# SR27 Draft Business Plan

# Technical Appendices

June 2025

*This document forms part of Scottish Water's Draft Business Plan Submission.*

*It is subject to further development ahead of publication of the Final Business Plan in February 2026.*

Scottish Water

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# Water Quality
## Technical Appendix 001

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# 1 Executive Summary

The Water Quality investment area covers all investment required to maintain or improve service outcomes relating to the quality of drinking water supplied to customers in the SR27 period. The proposed investment will deliver our regulatory commitments in line with legislation and Scottish Water strategies and policies, including the requirements of Ministerial Objectives to:

- Make progress towards the realisation of the long-term vision of the water industry.
- Maintain or improve current levels of service over the long-term for water quality.
- Understand the condition of assets, in particular those of a critical nature for maintaining service delivery and develop an evidence-based strategy to inform the long-term asset replacement needs of the industry.
- Comply with our drinking water quality duties and prepare plans to address failures and the risk of failures to comply with drinking water quality standards.
- Prepare investment plans to remove the contact of potable water with lead pipes in our networks and work with stakeholders to take steps towards a lead-free Scotland.
- Continue to implement and evolve plans for adaption measures necessary to protect its services from climate change.

Total water quality compliance with regulatory standards has increased from 99.27% in 2002 to 99.93% in 2024, reflecting the significant improvements delivered for customers since the formation of Scottish Water. However, increasing investment is required to maintain progress against the Ministerial Objectives and deliver ongoing improvements to compliance, reducing risk and allowing us to close the gap with England (99.97%) and Wales (99.96%).

In SR21, the Public Water Supplies (Scotland) Amendment Regulations 2022 were enacted which amended the 2014 Regulations to reflect the requirements of the recast European Drinking Water Directive. This included new standards for a number of parameters including Haloacetic Acids (HAA) and Chlorate. Future changes are also expected through the reduction of the lead standard from 10ug/l to 5ug/l by 2035. In addition, the challenges posed by climate change, through the deterioration in source water quality, along with the base maintenance demands from a more complex and ageing or deteriorating asset base, have the potential to compromise our ability to not only improve but maintain service levels in SR27 without appropriate levels of investment.

To identify the optimum blend of interventions to meet the above challenges, we have undertaken a strategic assessment process to review a number of potential investment scenarios. The investment scenarios have been developed from risks to water quality identified and validated through our Water Supply Risk Management (WSRM) processes, with the highest risks prioritised for delivery to maintain and improve water quality performance. The scenarios have been tested against Ministerial Objectives, customers' and stakeholders' expectations, the Water Sector Vision and the Climate Change Adaptation Plan, whilst aligning with Scottish Water Board expectations on meeting our regulatory requirements and making progress towards our Long-Term Strategy objectives.

Our Reference Scenario (CPI +4%) is recommended as it offers the best balance in meeting the above factors through customer charges which are sustainable for both current and future generations. The £1,581m of investment proposed through the Reference Scenario will address needs which have been validated through our Water Risk Assessment Platform (WRAP) and agreed with the Drinking Water Quality Regulator (DWQR) