are operating with minimal deterioration.

2. Collapses

Sewer collapses and sewerage rising main bursts occur when these assets reach the end of their long life. This is an asset health common performance commitment aimed at increasing investment in these long-term assets rather than burdening the investment for future generations.

The average age of our 35,000 km of sewers in the Wessex Water region is

- 60 years for sewers we were responsible for before 2011
- 45 years for the private sewers that were transferred to us in 2011 (under section 105a).

Some sewers are much older, even Victorian. Life expectancy of sewers depends on many actors, but range from 60 years to 250 years.

a. Sewer collapse

Our risk model is a geospatial model that includes all relevant data and information that we have, including environmental, geological, asset age, asset inspection information, operational issues. We are also looking at incorporating newly available ground movement information. It points us to where to proactively inspect sewers. We can then rehabilitate the problems that we find.

Our sewer deterioration modelling was developed a decade ago and is regularly updated to include recent data and information. It suggests we should be having a step change in proactive sewer rehabilitation to match the deterioration rate and challenges posed by climate change, so that we do not pass legacy assets on to future generations.

We want to be stable within the next 5 years for the collapse planning objective, but even with a step change to reach a more sustainable intergenerational solution, we think that our collapse incidents will increase in the short term. By not starting this step change in investment, we will be passing future generations a financial burden. But, even if we have a step change now, our deterioration modelling shows that we will not see the benefits for many decades.

b. Groundwater inundation

Joints or cracks in sewers can allow groundwater to enter the sewers when the groundwater table is high, during wet winters or prolonged times of rainfall. Groundwater inundation of foul sewers in the Wessex region is problematic because we have chalk geology in the southeast, mudstone geology in the north west and fluvial inundation of the Somerset levels and Moors during wet winters. Our video explains how flooding in areas with chalk geology can impact our customers sewage services, meaning that they are unable to flush their downstairs toilet for several weeks during wet winters.

In our DWMP we set a bespoke planning objective to reflect Wessex Water's programme of infiltration reduction work to prevent groundwater inundation. This is to have a step change in the amount of public and private assets we make more robust, to prevent inundation. This needs to focus in catchments vulnerable to seasonal groundwater inundation that causes flooding, restricted toilet use and storm overflow discharges.

At selected locations we are building innovative wetlands to treat such seasonal groundwater induced flows, so they do not count as discharges.

3. Infiltration Sealing

Groundwater infiltration occurs when groundwater finds its way into the underground sewerage system, which can result in sewer flooding.

We proactively monitor, inspect and line sewers to identify and reduce infiltration. We also work with partners, including the Environment Agency, councils and customers, to reduce infiltration and inflows across the wider drainage network, such as private sewers and highway drains.

During prolonged wet periods groundwater levels rise above our public sewers plus private sewers and drains. Any cracks or holes in the sewer system can allow the groundwater to infiltrate and can inundated the sewers. This can cause sewer flooding and restricted toilet use which can continue for many weeks during very wet winters.

Catchments that are vulnerable to groundwater inundation are subject to Infiltration Reduction Plans. These plans are our commitment to inspecting sewers and making good any significant defects that could let the groundwater infiltrate into the sewer. This is normally achieved by lining the sewer with a watertight liner.

Wet weather over the winter months have shown the high levels of groundwater infiltration into our sewerage network, increasing the number of Operation Mitigation Action Plans (OMAP) in operation and hugely increasing our expenditure on electricity, tankering and emergency over pumping. In order to make in-roads into reducing the levels of groundwater infiltration, increased sealing works are required at targeted areas to reduce this issue, such as areas of high groundwater that directly impact performance. This would also provide some benefit to reduce peak flows and operating costs at WRCs.

4. Sewer pollution reduction strategy

- See Pollution Incident Reduction Plan in document WSX16

5. Sewer jetting programmes

- More proactive sewer jetting a year. We currently jet over 500km a year, but we aim to increase this targeted at flooding and pollution hotspots

- Reactively clearing and cleaning up from blockages and rainfall events with more focus on understanding the underlying cause
- More proactive repairs and maintenance

Our base maintenance will increase in the future relative to our recent investment as we implement our pollution reduction programme.

Table 46: Sewers planned expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP7	AMP8	AMP9
Sewers	135.66	153.9	154.35

All of the investment set out in this asset group is essential if we are to do the right thing for customers and the environment, within the current policy and regulatory framework. We have carefully prioritised and only included what we need to do to meet legislative and regulatory expectations and deliver the outcomes our customers and communities support.

5.3. Combined sewer overflows

5.3.1. Asset inventory

We currently operate and maintain 1,486 overflow discharge points, including CSOs with consented screening installations and more recently, overflows with event duration monitoring (EDM) and telemetry installed.

Table 47: Asset Group overview

Overflow type	Number
Combined sewer overflow (CSO)	1,092
Settled storm overflow (SSO)	195
Emergency overflow (EO)	199
Total	**1,486**

The majority of CSOs are simple high-level weirs, sometimes with scum boards and/or static bar screens. The more complicated sites have mechanical screens, telemetry and can include pumping. There are currently 224 CSO with consented screening installations, a result of investment since AMP2 to meet the enhancement obligations of the Unsatisfactory Intermittent Discharge (UID) programmes.

By the end of 2023, we will have installed event duration monitoring (EDM) at 1290 CSOs and SSOs. This enables immediate notification of overflow operation and provide information on CSO performance by confirming spill operation times and the duration of the spill. Spill alarms are visible in the Regional Control Room via telemetry and allow response times to be minimised to determine the cause of the spill and to intervene in the event of premature operation to reduce the environmental impact. This performance data together with historical rainfall and model data is also used to identify cost-beneficial investments to reduce overall spill frequency and volume.

5.3.2. Maintenance planning objectives

The business strategic outcomes and performance commitments influenced by the condition and performance of assets in this asset group are:

Table 48: Performance Commitments

Outcome	Performance commitment
Excellent river and coastal water quality	Wastewater pollution incidents Reduce frequent spilling overflows
An effective sewerage system	Customer property sewer flooding (internal) Customer property sewer flooding (external)
Excellent Customer Experience	Customer measure of experience

To deliver these corporate strategic objectives and performance targets, our maintenance planning objective for this asset group is to ensure that assets reliably perform to required standards throughout their asset life and operate in a way that protects the environment and provides a cost- effective service to the environment and customers.

5.3.3. Historical maintenance expenditure

The annual average capital maintenance expenditure has been relatively low for these non-infra assets and is around £0.5m per year or £2.5m per AMP.

5.3.4. Maintenance forecasting

Assessment approach

Over the last 10 years environmental performance has been relatively stable for this asset group and historical levels of maintenance expenditure appropriate given the relatively young age of the assets. However, there are now factors that make the future different with respect to the maintenance of this group of assets:

- The growth in the number of maintainable short and medium life assets added since AMP2, many of which are approaching the end of their asset lives and are increasingly likely to require first time replacement
- Increased monitoring and understanding of the performance of intermittent discharges may result in the need for additional network investment

Our assessment of future capital maintenance requirements for this relatively small asset group has principally been based on asset renewal modelling to provide a view of AMP8 expenditure and to identify longer term trends in deterioration and renewal expenditure.

5.3.5. Conclusions

Allowance has also to be made for renewal of around 1000 short life EDM assets that will have been installed by 2025. This has been considered by using a separate, simple deterioration and replacement model.

The resulting projection for future capital maintenance expenditure is given in the table below.

Table 49: Combined Sewer Overflows planned expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP8	AMP9
Combined sewer overflows	2.3	6.25

All of the investment set out in this plan is essential if we are to do the right thing for customers and the environment, within the current policy and regulatory framework. We have carefully prioritised and only included what we need to do to meet legislative and regulatory expectations and deliver the outcomes our customers and communities support.

5.4. Sewage pumping stations

5.4.1. Asset inventory

There are currently 2,100 sewage pumping stations (SPS) in our region. The type and duty of stations operated includes single property pumping stations and network transfer stations through to larger terminal, storm and surface water stations. These SPS typically comprise the following maintainable asset types:

- Pumping
- Control, instrumentation & telemetry
- Penstocks/valves
- Standby generation
- Screening
- Buildings/kiosks/compounds/fencing and access
- Chemical storage and dosing
- Wet well/dry well structures.

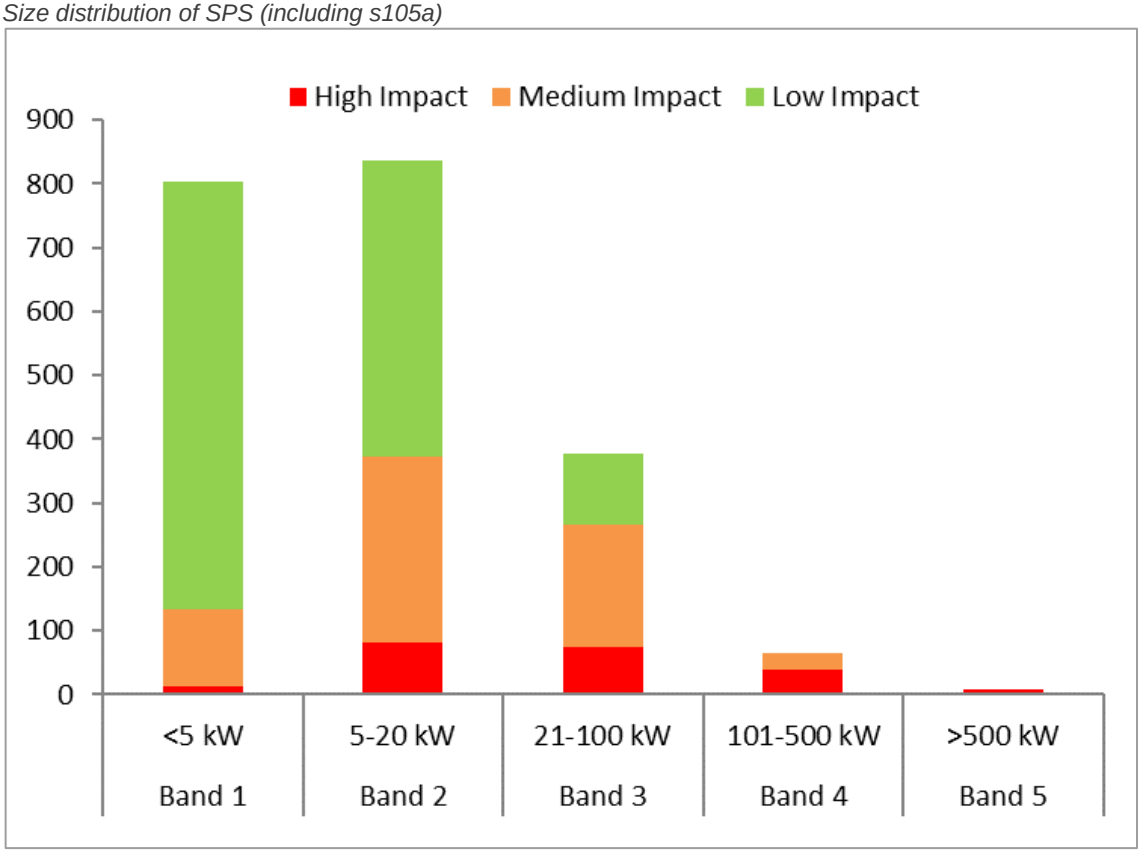
The number of maintainable assets has grown significantly since privatisation with a near doubling of the number of SPS in service, as shown in the figure below. This increase is due to enhancement obligations and adoptions. Approximately 40% of the total asset value is in short to medium life mechanical and electrical plant.

Our SPS are categorised by size band (kW) and the environmental and customer impact that may result in the event of a major asset failure. The criticality or relative importance of the station is used in the prioritisation of investment and day to day operational activities, including planned maintenance.

The figure below shows the distribution of SPS by size band and the proportion of sites within a given size band that have high, medium or low environmental impact on failure. The majority (>75%) of our stations are in the lower power bands (<20kW) and have low or medium environmental impact of failure.

Failures at these sites can often be addressed more reactively due to levels of equipment redundancy, telemetry alarms, the ability to over pump or tanker away, and the high availability of spares and standard components through supply chain agreements. Larger power band stations operating in more critical environments or with long lead time equipment require more proactive maintenance planning and contingency response plans.

Size distribution of SPS (including s105a)



5.4.2. Maintenance planning objective

The business strategic outcomes and performance commitments influenced by the operation, condition and performance of assets in this asset group are:

Table 50: Performance commitments

Outcome	Performance commitment
Excellent river and coastal water quality	Wastewater pollution incidents Reduce frequent spilling overflows
An effective sewerage system	Customer property sewer flooding (internal) Customer property sewer flooding (external)
Excellent Customer Experience	Customer measure of experience
Net Zero Carbon	Operational Greenhouse gas emissions

To deliver these outcomes and performance commitments, our maintenance planning objective for this asset group is **to ensure that assets reliably perform to required standards throughout their asset life and operate in a way that protects the environment and provides a cost- effective service to the environment and customers.**

5.4.3. Historical capital maintenance expenditure

A summary of long-term capital maintenance expenditure on SPS is given in the table below.

Table 51: Historical Sewage Pumping Stations expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP3	AMP4	AMP5	AMP6	AMP7	Average
Sewage pumping stations	18.85	22.33	25.33	28.66	31.11	25.26

Despite the steady growth in the number of SPS since AMP4, capital maintenance expenditure has been relatively constant up to the end of AMP7.

5.4.4. Historical performance

A key performance measures for sewage pumping stations is the number of environmental pollution incidents due to pumping station failures.

No serious pollutions have been recorded at an SPS site since 2018 and pre-2022, we averaged 11 spills per year. Instability in regional power supplies, the effects of storm Eunice and the implementation of Event Duration Monitoring (EDM) led to a much higher reported pollution numbers in 2022.

Our long term aspiration is to have zero pollution incidents. Our Pollution Incident Reduction Plan has been developed in AMP7 to undertake a varied range of activities to reduce these numbers. This plan will be further enhanced during AMP8.

5.4.5. Capital maintenance forecasting

Assessment approach

Recent investment and operational activity plans have been effective in delivering our strategic objectives for this asset group and maintaining stable levels of environmental performance. However, there are now factors that make the future different with respect to the maintenance of this group of assets:

- The growth in maintainable short and medium life assets installed since AMP4 to meet new obligations or through adoptions and transfers, many of which are deteriorating, approaching the end of their expected lives and requiring replacement
- an EA expectation for a reduction in pollution incidents across the industry of 40%, requiring higher levels of asset reliability and availability, and maintenance of system performance and capacity
- Energy costs are forecast to rise above inflation impacting on our ability to keep operating costs down.

Our assessment of future capital maintenance requirements for this asset group is principally based on asset renewal modelling used to validate AMP8 expenditure and forecast longer term trends in asset deterioration and renewal expenditure.

However, there are a number of immediate actions that would directly improve resilience, response to power supply issues, improve the performance of the stations and generate energy savings:

- Replacing old fuses for modern circuit breakers at all SPS sites with overflows.
- Wet well level and telemetry battery back-up for power failures. This will continue to give visibility of the wet well level and improve our response. Retro fitting these on our high criticality EDM sites circa 500 over two years.
- Control room remote resets on critical SPS sites.
- Additional resources to build on the current success of the dedicated team who currently assess, implement and drive pumping station flow, energy and reliability.

5.4.6. Conclusions

This asset group has experienced a steady growth in station and asset numbers since AMP4 and has now almost doubled in size due to various enhancement obligations and adoptions.

In this period investment and operational activity has been successful in maintaining stable assets and improving environmental performance. However, the modelling assessment confirms that historical levels of expenditure will no longer be sufficient to keep pace with the rate of asset deterioration and will need to increase in AMP9 to prevent a deterioration in service and to meet customer and EA expectations of a reduction in flooding and pollution levels.

The table below shows the planned capital maintenance expenditure from AMP7 to AMP9.

Table 52: Sewage Pumping Stations planned expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP7	AMP8	AMP9
Sewage pumping stations (including s105A)	31.11	29.9	47.6

We have proposed AMP8 expenditure based on asset modelling, supported by observations of asset condition and performance and have considered risk in relation to deliverability and affordability constraints. All of the investment set out in this plan is essential if we are to do the right thing for customers and the environment, within the current policy and regulatory framework. We have carefully prioritised and only included what we need to do to meet legislative and regulatory expectations and deliver the outcomes our customers and communities support. As a result, we propose further increases in expenditure for AMP9 to reflect the model output.

5.5. Pumping mains

5.5.1. Asset inventory

This section covers the business case for the base maintenance of the 1,208 km of rising mains in our region and their associated ancillary assets, such as air valves and vent stacks.

The figure below illustrates the relative proportion of the different pipe materials and diameters of the rising mains in this asset group.

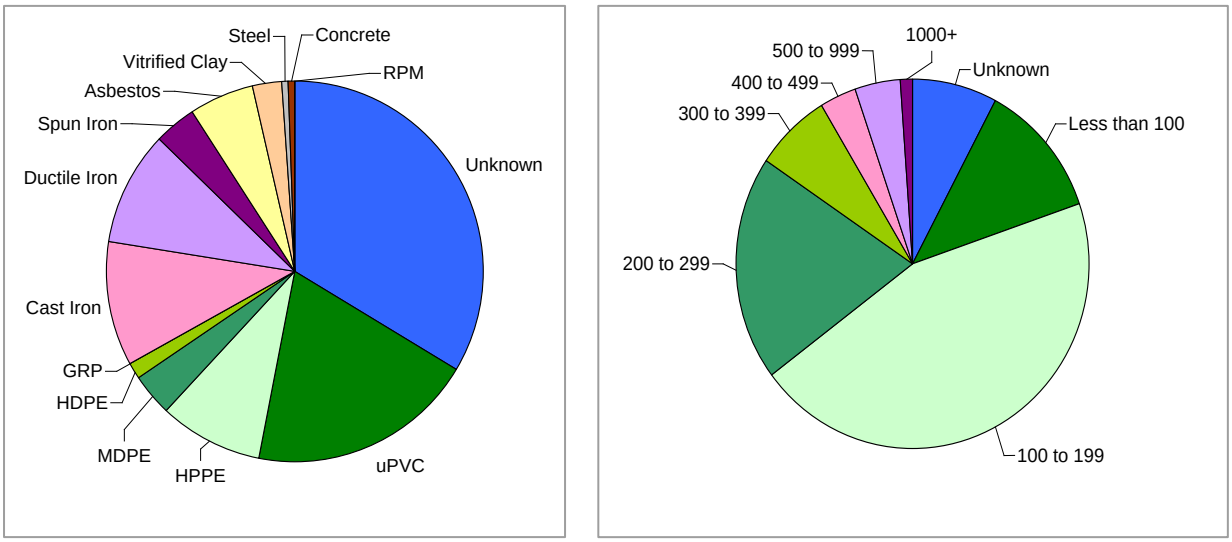


Figure 6 - Relative proportion of pipe materials and diameters (mm)

The routes of these rising mains are recorded on our corporate GIS system together with details of rising main features, ancillaries, material and size attribution and areas of environmental importance. A typical record for a rising main extracted from our GIS system, showing the route, long section and areas of environmental impact is shown in the figure below.

✂

Figure 7 - Typical rising Main GIS record

5.5.2. Maintenance planning objective

The business outcomes and performance commitments affected by the performance of this asset group are:

Table 53: Performance Commitments

Outcome	Performance commitment
Excellent river and coastal water quality	Wastewater pollution incidents
Effective sewerage system	Rising main bursts (sewer collapses) Customer property sewer flooding (internal) Customer property sewer flooding (external)
Excellent Customer Service	Customer measure of experience

To deliver these corporate strategic objectives and performance targets, our maintenance planning objective for this asset group is ***to understand the life expectancy of rising mains, and to invest in the most cost-effective way to improve the reliability and integrity of rising main systems.***

5.5.3. Historical capital maintenance expenditure

The table below shows the historical capital maintenance expenditure for this asset group which has increased in successive AMPs to reflect our long term strategic aim of managing the rate of asset deterioration. The long-term average required for base maintenance is in the region of £6.5m.

Table 54: Historical Rising mains expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Rising mains	1.01	3.56	3.87	11.90	12.1	6.5

**Forecast*

5.5.4. Historical performance

Key performance measures for this asset group are number of bursts and number of pollutions resulting from rising main failures. These bursts generally have limited direct impact on our customers but can have a significant impact on the environment, particularly pollutions.

The table below details numbers of rising main bursts and pollutions over the past four years

Table 55: Rising Main performance overview

	2019	2020	2021	2022
Number of bursts	92	35	66	101
Number of pollutions	9	12	8	10

5.5.5. Capital maintenance forecasting

Rising mains are more vulnerable to collapsing than gravity sewers due to their pressurised nature (having cyclic positive and negative pressures) and septicity issues that can cause corrosion through H2S attack (which is caused by aggressive nature of sewage creating an acidic environment in the sewerage system).

Our rising main repair programme aims to cover the unforeseen asset failures and includes an allocation for reactive repairs and sectional replacement based on historical averages. Whereas the long-term trend for bursts is rising, the rate of failure for the last 5 years has been flat, as has the level of expenditure required to manage and repair reactive failures. The immediate future is unlikely to be significantly different to the current position and an allocation for AMP7 reactive maintenance expenditure based on recent expenditure is considered adequate to manage risk.

5.5.6. Conclusions

Our baseline assessment for rising main capital maintenance expenditure requirements is based on a cost-effective reactive management approach to emerging risks, and recent AMP average of around £10m.

This baseline proposal will not reduce the rate of rise in bursts. Only a step change in the proactive replacement and monitoring of high-risk rising mains will arrest the rate of failure and reduce significantly the risk of pollution incidents.

The resulting projection for future capital maintenance expenditure is given in the table below.

Table 56: Rising Mains planned expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP7	AMP8	AMP9
Rising Mains	12.1	14.6	30.0

All of the investment set out in this plan is essential if we are to do the right thing for customers and the environment, within the current policy and regulatory framework. We have carefully prioritised and only included what we need to do to meet legislative and regulatory expectations and deliver the outcomes our customers and communities support.

5.6. Wastewater Recycling Centres (WRC)

5.6.1. Asset inventory

We currently operate and maintain 398 WRCs. Each typically serves a discrete catchment, often defined by a watershed, and there is a wide range of capacities and capabilities. The sizes range from those serving our biggest towns and cities incorporating domestic, commercial and industrial flows, to those serving small villages or hamlets, or just 1 or 2 properties. The figure below shows the distribution of our WRCs by the population equivalent (PE) and size band as defined by Ofwat.

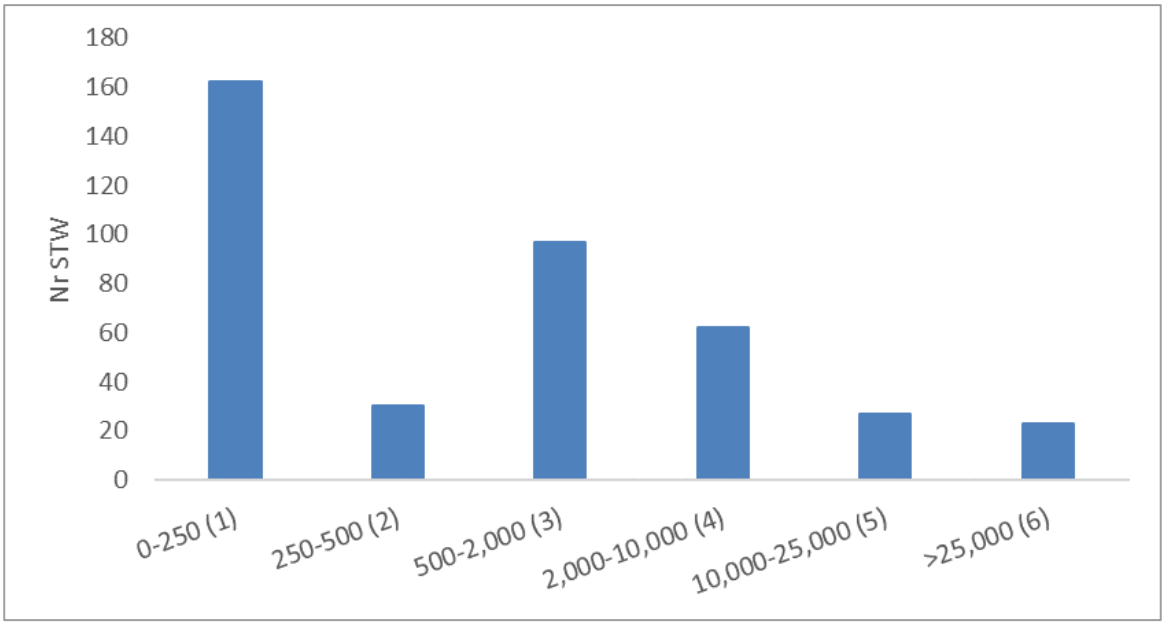


Figure 8 – WRC Site size bands

The types of WRC range from those with just primary treatment to those with advanced tertiary treatment, disinfection and chemical dosing. The scale and type of treatment process on any works is dependent on the incoming flows and loads, as well as the nature of the receiving water body (to establish the effluent discharge permit parameters).

The rural nature of a large part of our region means that the majority of these WRC are size band 3 or lower and generally utilise more simple forms of treatment processes such as biological filters, rotating biological contactors (RBC), packaged plant, reed beds and septic tanks. Collectively, these sites account for 30% of the asset group value.

Our larger size band 4, 5 and 6 WRC utilise either traditional biological trickling filters or more energy intensive activated sludge processes. Many of these WRC also include a tertiary or advanced treatment stage required to meet tighter consents for the removal of suspended solids, the removal of nutrients such as nitrogen and phosphorous, and disinfection. WRC in these size bands account for around 70% of the total asset group value and include significant levels of short to medium life mechanical, electrical, process, instrumentation and automation equipment.

5.6.2. Maintenance planning objective

The business strategic outcomes and performance commitments influenced by the operation, condition and performance of assets in this asset group are:

Table 57: Performance Commitments

Outcome	Performance commitment
Excellent river and coastal water quality	Treatment works compliance Wastewater pollution incidents

Excellent Customer Experience	Customer measure of experience
Net Zero Carbon	Greenhouse gas emissions

To deliver these outcomes and performance commitments, our maintenance planning objective for this asset group is to ***manage the lifecycle of our sewage treatment assets in a way that ensures compliance with all regulatory standards, provides adequate capacity and protects the environment and improves ecological standards.***

5.6.3. Historical maintenance expenditure

A summary of long-term capital maintenance expenditure on WRCs is given in the table below.

Table 58: Sewage Treatment Works historical expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Water Recycling Centres	53.42	97.83	97.36	127.78	128.88	101.05

This increasing trend in capital maintenance expenditure is a consequence of the addition of around £1bn of assets since 1990 to meet the requirements of ever tighter quality and capacity enhancement obligations. A significant proportion of this investment has been in short- and medium-life assets.

5.6.4. Historical performance

Key indicators we use to monitor the environmental performance of our WRCs include:

- % of WRC with any numeric consent passing consent
- % of population equivalent served by WRCs compliant with Look Up Table (LUT) sanitary consents
- Pollution incidents attributable to WRCs.

Recent WRCs compliance performance data and historical pollution incidents arising from WRCs are shown in the table and chart below.

Table 59: WRC compliance

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
WRC compliance	**99.7**	**99.7**	**99.0**	**99.7**	**99.7**	**99.4**	**99.0**	**100.0**	**98.5**	**99.1**	**100.0**	**99.4**

The chart below details numbers of pollutions at WRCs since 2018

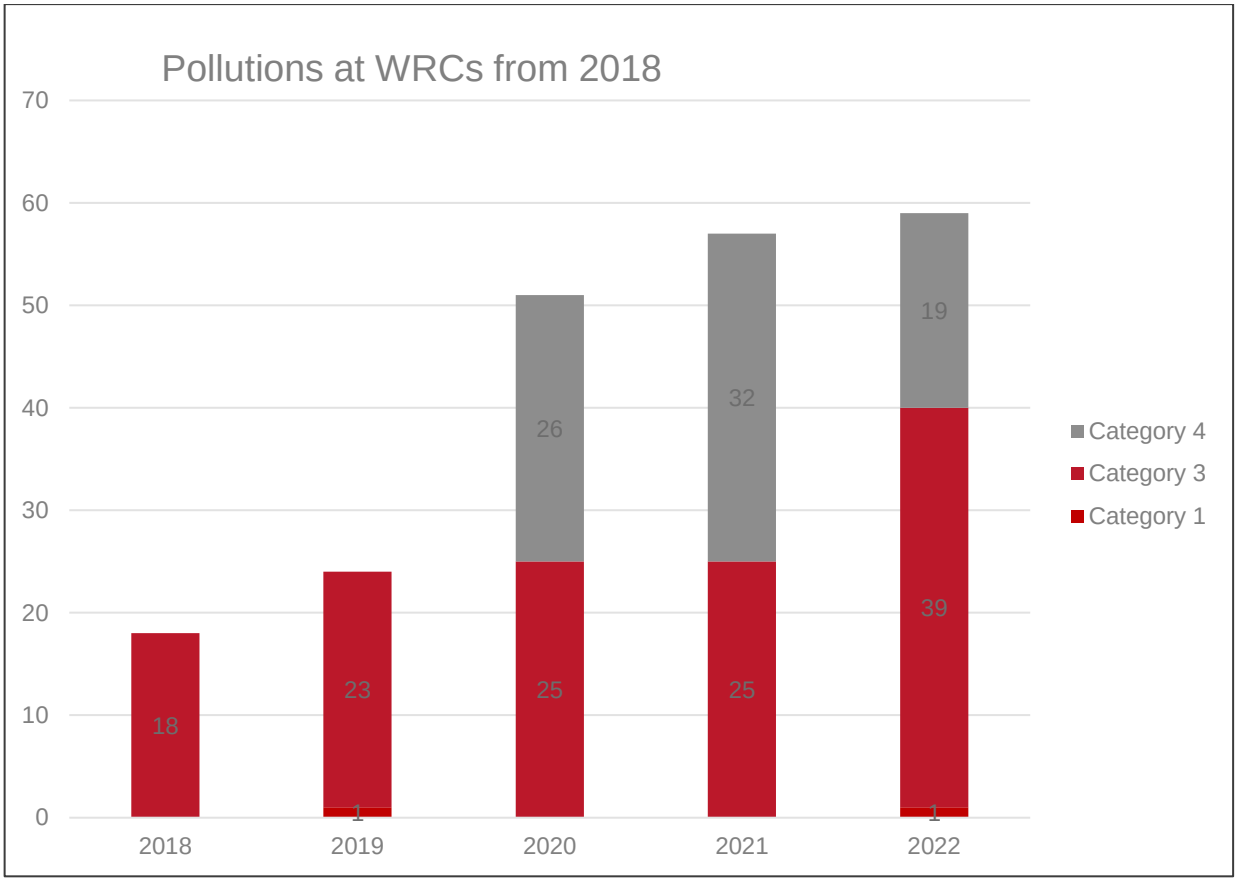


Figure 9 - WRC Pollution performance

The increase in pollution incidents is in part due to the fact that the AMP7 programme of monitor installs (U_MON1) is highlighting issues that were not previously evident or fully understood.

5.6.5. Maintenance forecasting

Assessment approach

Over the long-term, activity and investment plans have generally been effective in delivering our strategic objectives as our WRCs have continued to meet the standards required by the EA set permits for discharging effluent to the environment. However, there are now factors that make the future different with respect to the maintenance of this group of assets:

- The increasing maintenance impact of the growth in short- and medium-life assets installed since AMP1 to meet enhancement obligations at minimal cost, many of which are deteriorating and approaching the end of their expected lives
- An EA expectation for a 100% compliance and reduction in pollution incidents across the industry of 40%, requiring higher levels of asset reliability and availability, and maintenance of system performance and capacity. The impact of failure of smaller STW with numeric consents is now far greater
- Customers are now placing greater importance on how we maintain resilient services to protect the water environment in rivers, lakes and estuaries, and improve the quality of beaches and bathing waters.

This is our largest asset group by value and our assessment of future capital maintenance requirements has principally been based on asset renewal modelling to define AMP8 expenditure and then forecast longer term trends in asset deterioration rate and renewal expenditure.

The modelling has shown that an increasing number of assets installed before privatisation or those installed in the early AMP periods to meet new enhancement obligations are approaching the end of their assets lives. In many cases, they require first-time replacement due to obsolescence or poor condition. Typical maintenance needs identified by the modelling included:

- Inlet works:
  - Replacement of ageing coarse and fine screens, screenings handling and grit removal plant;
  - Replacement of flow conditioning plant with screens on smaller works;
  - Repairs of civil structures and channels,
  - Replacement of corroded steelwork.
- Primary treatment:
  - Refurbishment or replacement of aging primary settlement tank scraper assemblies and desludging equipment;
  - Structural repairs to tanks
- Secondary treatment:
  - Structural repair of biological trickling filters and media replacement;
  - BAFF plant media replacement;
  - Emptying and cleaning of SBR/ASP lanes and replacement of aeration lane diffuser grids;
  - Refurbishment or replacement of aging final settlement tank scraper assemblies and desludging equipment;
  - MBR membrane replacement;
  - Replacement of aging RBC and small packaged plant;
  - Replacement of aging aeration blowers/systems
- Tertiary treatment:
  - Refurbishment of tertiary sand filters;
  - Refurbishment/maintenance of grass plots, reed beds and lagoons
- Sludge:
  - Replacement of mechanical sludge thickeners and ancillary equipment;
  - Repair or replacement of sludge storage and sludge thickening tanks
- Chemical/Disinfection:
  - Replacement of chemical tanks; replacement of aging and inefficient UV plant
- Site general:
  - Increasing frequency of rising main failures
  - Renewal of HV systems to improve site resilience;
  - Replacement of increasing number of aging MCC and LV systems;
  - Replacement of obsolete and unsupportable control, monitoring and communications equipment;
  - Replacement of aging and under-capacity standby generators,
  - Refurbishment of containers and enclosures;
  - Site access improvements;
  - Building repairs and replacement of kiosks;

Analysis shows that most of the identified needs are associated with assets in the secondary treatment, site general, inlet and sludge process areas. The most significant asset types or asset systems requiring renewal investment within these process areas are listed in the table below:

Table 60: Asset Group characteristics

Process Area	Assets
Site general	Land and buildings Site control and LV systems

	Standby generation HV Systems
Inlet	Screening equipment Storm tanks Grit removal Inlet works structures
Secondary treatment	Trickling biological filters BAFF plant Final settlement ASP (surface aeration) ASP (diffused aeration) Membrane RBC/SAF/Packaged
Sludge	Mechanical thickening (belt and drum) Sludge tanks

5.6.6. Conclusions

We are proposing a significant rise in investment in AMP8, mainly due to the following:

- Minehead WRC – Submerged Biological Contactor replacement due to obsolete, unsupported equipment
- Chilton Trinity WRC – UNOX aeration plant replacement due to obsolete, unserviceable equipment
- UV disinfection systems across multiple WRCs now obsolete and unsupported (unavailability of spares due to age of equipment e.g. Holdenhurst WRC)

The resulting projection for future capital maintenance expenditure is given in the table below.

Table 61: Planned Sewage Treatment works expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP7	AMP8	AMP9
Water Recycling Centres	128.88	182.1	297.48

We have proposed AMP8 expenditure based on asset modelling, supported by observations of asset condition and performance and have considered risk in relation to deliverability and affordability constraints. All of the investment set out in this plan is essential if we are to do the right thing for customers and the environment, within the current policy and regulatory framework. We have carefully prioritised and only included what we need to do to meet legislative and regulatory expectations and deliver the outcomes our customers and communities support. As a result, we propose further increases in expenditure for AMP9 to reflect the model output.

5.7. Wastewater Network Plus Base Operating Expenditure

We consider that Wastewater Network Plus base OPEX will increase from AMP7 due to the incorporation of enhancement OPEX from 2024-25 into base in 2025-26. As with the other price controls, business rates continue to be expected to be a significant driver of increased base OPEX due to rate rises as part of triennial reviews and the continued addition of new assets to sites as we expect experience throughout AMP8 to the Capex schemes planned.

The impact of real price effects and Frontier Shift is noted in the increase in power costs from 2025-26 through to 2029-30 and decreasing costs in Other operating costs via labour and materials efficiencies. For more detail on how Real price effects and frontier shifts have been applied to the price control, please refer to WSX08.

However, we anticipate an increase in Other operating expenditure from AMP7 due to planned increased base expenditure relating to our determined efforts to reduce pollutions wherever possible, increasing site standards due to tighter consents and our assessment of health and safety activities that require optimisation throughout AMP8. We are also anticipating ongoing maintenance to our aging asset pool will increase across AMP8 due to the correlation of the age of assets and frequency of failures and maintenance required.

6. Bioresources

6.1. Price control summary

6.1.1. Assessment approach

Table 62: Asset Group Characteristics & Approach

Functional Group	Asset Group	Characteristics	Assessment approach
Sludge collection	Sludge logistics	Small asset group, comprising sludge tanker fleet for inter-site sludge transfer	Optimum replacement intervals for capital expenditure associated with the tanker fleet. Operational costs based on 2022-23 and adjusted to reflect input cost pressures, growth in sludge production and impact of treatment strategy on inter site transportation
Sludge treatment	Sludge treatment centres (9 sites)	Small asset group, complex processes comprising long life civil and shorter life process and EMI assets operating in aggressive environments	A combination of deterioration modelling, bottom up capital expenditure assessment, asset performance data and risk assessments used to generate AMP8 spend and forecast longer term trends. Operational costs based on 2022-23 and adjusted to reflect input cost pressures and volume changes
Sludge disposal	Sludge disposal operation	No significant physical asset base to maintain, predominantly an operational service	Based on historical expenditure, with operational costs adjusted to reflect input cost pressures and predicted growth in sludge volumes for treatment

6.1.2. Investment Summary

Our proposed capital maintenance investment plan addresses the challenges associated with maintaining an increasing volume of aging shorter-life assets, managing obsolete and unsupportable equipment, particularly that required for control and monitoring of asset performance, and affordability and the need to constrain investment subject to internal risk review and challenge.

Significant capital maintenance is required in AMP8 to bring all our Bioresources Centres (BC) up to standards required by H&S, Industrial Emissions Directive (IED) and Environmental Permitting Regulations (EPR). Our maintenance programme includes digester inspections and gas system upgrades to meet the needs of process safety alongside various asset replacements to ensure the assets meet Best Available Techniques (BAT) for IED and EPR compliance.

All Bioresources assets on IED sites need to be maintained in good condition to be BAT compliant. This results in additional or accelerated maintenance, as previously we would have taken a risk based approach on maintenance requirements. Now the maintenance is mandatory to comply with BAT. Therefore this is the first time that maintenance has been directly associated with regulatory compliance. We are arguing that the step change increase in maintenance due to IED needs to be modelled in the base costs as this was not done in PR19.

With the volume of work within the plan, uncertainty around the full scope of IED and complexity of biogas sites, AMP8 will bring significant challenges to ensure service is maintained throughout delivery of investment. If we do not undertake the required maintenance we will not comply with IED and the lack of maintenance will also increase H&S risks on our biogas sites.

The proposed investment will deliver replacement assets/infrastructure and allow us to refurbish existing assets to improve the resilience of our treatment process. This approach will mitigate the risk of noncompliance and the associated costs of treating noncompliant sludge (landfill). It will enable Wessex Water to deliver an efficient and reliable bioresources service to our customers.

Service to customers and the environment has been stable with 100% of sewage sludge disposed of satisfactorily, zero pollutions and negligible odour complaints attributable to sludge management operations.

Looking forward, expenditure for operating and maintaining our bioresources treatment and disposal assets will continue to face additional upwards cost pressures associated with:

- increases in energy and chemical costs above inflation
- the growth in sludge production due to gradual population growth
- growth in sludge production due to enhancement schemes for Phosphorus removal completed in AMP7 and those planned for implementation in AMP8 and AMP9
- extreme winter weather events that either limit land access for recycling biosolids or result in additional activity to reinforce on farm stock piles

Our proposed operational plans aim to counter these upwards cost pressures through:

- continuing our programme of energy efficiency and system optimisation activities
- maximising sludge digested for increased renewable generation, reduced solids for disposal and reduced use of lime treatment: however, the opportunity for further savings will diminish as we approach the limit of installed digestion capacity
- continuing in house operation and management of a sludge collection service that is benchmarked against ‘hired in’ services, and ensures control of risks and costs
- benchmarking and tendering on a 5-yearly basis the contracted sludge recycling service.

6.2. Sludge collection and treatment

6.2.1. Asset inventory

1. Sludge logistics

Sludge logistics is predominantly an in-house service operating a fleet of tankers on a 24-hour basis. Import centres record details of imported biosolids source, volume delivered and dry solids content.

2. Sludge treatment

Treatment of sewage sludge is asset intensive and comprises functional groupings of assets for:

- the reception and screening of untreated sludge
- thickening
- dewatering
- treatment using anaerobic digestion or lime addition
- sludge storage
- liquor treatment

- biogas collection and treatment
- renewable energy generation.

The functional groups comprise a mixture of long life structures and shorter life mechanical, process, electrical and instrumentation assets operating in aggressive environments.

All our sewage sludge is treated to meet either conventional or enhanced standard and is treated by anaerobic digestion or through the addition of lime. Regionally, there are currently nine BCs, of which seven are integrated within an WRC site and two located independently of the WRC they serve.

We have regional treatment capacity of around 77,000 tonnes dry solids (tDS) per annum and the majority is treated by anaerobic digestion in line with our carbon footprint reduction strategy. Bristol (Avonmouth) BC is the most important centre, processing more than 50% of all sludge produced. The financial and operational impact of failure at this site is significantly greater than any other site.

6.2.2. Maintenance planning objective

The business strategic outcomes and performance commitments influenced by the operation, condition and performance of assets in this asset group are:

Table 63: Performance Commitments

Outcome	Performance commitment
Excellent river and coastal water quality	Discharge permit compliance Wastewater pollution incidents
Effective sewerage system	Customer property sewer flooding (internal) Customer property sewer flooding (external) Sludge rising main bursts (Sewer collapses)
Excellent Customer Experience	Customer measure of experience
Net Zero Carbon	Greenhouse gas emissions

To deliver these outcomes and performance commitments, our maintenance planning objectives for this asset group are to ***collect and treat biosolids in a safe, reliable and sustainable way and to maximise their potential nutrient and energy value to minimise costs and carbon footprint.***

6.2.3. Historical maintenance expenditure

Between AMP4 and AMP6 there has been significant capital maintenance investment in the expansion of our anaerobic digestion facilities, driven by our long-term carbon footprint reduction strategy, dealing with additional sludge arising from Phosphorus removal, and more recently preparation for sludge separation. The strategy consolidates sludge treatment at fewer, larger facilities with 24/7 access to maximise utilisation of assets and resources, and to increase renewable generation. A summary of long term capital maintenance expenditure for sludge treatment is given in the table below.

Table 64: Historical expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP3	AMP4	AMP5	AMP6	AMP7
Sludge collection and treatment	9.27	21.59	29.71	47.49	81.58*

**Forecast*

Capital expenditure associated with sludge collection is predominantly that associated with the replacement of the sludge tanker fleet which has historically been allocated to Management and General but is now allocated to the Bioresources price control.

6.2.4. Historical performance

Biosolids treatment is heavily regulated and compliance forms part of the Environment Agency's annual Environmental Performance Assessment.

Key performance measures for sludge treatment are Compliance with the Safe Sludge Matrix (%) and the number of Wastewater pollutions. The Table below shows the recent history of our performance against these measures, together with the quantities of sludge produced and disposed of, and other performance measures used to chart our progress in delivering our carbon footprint reduction strategy.

Table 65: Bioresources historical performance

Year	2016	2017	2018	2019	2020	2021	2022
Pollutions (to land)	0	0	0	0	0	0	0
Percentage of sludge compliant	100%	100%	100%	100%	100%	100%	100%
Total volume of sludge dispatched (t) thousands dry solid	52.1	52.8	52.1	51.0	44.0	43.8	44.9

This performance data suggests that recent operational activity and investment plans have been effective in delivering the company's strategic objectives for biosolids treatment.

6.2.5. Maintenance forecasting

The sludge treatment asset group is a relatively small asset group and our forecasting of capital maintenance requirements for AMP8 has been based on site specific bottom-up assessments from which emerging needs, opportunities, and strategic maintenance expenditure requirements for the next 5 -10 years have been identified.

Asset renewal modelling has been used to supplement the bottom up assessment and provide a longer-term forecast of capital expenditure requirements, beyond AMP8.

Details on specific site investment plans can be found in WSX18 – Bioresources strategy and investment.

6.2.6. Conclusions

Our proposed capital maintenance investment plan addresses the challenges associated with maintaining an increasing volume of aging shorter-life assets, managing obsolete and unsupportable equipment, particularly that

required for control and monitoring of asset performance, and affordability and the need to constrain investment subject to internal risk review and challenge.

The resulting projection for future capital maintenance expenditure is given in the table below.

Table 66: Planned Sludge collection and treatment expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP7	AMP8	AMP9
Sludge collection and treatment	81.58	187.6	63.2

We forecast a significant step change in our major maintenance requirements for bioresources in AMP8. The reasons for the increased major maintenance in AMP8 are:

- The digesters at Avonmouth, Trowbridge, Taunton and Berry Hill will need to be inspected and cleaned as they reach 10 years of operation in AMP8,
- Various biogas assets such as biogas holders, flares and pressure relief valves will need to be refurbished or replaced to meet process safety standards,
- The maintenance programme of various bioresources assets will need to be accelerated to ensure that the sludge treatment process at IED-permitted AD sites meet BAT standards.

All of the investment set out in this plan is essential if we are to do the right thing for customers and the environment, within the current policy and regulatory framework. We have carefully prioritised and only included what we need to do to meet legislative and regulatory expectations and deliver the outcomes our customers and communities support.

6.3. Sludge disposal

6.3.1. Asset inventory

Biosolids recycling and disposal is predominantly a service operation with few physical assets and includes:

- collection, transportation and recycling of 215,000 tonnes per year of treated sewage sludge
- land bank management
- environmental management of former sludge tips at Glastonbury, Wells and Yeovil (Vale Rd).
- sludge haulage skips, front loaders, cake loading bays

The collection, transportation and recycling of sludge cake to agricultural land is currently provided by a single third party under a competitively tendered contracted service. In house resources oversee this operation and manage landbank availability and quality assurance of activities relating the application of treated sludge to arable crops such as wheat, barley and oilseed rape as an alternative to artificial fertiliser.

6.3.2. Maintenance planning objective

The business strategic outcomes and performance commitments influenced by these service operations and condition and performance of associated assets are:

Table 67: Performance Commitments

Outcome	Performance commitment
Excellent river and coastal water quality	Discharge permit compliance Wastewater pollution incidents
Excellent Customer Service	Customer measure of experience
Net Zero Carbon	Operational Greenhouse gas emissions

To deliver these corporate strategic objectives and performance targets, our maintenance planning objective for these functions is to ***manage the collection, transportation and recycling of treated sludge in a safe and sustainable way, at least cost, while conforming to relevant codes of practice and regulation***.

6.3.3. Historical maintenance expenditure

Expenditure associated with this asset group is predominantly operational which includes external costs for tendered sludge recycling services, and internal costs for managing service contracts, the landbank and stakeholders.

Typically, maintenance expenditure is minimal and includes for replacement of haulage skips, loading vehicles, minor concrete repairs to cake loading bays and ongoing management and environmental monitoring of legacy sludge tips. A summary of long term capital maintenance expenditure is given in the table below. The long-term average expenditure is around £0.2m per AMP.

Table 68: Historical Sludge Disposal expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m @ 2022-23	AMP3	AMP4	AMP5	AMP6	AMP7
Sludge Disposal	0.1	0.2	0.1	0.3	0.2

6.3.4. Historical performance

Sludge disposal compliance is heavily regulated and compliance forms part of the Environment Agency's annual Environmental Performance Assessment. Historically, our operations have been successful in cost effective delivery of business objectives whilst meeting the following performance requirements:

- 100% compliance with the Safe Sludge Matrix and draft Sludge (Use in Agriculture) Regulations
- No pollutions associated with sludge recycling operations
- No odour nuisance complaints associated with recycling operations.

6.3.5. Maintenance forecasting

Our sludge disposal operation has been successful in delivering a cost effective, compliant and sustainable sludge recycling service. It has been effective in sustaining recycling of treated sludge to agricultural land as the best practical environmental option at lowest cost.

Requirements for capital expenditure are small in comparison to operational costs and future levels are unlikely to be different from recent historical levels.

The principal threat to the sustainability of our sludge disposal strategy is the loss of access to agricultural land, due to expected changes in the Farming Rules for Water (FRfW). This will restrict sludge spreading on soils that are high in nutrients and will require significant industry wide capital investment in alternative sludge destruction and disposal solutions.

6.4. Bioresources Base Operating Expenditure

We consider that Bioresources base OPEX will increase from AMP7 due to the incorporation of enhancement OPEX from 2024-25 into base in 2025-26. As with the other price controls, business rates continue to be expected to be a significant driver of increased base OPEX due to increases expected from triennial reviews and the continued increase of in assets we expect to continue to experience throughout AMP8.

It is anticipated that power costs will increase across AMP8 but that other operating costs will decrease for the price control as a result of real price effects and frontier shift efficiencies. For more detail on how Real price effects and frontier shifts have been applied to the price control, please refer to WSX08.

Other operating costs will also have some additional costs included which will be in support of our ongoing efforts to reduce pollutions and implement continuous improvement in health and safety activities, specifically the level of attendance at all sites, which are forecast to incur additional labour and materials costs throughout AMP8 in comparison to AMP7. We also anticipate ongoing maintenance to our existing aging asset pool will increase across AMP8 due to the correlation of the age of assets and frequency of failures.

7. Management and General

7.1. Price Control summary

The 'Management & General' (M&G) asset groups and business areas needed to maintain our wholesale water and sewerage services in AMP8 and AMP9 are listed in the table below.

Table 69: M&G sub asset groups

Asset Group	Sub-group
Information Technology	Software applications / systems Infrastructure hardware
Infrastructure hardware	Company cars Operational vehicles Tools & plant
Transport	Offices & depots Conservation, Access & Recreation (CAR) Others (Agricultural holdings, abandoned sites, residential / commercial)
Other	Laboratory analytical services Technology and innovation Digital transformation

This scope excludes M&G investments directly associated with retail services or new Information Technology (IT) applications / infrastructure to provide service resilience improvements.

The table below summarises our proposed M&G expenditure which has been derived using the assessment methodology outlined earlier in this document.

Table 70: M&G asset group AMP8 expenditure

Asset Group	AMP7 Expenditure (£m)	AMP8 Expenditure (£m)	AMP9 Expenditure (£m)
Information Technology (IT)	51.28	46.9	56.87
Transport	24.96	51.39	47.28
Property	6.52	5.83	6.86
Other areas (Laboratory services / digital strategy & services)	4.11	17.79	14.76
TOTALS	**86.87**	**121.9**	**125.77**

These costs are then allocated at Price Control level using the opex recharge splits for depreciation which are based on use of capital assets.

7.2. Information technology

7.2.1. Overview

The purpose of this section is to provide an overview of the IT strategy and its alignment with business strategy to support the business plan 2025-30. Furthermore, it will provide an insight into how IT is setup to understand the business need and to develop technology solutions that meet their objectives whilst keeping an eye on future requirements and advances in technology. It also describes the governance processes that ensure the delivery of the right products and services at the right time to maximise value for our stakeholders, customers, and the environment.

AMP8 will be Wessex Water's largest capital delivery programme. This increase means that the IT strategy and the services provided including IT support and additional hardware will also need to be scaled to ensure the business can meet its desired outcomes.

7.2.2. IT Strategy

The purpose of the IT department is defined by the objectives agreed with the Board of Directors and formed around the three key principles of "keep us secure," "keep the lights on" and "drive our success."

This document builds upon the visionary statements above, aligns them with our strategic direction that address key challenges, including climate change, affordability, biodiversity, and service excellence and from that derives the medium-term IT strategy to the end of this decade and beyond.

The vision of the IT department is to be a trusted partner delivering visionary solutions that help drive the business to achieve its objectives.

7.2.3. IT Priorities

Water and waste utilities in the UK face multiple challenges in the coming years, such as climate change, population growth, ageing infrastructure, and regulatory pressures. To address these challenges, we need to invest in technology solutions that can protect our services (keep us secure), keep us working (keep the lights on) and engage to help solve business problems (drive our success). This forms the basis of the IT Mission.

The delivery of the mission is divided into distinct roadmaps that are tracked from strategy though to deployment. This ensures we prioritise our portfolio and can monitor benefits and ensure alignment to the outcomes defined in the WW Strategic Direction Statement.

Keep us secure: As per the IT mission statement, maintaining secure networks, applications, and data is of paramount importance. Underpinning this objective is the security roadmap, informed by the cyber maturity assessment and aligned with NIS directive.

Keep us working: Underpinning the second objective is the combination of the security, support and maintenance roadmaps. This is essential for Wessex Water to operate and to maintain services to our customers.

Drive our success: This is underpinned by two roadmaps, re-platforming, and data & Artificial Intelligence (AI). This is driven by business strategy, changes in technology and new regulatory commitments. It is focused to deliver value to customers, the environment, and shareholders.

7.2.4. IT Investment Strategy

We are proposing a roadmap for prioritising investments in the short, medium and long term based on our strategic objectives and our operational needs.

In the short term (1-3 years), we will invest in technologies that can deliver quick wins and immediate benefits, this includes data analytics platforms, asset management and machine learning capabilities. These technologies will help us reduce water losses, improve customer service, optimise network performance, and increase operational efficiency.

In the medium/long term (3-10 years), we will invest in technologies that can enable more integrated and adaptive management of water and waste systems, such as digital twins, artificial intelligence, and cloud computing. These technologies could create digital replicas of our physical assets, leverage advanced algorithms to automate decision making, enhance data security and transparency, and scale up our computing capabilities.

Below in Figure 10 is a sunray diagram that illustrates how the roadmaps build to create value to our customers, and the environment. The roadmaps can be delivered in parallel tracks, so they are not sequential in nature. What they do is provide line of sight between the business strategy and the IT strategy.

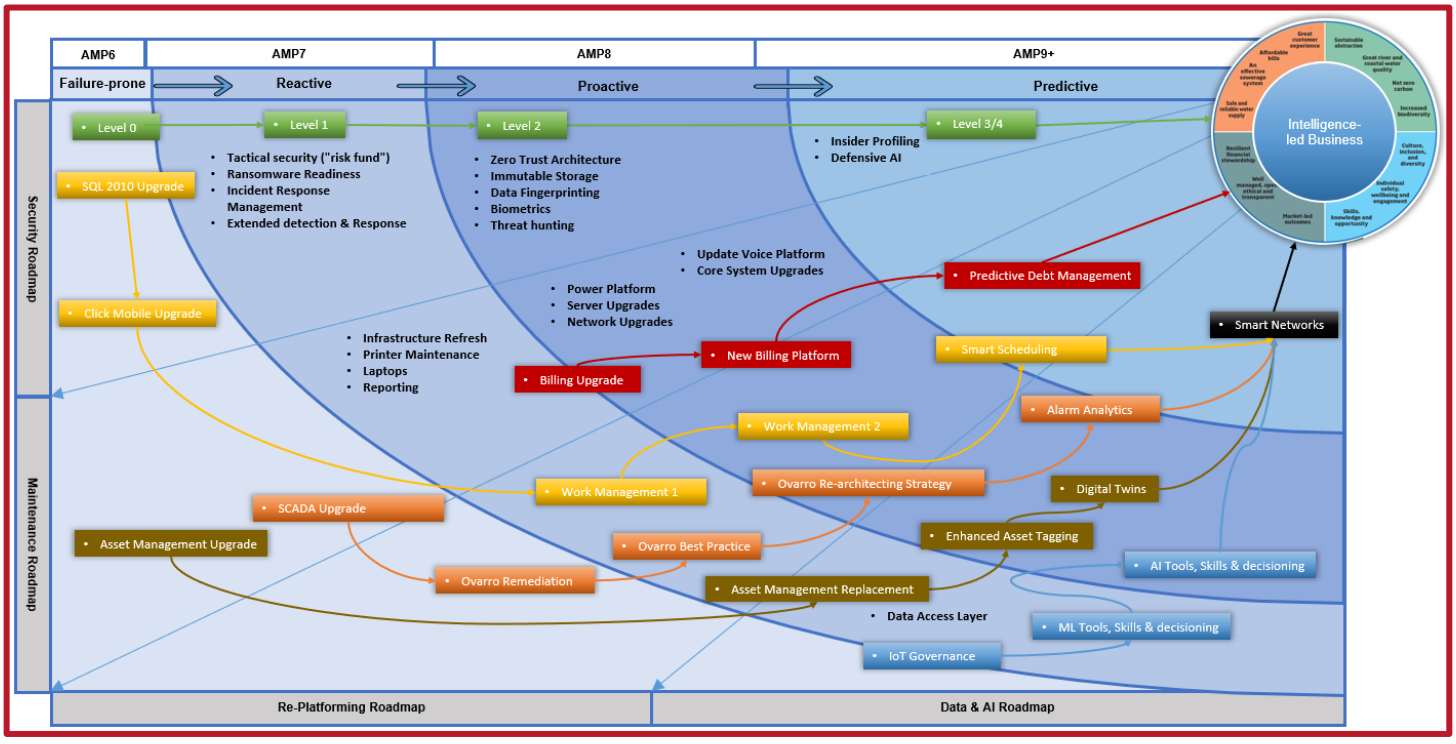


Figure 10 IT Priority Sunray Diagram

7.2.5. IT and Business Strategy Map

The Wessex Water IT estate consists of systems, applications, databases, and networks and makes information and knowledge available to employees, customers and stakeholders. It is this knowledge and information that enables Wessex Water to meet the outcomes set out in the strategic direction statement.

Through our roadmaps we are pursuing a low total cost of ownership strategy which aims to deliver the most benefits, to the environment, customers and shareholders through IT systems that focus on quality, process improvement and workforce productivity.

Figure 11 below shows how the IT strategy underpins the delivery of the business strategic outcomes. Whilst IT cannot always be directly attributed to outcomes, it underpins everything Wessex Water does as an organisation and its value only comes in the context of the business strategy.

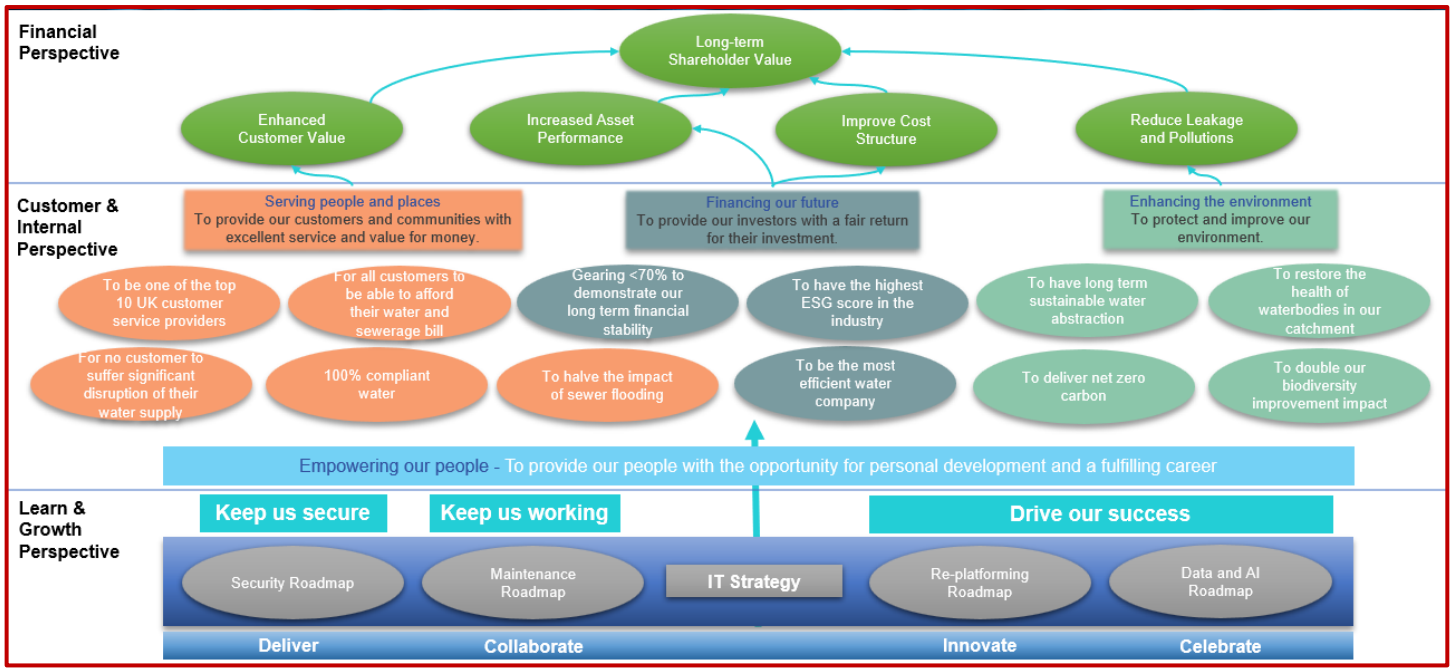


Figure 11 IT/Business Strategy Map

7.2.6. Creating Business and IT Alignment

Wessex Water IT uses Business Architecture Body of Knowledge (BIZBOK) methodologies and The Open Group Architecture Framework (TOGAF) to align business and IT architecture.

We recognise the importance of business led IT, rather than IT working in a silo developing services and solutions that fail to meet the desired outcomes of the business.

Therefore, our IT strategy is not developed in isolation, it is developed from the understanding of the business strategy and objectives through the lens of business architecture.

7.2.7. Business Architects – Strategy Execution

Figure 12 below, is from the Business Architecture Body of Knowledge (BIZBOK). It illustrates how alignment to business strategy, planning, and investment interface with the role of business architecture. The Business Architecture team have been working with key stakeholders across the business to develop a bottom-up plan, which will deliver a change portfolio across AMP8 and into AMP9 creating an alignment of business and IT strategies.

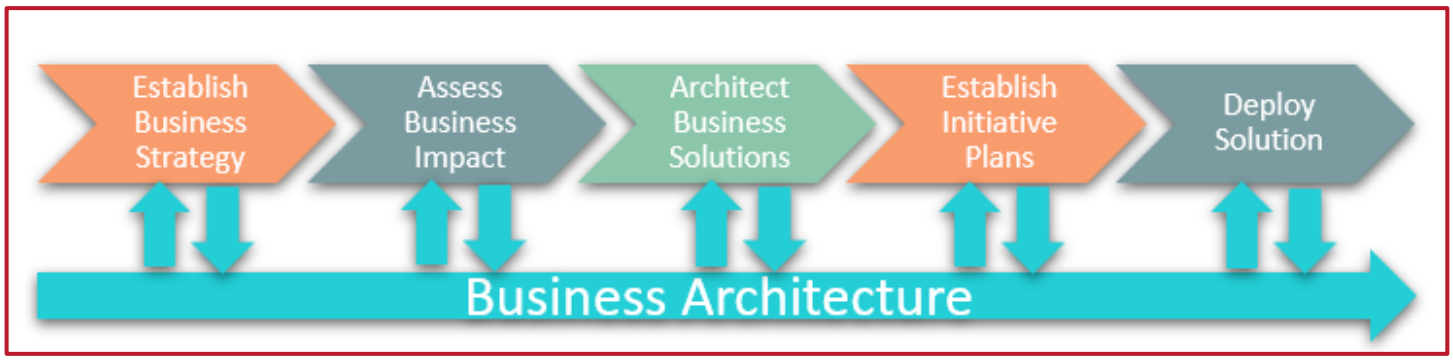


Figure 12. End-end strategy execution

7.2.8. System Architects – Technology to Deliver Business/IT Strategy

System Architecture is a combination of Application, Data and Technical domains. These provide the services, information, and underlying platforms that support the operation of Wessex Water. The System Architecture Team is responsible for overall design, frameworks, standards, and development prioritisation of these domains to meet the business needs both current and future.

Figure 13 below shows the governance groups that ensure strategy, patterns and standards are being followed.

Figure 13 - System Architecture Governance

- Architecture Review Board (ARB)

The ARB is chaired by the Systems Architecture Manager and is attended by all IT functional areas. It provides a governance mechanism to review all proposed solutions to ensure they align with the business and technology strategy, follow standards and patterns, and meet security requirements. All ARB decisions are logged in the ARB solution sign off register.

- Platform Design Authority (PDA)

A PDA provides governance specifically at the platform level to capture architecturally significant decisions to our core platforms e.g., Azure, Agresso & Dynamics. The PDA operates under the delegated authority of the ARB.

- Service Design Authority (SDA)

The SDA ensures that a roadmap exists for our key technologies. The SDA reviews the competitor landscape to ensure that our technology suite continues to meet the business capability needs and explore opportunities to innovate based on technology developments. The SDA ensures that the service remains supportable and that technology-driven events contribute to the roadmap.

7.2.9. Governance – Controlled delivery

Wessex Water IT project delivery is based on PRINCE2 methodology and uses a Project Management Office (PMO) that sets and maintains standards for project management and measures and monitors delivery. This ensures we provide best value to Wessex Water and in turn our customers and shareholders.

7.2.10. P3M3 Assessment

The Portfolio, Programme, and Project Management Maturity Model (P3M3) is a management maturity model looking across an organisation at how it delivers its projects, programmes, and portfolio. The Wessex Water IT Department has successfully used this model, supported by external auditors to assess our delivery capability.

The assessment considers 7 perspectives of Project Management, which together define the processes used to define, deliver, and control projects within an organisation. Each perspective is assessed for its maturity level against outline criteria, and a maturity level between 1-5 is assigned.

For the 2022 Project & Portfolio Maturity Assessment the focus was on:

- Stakeholder Management
- Risk Management
- Benefits Management

Those areas were chosen specifically as we align the IT and business strategies. We want to ensure we deliver the right solutions to the right people in the areas that reduce the most risk and deliver the maximum benefits to our customers, the environment, and our shareholders.

Figure 14 below shows how our maturity level has increased over time.

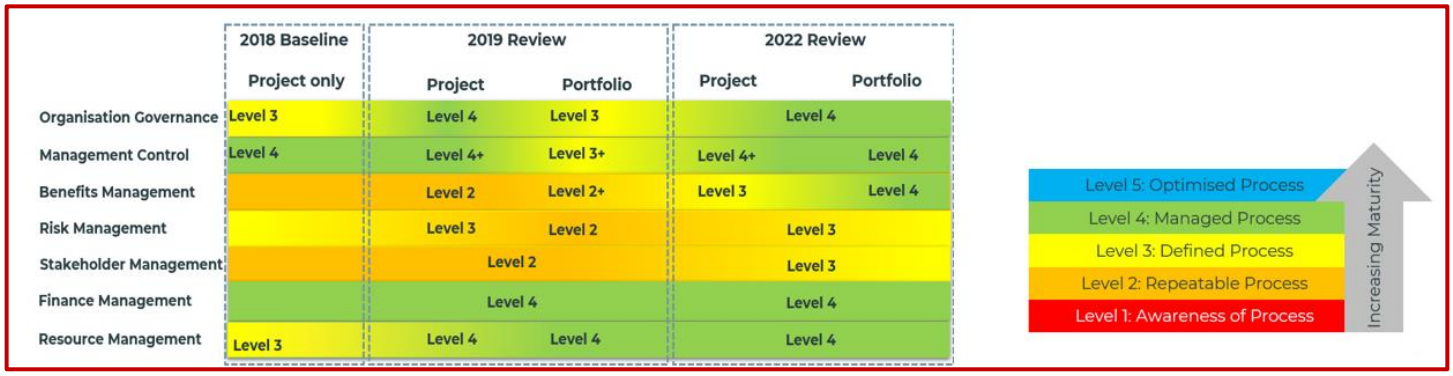


Figure 14 P3M3 results

7.2.11. IT Portfolio management framework

This framework provides a gated process with regular formal checkpoints which ensure that the projects we deliver meet the business and IT strategy. It is made up with the following areas:

- Strategic & organisational context
- Portfolio definition
- Portfolio delivery
- Portfolio maintenance

Figure 15 below illustrates the gate process we use to ensure a controlled and structure approach to project and portfolio delivery.

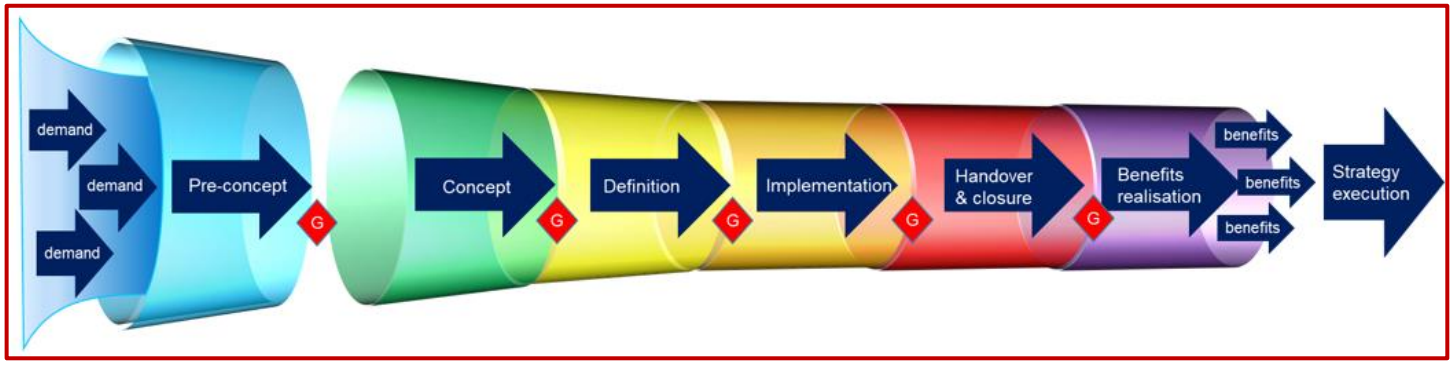


Figure 15 IT Portfolio Management Framework

7.2.12. Business Benefits Mapping

The IT portfolio is managed and controlled using Microsoft Project and Microsoft Project Online. Combined with Power BI for performance dashboarding we have a powerful delivery tool which is used at each stage of the gated process. Figure 16 below, is an example of a report we use which tracks benefits delivery. This highlights both the delivery against the IT mission: Keep use secure, keep us working and drive our success and it also tracks company performance and strategic aims.

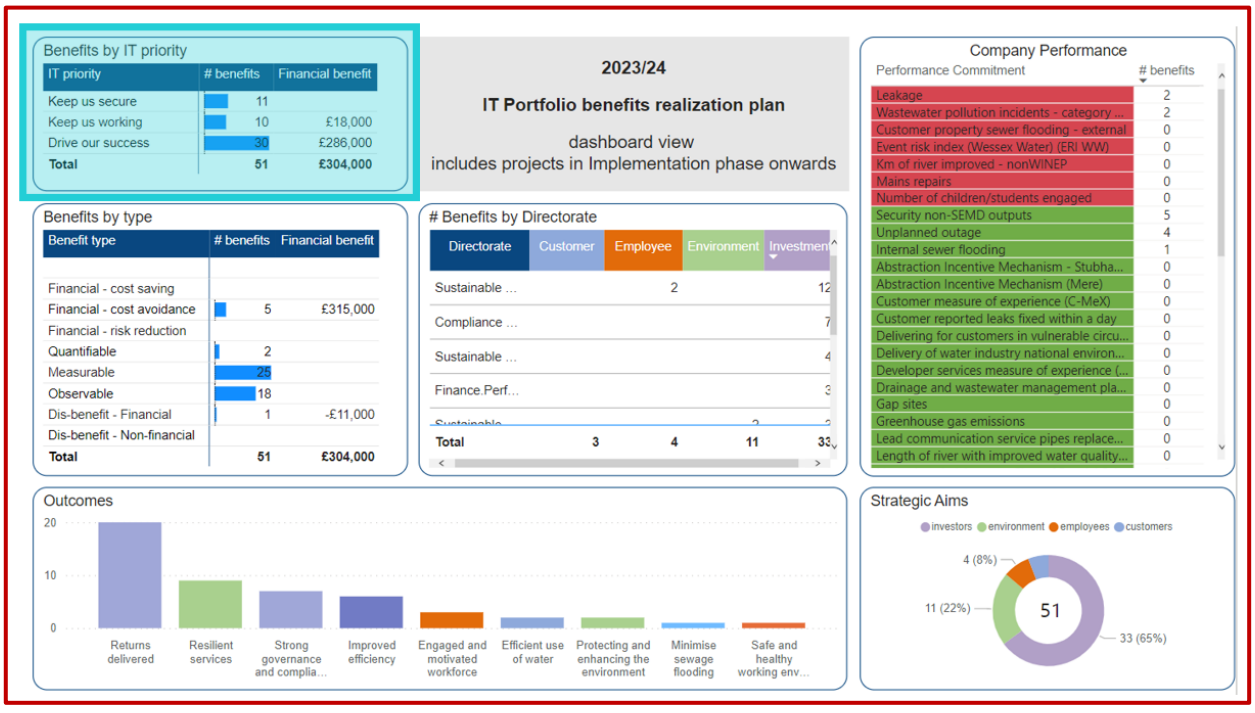


Figure 16 Benefits Realisation Plan

7.2.13. Benchmarking

Benchmarking against the Utilities Industry, using Gartner Key Metrics Data, suggests that maintaining the “Keep Up” level of investment we have seen in AMP7 is highly efficient for the Water sector and the wider utilities sector as seen in the table below.

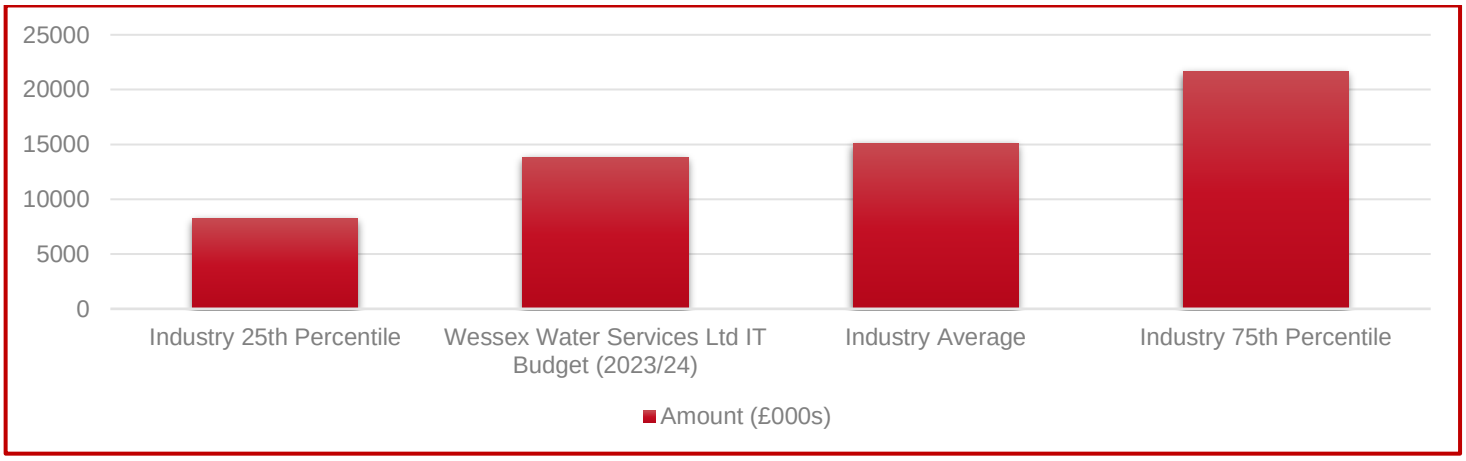
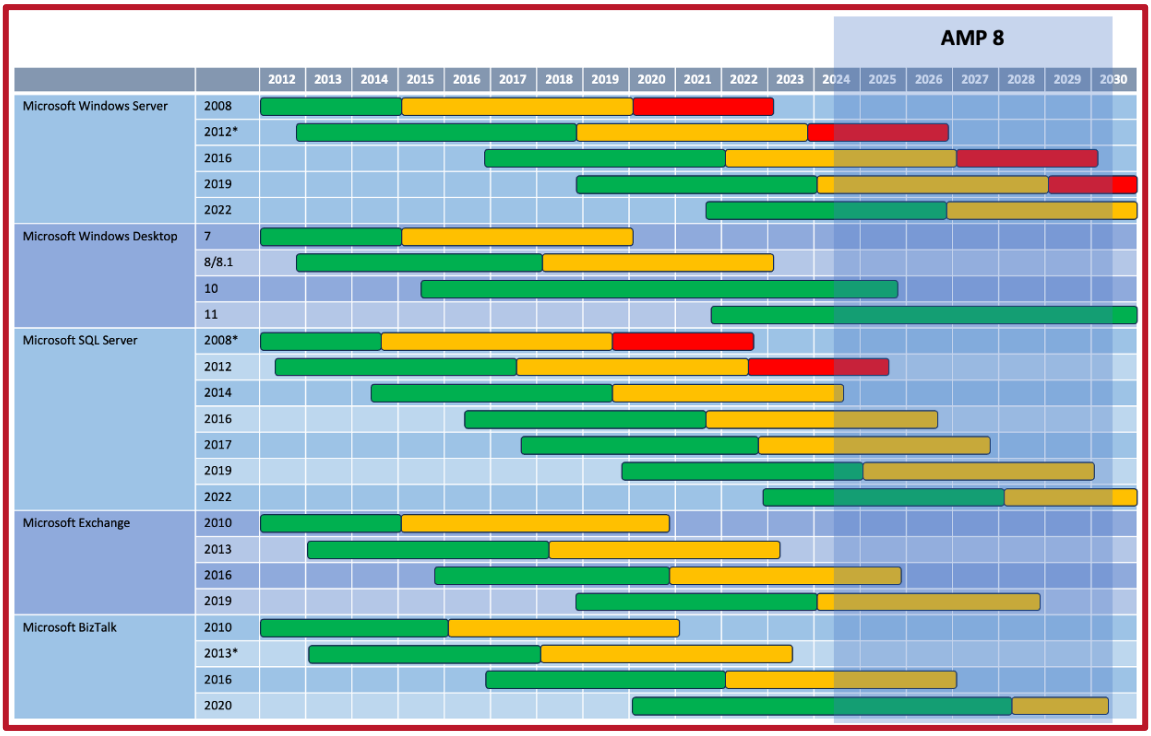


Figure 17 -Gartner Benchmarking

7.2.14. Technology Maintenance

Most of the services we provide are based on Microsoft technologies. This is in a hybrid model, with both on-premises solutions and technologies, and those hosted by Microsoft and others. Where appropriate, we are migrating services to hosted solutions to reduce the overhead in maintaining platform technologies and support the organisational journey to net zero carbon.

Our on-premises Microsoft platform technologies will each require at least one version upgrade to remain supportable during the period covered by AMP8. These platform support dates are tracked in our Service Design Authorities.



Legend

Microsoft Windows Server	Active Support	Security Support	Extended Security Updates
Microsoft Windows Desktop	Active Support	Security Support	
Microsoft SQL Server	Active Support	Security Support	Extended Security Updates
Microsoft Exchange	Active Support	Security Support	
Microsoft BizTalk	Mainstream Support	Extended Support	

Figure 18 Microsoft support roadmap

In addition to the Microsoft platform technologies, the Service Design Authorities track the key support, contract and milestone dates for our Telemetry system, other in-house and 3rd party systems. This enables an overview of upcoming areas of risk, informing investment requirements, and the sequencing of project deliveries. This is currently maintained in a spreadsheet, and is contributed to by the System Architects, Business Architects and Subject Matter Experts. We ensure that contract renewals are supported in line with our defined procurement processes.

We also have a robust supplier management process in place to review supplier performance and delivery in line with contractual KPIs and SLAs. This includes monitoring contract duration and ensuring that contract renewals or retenders are carried out in a timely manner in line with commercial governance to continue to deliver value for money.

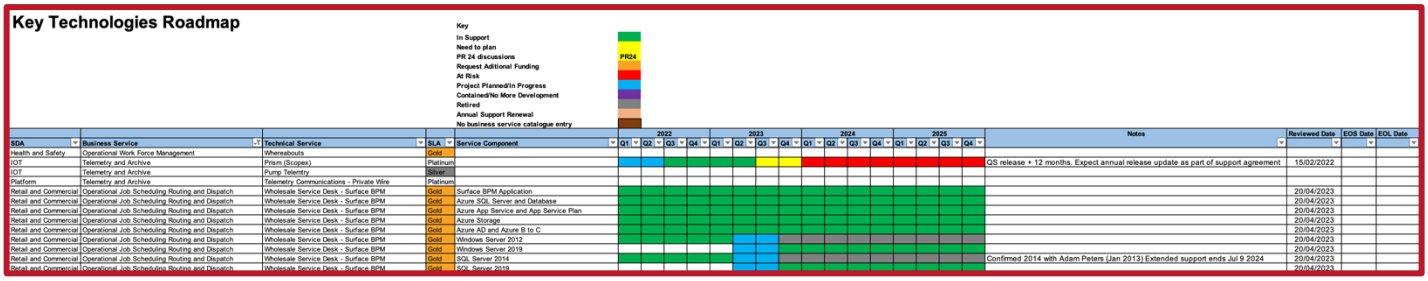


Figure 19 Excerpt from "Key Technologies Roadmap" spreadsheet, as maintained in Service Design Authorities

During AMP7, several key technologies have been replatformed to hosted solutions. Where possible, we prefer SaaS (Software as a Service) solutions, as these are always in support and offer standardisation. This significantly reduces the risk associated with maintaining legacy, on-premise technology.

These services addressed by migration to hosted solutions during AMP7 include:

- Customer portals and online billing
- Above-ground asset records and maintenance
- Associated workforce management and scheduling
- HR and payroll
- Internal collaboration tools

There are growing internal and external pressures on the industry to be able to collect and report on real-world data in near real-time. This requirement features across many workstreams, and it is therefore a priority to ensure that the platforms and technologies which enable this are well documented, understood and supportable.

As we advance towards AMP8, we are in the process of investing in tooling to be able to better track the maintenance and interconnections between our key systems, allowing efficiencies in the roadmap tracking, portfolio and project planning and service design processes. This addition of an enterprise architecture tool will also enable subject matter experts in the IT department and across the business to contribute to the architecture documentation in a controlled and consistent way.

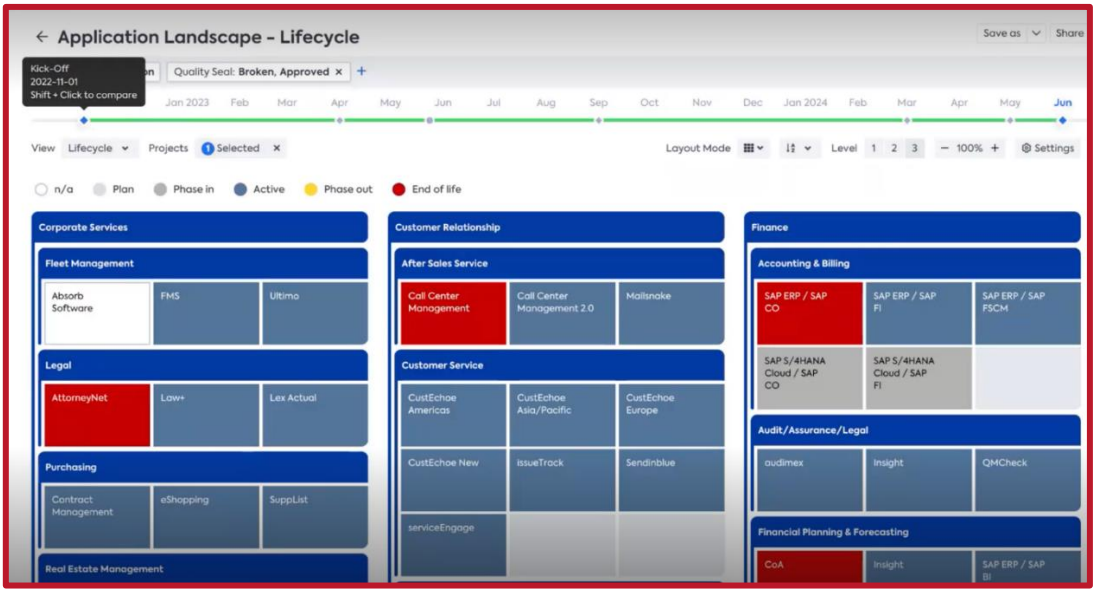


Figure 20 Screenshot from a vendor demonstration of an enterprise architecture tool

7.2.15. PR24 Approach

So far, we have described how our IT strategy, vision, mission and priorities are structured to meet the business strategy. Also, how we are setup and governed to ensure that benefits are checked though the delivery lifecycle. The next section describes how we plan and how it's built on the foundations we have created during AMP7.

7.2.16. External Input

Whilst we have developed our own strategy based upon our experience and knowledge of both the water industry and the technology world, we also seek validation from external bodies to check that we are being pragmatic and choosing technologies, which are cost effective, sustainable, and future proofed to allow for adaptation over time.

As we move into the 5th industrial revolution with industry 4.0 technologies including Big Data, AI and the Internet of Things (IoT), which are dynamic, rapidly changing and sometimes in unforeseeable ways, we must balance the legacy IT estate with innovation and at the same time always having security as a paramount priority.

Therefore, it's important we collaborate with partners and our industry peers to choose and select solutions that will deliver the maximum value for the longest time. The need to retain flexibility and agility to respond to the opportunities presented by rapid technological advancement is key to ensuring we continue to offer value for money to our customers.

One area that we are pursuing is digital twins. A digital twin is a virtual representation of a physical system that can simulate its behaviour and performance under different scenarios. A digital twin of a waste network could support our operational and regulatory commitments by providing them with real-time data, insights and predictions that could help us to optimize processes, reduce costs, enhance customer service, and comply with environmental standards.

A digital twin of a waste network could also enable us to test and evaluate various interventions and strategies before implementing them in the real world, thus minimizing risks and uncertainties. A digital twin of a waste network can be a powerful tool for water and waste companies to improve their efficiency, sustainability, and resilience in the face of increasing challenges and demands.

7.2.17. Regulators

We have used the Ofwat PR24 and beyond guidance, Ofwat Delivering into the future challenges and the government's strategic priorities for Ofwat. This has validated that we are focused in the right areas and with the right timescales. The key themes of data and AI are highlighted which resonates with our strategy.

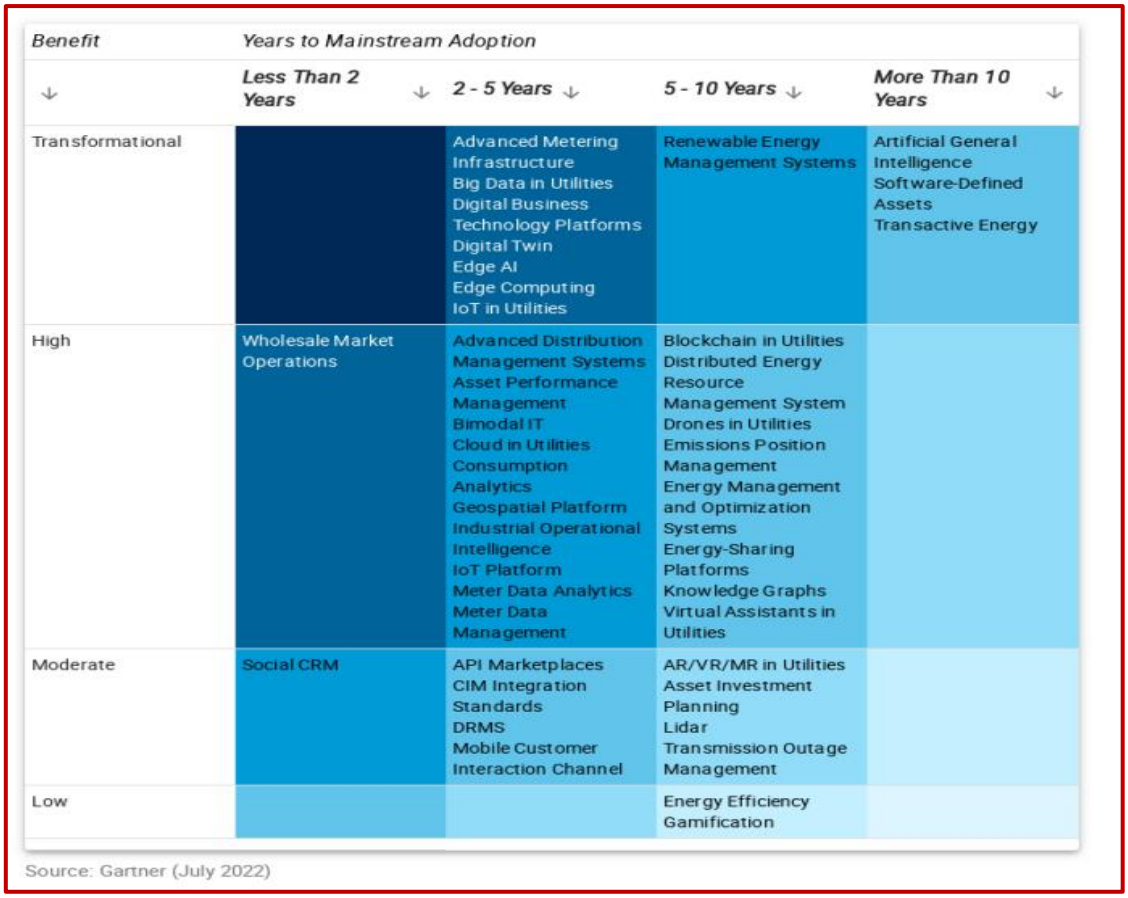
7.2.18. Gartner

We have a Gartner membership, which we use to review technology vendors and solutions to help support decision making. We have also engaged Gartner to help support our data strategy creation to ensure that it too has line-of-sight with our business strategy and ensures that we focus on delivering best value to the business.

We also use their industry insights to look at what technology priorities are being pursued, to help support business cases and technology strategy.

Finally, as per section 7.2.13 and figure 17, we also use Gartner to benchmark our investment plans to ensure we are in line with the sector, offer value for money and are not overreaching. We believe that via this process we are confident that our plans are not only deliverable but the start of our aspirations to deliver elastic solutions. This foundational work will support ambitions in AMP8 but will need further development in the future to meet the requirements in AMP9 and beyond.

Figure 21 below describes the Gartner view of IT priorities over time from low benefit to transformational, this echoes the themes from the Ofwat PR24 and beyond guidance and provides a secondary verification of our strategy.



Benefit	Years to Mainstream Adoption			
	Less Than 2 Years	2 - 5 Years	5 - 10 Years	More Than 10 Years
Transformational		Advanced Metering Infrastructure Big Data in Utilities Digital Business Technology Platforms Digital Twin Edge AI Edge Computing IoT in Utilities	Renewable Energy Management Systems	Artificial General Intelligence Software-Defined Assets Transactive Energy
High	Wholesale Market Operations	Advanced Distribution Management Systems Asset Performance Management Bimodal IT Cloud in Utilities Consumption Analytics Geospatial Platform Industrial Operational Intelligence IoT Platform Meter Data Analytics Meter Data Management	Blockchain in Utilities Distributed Energy Resource Management System Drones in Utilities Emissions Position Management Energy Management and Optimization Systems Energy-Sharing Platforms Knowledge Graphs Virtual Assistants in Utilities	
Moderate	Social CRM	API Marketplaces CIM Integration Standards DRMS Mobile Customer Interaction Channel	AR/VR/MR in Utilities Asset Investment Planning Lidar Transmission Outage Management	
Low			Energy Efficiency Gamification	

Source: Gartner (July 2022)

Figure 21 Gartner Priority Matrix

Figure 22 below shows key investment areas from Gartner IT budget research. Three of the top 5 initiatives align directly with our IT mission.

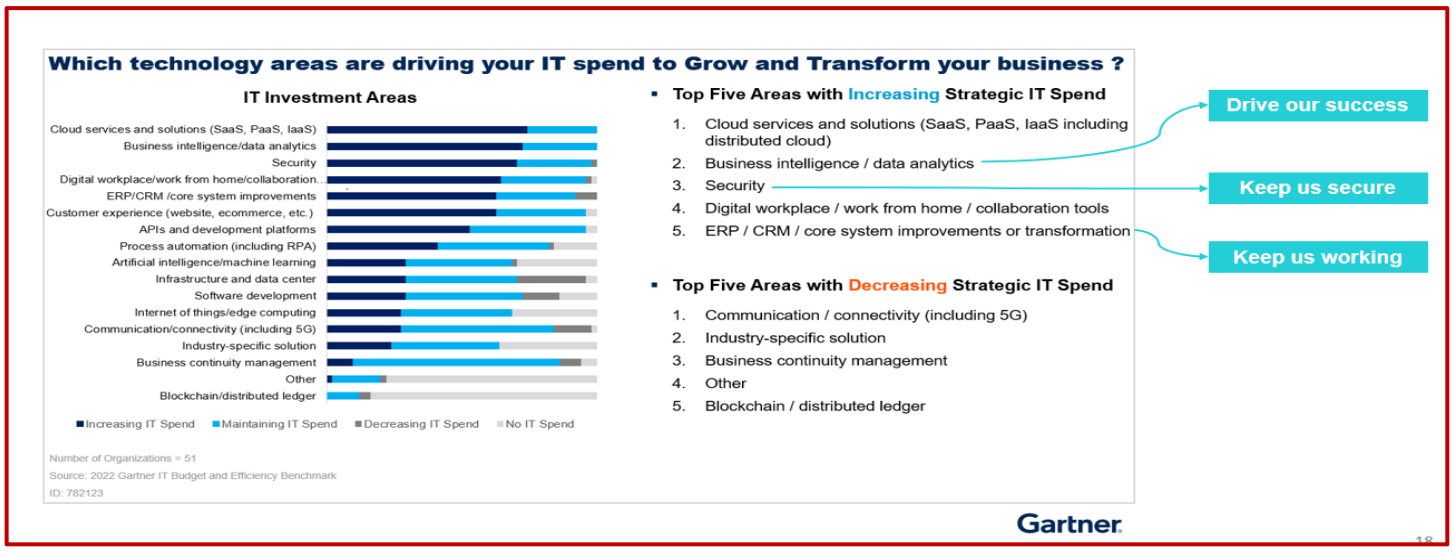


Figure 22 Gartner IT Investment Areas

7.2.19. PR24 Planning

To start our PR24 plans Business Architects met with all sub-programme owners who were preparing their PR24 plans. During these meetings we identified areas for investment that would require technology solutions.

Following these sessions Business Architects and System Architects held workshops to look at current technology landscape and roadmaps to identify emerging needs, these were fed back to the sub-programme owners along with impacts and indictive costs.

Outside of the business needs, IT maintenance requirements were captured. These are the items that keep us working and ensure our platforms and systems are supported or retired where needed. We also highlighted applications that would need re-platforming in AMP8.

7.2.20. PR24 Funding

We use a Rough Order of Magnitude (ROM) calculation to estimate the costs. This calculation was developed by our PMO function and is based on actual, historic project costs and delivery results captured in our project and portfolio tool, which is updated regularly. Through a series of questions, we identify the project complexity and we set the duration of the project based on our previous experience of similar types of projects. This provides three costs estimates: minimum, maximum and our estimate for the budget.

The initiatives were then grouped into three areas:

- Business Driven

These are initiatives identified for sub-programme owners these are business projects that require technology solutions. These costs have been added to the relevant sub-programmes and excluded from the IT submission as they will be integral to the individual sub-programme plans.

- Enhancements

Enhancements are new initiatives that have been identified and represent new capabilities to deliver customer benefit. These are aligned to the drive our success mission.

- Maintenance

Maintenance are initiatives that fit into the keep us secure and keep us work categories. These are vital for the operation of our business.

7.2.21. PR24 Approach Internal/External Verification

Our approach to PR24 has been iterated over time and including 5 internal PR24 challenge sessions. Those challenge meetings were designed to test our strategy and to ensure it stands-up to scrutiny and provides the best value to our stakeholders, customers, and the environment. Our approach has also been audited by Mott MacDonald and no actions were recommended after their review. Ultimately our plan has been received positively both internally and externally and it is recognised that this provides the right foundation for AMP8 which can be built on in future AMPs.

As each AMP has seen an increase in overall plan size, with AMP8 being no exception. The IT technology investment has remained stable to support the business needs and whilst we have demonstrated within this document how technology and specifically data underpin everything, the scale of our investment is not excessive and has been benchmarked to check we are providing the best value for our customers.

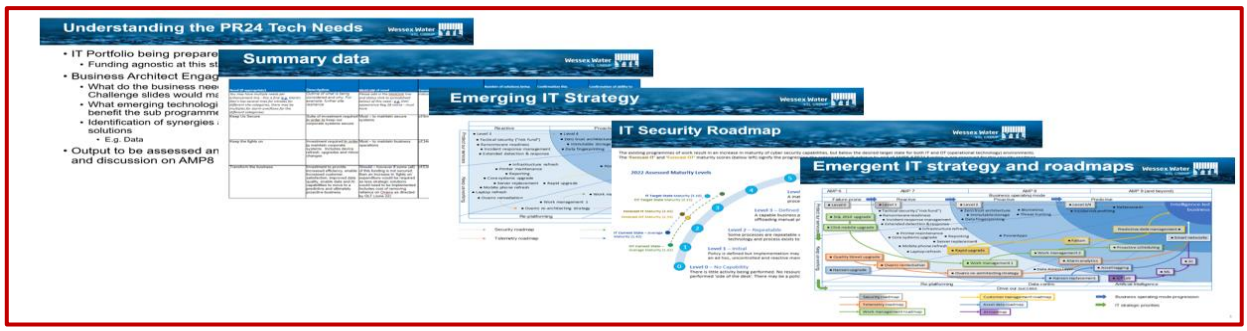


Figure 23 Evolution of IT PR24 submissions for Challenge Meetings

7.2.22. Conclusion

The AMP8 IT investment proposals are listed in the table below. Expenditure figures have been compiled from cost estimates of the systems, hardware, maintenance, and support, needed to deliver secure and stable IT systems along with enabling technology solutions to meet business objectives for AMP8 & beyond. All of the investment set out in this asset group is essential if we are to do the right thing for customers and the environment, within the current policy and regulatory framework. We have carefully prioritised and only included what we need to do to meet legislative and regulatory expectations and deliver the outcomes our customers and communities support.

Table 71: IT planned expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

Information Technology systems - Base	Amount (£m)
Work and Asset Management / Operations control	11.3
Environmental & scientific	2.0
Back office	6.6
Small systems	1.3
Foundation	3.9
Systems Total	**25.2**
Servers & storage	6.4
Computers / printers	5.6
Network	5.6
Operating systems including desktop	2.2
Mobile Phones	2.0
Infrastructure Total	**21.8**

Capex	**46.9**

7.3. Fleet

7.3.1. Asset inventory

Wessex Water's current transport assets (vehicles and plant) for supporting wholesale service are quantified in the summary table below.

Table 72: Fleet and plant assets

Group	AMP7	AMP8
Company cars (including pool cars)	408	300
Small Light Commercial Vehicle (LCV) – Vans	439	335
Large LCV	360	482
Heavy Goods Vehicle (HGV) – tippers / grabs & cranes	40	71
Off-road vehicles (4x4)	121	110
Bowsers & pumps	139	110
Mobile jetters	53	63
Tractors / forklifts	31	35
Mobile trailers	172	190
Locating equipment	598	635
Mobile generators	42	50
Site equipment Excavators	62	60
Various handheld tools	835	950

The numbers reflect the use of our in-house services for the operations of our services and the delivery of our capital investment programme. These numbers are based on replacement of the current fleet and do not include allowance for growth.

7.3.2. Maintenance planning objective

The company's policy of direct ownership is targeted at ensuring least whole life cost by:

3. optimising replacement and service intervals through direct control of costs
4. reviewing the latest guidelines, available technology and contract arrangements on replacement

7.3.3. Capital maintenance forecasting

It is forecast that the total number vehicle and plant replacements will remain at current levels over the AMP8 period. To establish the optimum replacement intervals the following costs have been reviewed:

- Original purchase prices (including manufacturers discounts)
- Asset re-sale values based on automotive industry pricing information ('CAP')
- Servicing & maintenance cost profiles based on history and 'CAP' total costs
- Downtime/breakdowns based on service history and internal hourly rates.

The replacement and service intervals used in the proposals for each asset group are listed in the table below.

Table 73: Fleet replacement and service intervals

Group	Replacement Interval (years)	Service Interval
Company Cars	4	Manufacturers
Operational Vehicles		
Small LCV - Vans	5	Manufacturers
Large LCV	6	Manufacturers
HGV – tippers / grabs & cranes	9	6 weeks
Off-road (4x4)	7 *	Manufactures
Tools and Plant		
Bowsers & pumps	6-10 *	3 months
Mobile jetters	10	3 Months
Tractors / forklifts	8-10 *	Manufacturers
Mobile trailers	10	3 months
Locating equipment	6-10 *	Annual
Mobile generators	10	12 Months
Site equipment (dumpers / excavators)	6	Manufacturers

Various handheld tools	5	3 months

*Replacement intervals based on actual costs. Average figures used for identifying expenditure needs

7.3.4. Alternative fuels

We have assessed the viability of using electric vehicles (EV) as part of our strategy to reduce operational carbon emissions. At this time the alternative fuel technology is deemed suitable for us to move to EV for the company car and small vans and a partial transition for larger vans. The other vehicles in the fleet may transition during the AMP if technology developments mean suitable options become viable. The table below summarises the cost and embodied and operational carbon emissions for the two assessed options.

Table 74: Fleet option summary

Option	AMP8 Totex £m	AMP8 Embodied carbon emission tCO2eq	End of AMP8 Operational carbon emission saving tCO2eq
Option 1 – all combustion engine	92	8,507	0
Option 2 – all combustion engine except electric light vans and company cars, partial transition for large vans	100	11,449	1,494[1]

[1] This equates to a 60% reduction and includes emissions from charging.

Our assessment indicates option 2 has a higher totex cost and embodied carbon emission due to the EV options having a higher capex than internal combustion engine equivalent. We have chosen to proceed with option 2 which has a benefit of lower operational carbon emissions.

7.3.5. Conclusions

The AMP8 Fleet maintenance expenditure proposals are listed in the table below. The costs have been compiled from estimates of current costs to replace the existing fleet and to transition to a greener fleet whilst allowing services to our customers to continue.

Table 75: Option summary

Group	AMP8 Capex (£m)
Company cars (EV)	13.88
Small LCV (EV)	9.12
Large LCV (EV/Diesel)	14.92
HGV – tippers/grabs & cranes (Diesel)	8.81
Tools & plant	4.66
Total	**51.39**

7.4. Property

7.4.1. Asset inventory

Wessex Water's wholesale property is shown in the table below. The scope does not include operational sites directly linked to water or sewerage services.

Table 76: Wholesale property summary

Category	Function	Number
Primary portfolio (support wholesale operational service)	Regional Operations Centre	1
	Analytical Laboratory	1
	Business resilience / back-up control / archive	2
	Regional stores / transport depot	1
	Regional offices	9
	Depots	10
Conservation, Access and Recreational land (CAR)	Education centres	6
	Ancient monuments and listed buildings	22
Others	Agricultural holdings, abandoned sites, residential / commercial	190

7.4.2. Capital maintenance forecasting

Residential property

Annual surveys are conducted using a scoring matrix to review and monitor the function and condition of properties and their component parts. This identifies and prioritises expenditure required over AMP8. We will continue to monitor, review and invest in residential property to ensure it meets statutory and good practice requirements to be leased to tenants.

Conservation Access and Recreation

Wessex Water has statutory duties in accordance with the Conservation Access and Recreation code of practice to manage, conserve, enhance and promote our land for conservation, access and recreation. Several sites of high natural and amenity value are owned and these include reservoirs and surrounding land which is accessed by the public, local community groups and used for leisure pursuits such as fishing and sailing.

Following a strategic accessibility audit across our main sites, substantial investment has been made since 2019 to improve key routes and environmental accessibility for customers of all abilities. Our capital maintenance programme funds maintenance and replacement of assets previously installed.

We also have 6 education centres located across our region. These are an important educational resource and platform to explain how our water cycle and system works, demonstrating the value of saving water and the challenges we face in protecting local catchments and the wider environment against the backdrop of more rapid climate change. Annual surveys are conducted using a scoring matrix to review and monitor the function and condition of the buildings their component parts. This identifies and prioritises expenditure required over AMP8. We will continue to monitor, review and invest in education centres to ensure they meet statutory and good practice requirements for use as an educational resource.

Offices

Annual investment in building and electrical works at our offices (34nr) to maintain health & safety standards and continued functionality for our staff to work effectively. Investment also ensures the sites stay secure and mitigates potential breaches.

Depots

Investment will be for annual work at depots to maintain staff welfare, functionality and security standards.

Analytical Laboratory building

A major refurbishment of the laboratory building is planned in AMP8. This includes replacement of the ventilation system, upgrades to the electrical and wiring infrastructure, implementation of fire stopping capabilities and improvement works to bring the building up to current regulatory standards. Failure to complete these works puts the health and safety of the users at increased risk, particularly from fire. Loss of the building through electrical failure or fire damage would adversely affect the company's ability to meet its regulatory monitoring commitments and remove its ability to carry out operational monitoring completely. Energy and efficiency savings in terms of reduced heating and lighting are anticipated from the refurbishment. Separately costs for expansion are included in this investment plan as enhancement.

7.4.3. Conclusions

The AMP8 Property expenditure proposals are listed in the table below. These have been compiled from cost estimates of maintenance investment and asset renewal needs to maintain the assets in a serviceable and safe condition.

Table 77: Property investment allocation

Property	AMP8 Capex (£m)
Primary portfolio (Offices, depots, laboratory)	7.1
Conservation Access and Recreation (CAR)	0.7
Others (Residential / commercial)	0.6
Total	**8.4**

The AMP8 proposals are consistent with historical levels of expenditure. It is forecast that the levels of expenditure in AMP8 will extend into AMP9 to continue the programme of asset renewal.

7.5. Other

7.5.1. Scope

Other areas of M&G expenditure in our proposals include for investment in:

- Laboratory analytical services
- Digital strategy and services

7.5.2. Laboratory analytical services

Investment in laboratory services in AMP8 will involve a programme of replacement of specialist equipment to analyse water quality and test for pollutants, with decisions on the need for replacement based on annual condition assessments. The majority of the equipment is needed to replace existing kit and instrumentation that is coming to the end of its useful working life. In most instances manufacturer guaranteed support is being withdrawn which means in the event of a breakdown it may not be possible to restore the item back to working functionality.

We have a robust programme of compliance monitoring for both potable water and wastewater which requires accredited analysis; all instruments and equipment used has to undergo rigorous testing before we can commence sample analysis. Our managed programme of equipment replacement will minimise disruption to both internal and external customers, reduce the risk of regulatory non-compliance and shortfalls, and unexpected costs of either resampling or subcontracting.

As previously mentioned in section 2.5.2 above we plan to refurbish the existing building. With the growth in regulatory requirements we have made a separate business case for enhancement funding to expand the analytical lab capacity by growing the available space.

7.5.3. Digital strategy and services

There continues to be an exponential demand for digital services and the way in which customers want to transact and communicate with us. This growth has been accelerated by the pandemic that occurred during 2020-22. Customer expectations continue to grow in their demand for seamless services which need to be transformational.

Our ongoing digital strategy is to provide and support online services that will give customers a choice in the way they wish to transact and self-serve. We will ensure that these services are easy to use, provide a consistent experience and are accessible to all users in line with recognised industry standards.

Our online services will be maintained according to the latest security standards using platforms and services that are resilient, readily available and continually monitored. These environments will be fully supported 24/7, 365.

As new and existing digital channels evolve, we will continue to adapt our processes to ensure that these complement offline channels. To achieve this, we will need to capture, document and fully test the end-to-end user journeys. This is an iterative process to ensure continual improvement.

We will deliver this strategy in a responsible, sustainable and iterative way that also responds to external factors such as C-Mex, changing customer demand and compliance with the General Data Protection Regulations (GDPR).

We want to encourage open and honest feedback from our customers about our online services and communication channels. We will capture this feedback using simple and effective online tools that are not intrusive to customers. By analysing customer behaviour, we can achieve greater insights.

Our agile approach will allow us to adapt to the emergence of new technologies.

During the AMP8 period, the focus on digital development and delivery will further improve customer engagement and experience:

Providing customers with real-time communications

As an important service to our customers, the ongoing development of real time customer communication services, such as report a problem and job tracker, will:

- enable customers to receive proactive and timely advice thereby building trust whilst maintaining our leading reputation for service
- manage or even exceed customer expectations by giving them advance notice of planned work which may interrupt their services. This enables customers to plan ahead
- ensure a frictionless end-to-end experience so customers are kept informed of progress in a proactive way thereby managing their expectations
- deliver a better customer focused service with timely communications that explain the reason for any interruption of service.

Personalising the customer experience

To provide customers with the right information at the right time, we will continue to build our personalised relationship strategy. This will include continuing the development of digital identity for single sign-on to allow customers to receive proactive and targeted communications based on their preferences. It will also enable customers to have a single and secure view of all their transaction with us – billing, operational and community related.

This will:

- enable us to improve the feedback loop so more customers can take part, have their say and influence key decision making
- help to build valuable customer insight
- strengthen trust and ensure transparency
- encourage local community engagement and citizenship.

Providing excellent content for customers

Providing customers with accessible and engaging content that is easy to understand, timely and engaging is a vital element of our digital strategy. We will aim to deliver this content in a format that can be consumed across many devices and channels at our customers convenience.

Data continues to show that customers are increasingly consuming more video content on mobile devices. As well as meeting this trend, we will also ensure content is available in other formats to meet all customer needs.

Ongoing developments in the way in which content is consumed will lead to a greater focus on more immersive content such as virtual and augmented reality.

This provides an opportunity to further strengthen our engagement with customers which will involve:

- developing more short form video content
- exploring live content to showcase the work we are doing in our region
- developing educational and informational video content, e.g., how to check your stop tap and how to find and read a meter, etc.

Building online communities

To help extend our relationships with non-contactors and stakeholders, our aim is to collaborate using initiatives that can support communities whilst promoting the work of Wessex Water. This involves:

- working with trusted partners particularly those with whom customers have relationships
- participating in wider community programmes
- supporting regional or special interest projects.

This will enable us to deliver better outcomes by:

- extending our brand and reputation through online associations with partners
- building positive sentiment and net promoter score
- incentivising behaviours by encouraging best practice
- promoting thought leadership and supporting opinion formers.

Using technology to improve the customer experience

Using new technologies, such as conversational artificial intelligence (AI), are enabling customers to experience an informative and intuitive service. The use of chatbots and our existing knowledge manager (online FAQs) can further support this online offer. Emerging voice channels will inevitably change the way we provide data and information to customers.

We will continue to provide real-time communications using established channels such as SMS and email which enable us to have the greatest reach among our customer base. As social media channels continue to evolve and grow in popularity, we will also ensure that the way we use them adheres to our digital strategy.

7.5.4. Conclusions

The table below summarises the expenditure in these other areas of M&G expenditure between 2020 and 2025. The proposed AMP8 figures have been compiled from estimates of investment needs required to maintain levels of service.

Table 78: Other areas

Other areas	AMP8 Capex (£m)
Laboratory analytical services	10.7
Digital	7.0
Total Capex	**17.7**

All of the investment set out in this asset group is essential if we are to do the right thing for customers and the environment, within the current policy and regulatory framework. We have carefully prioritised and only included what we need to do to meet legislative and regulatory expectations and deliver the outcomes our customers and communities support.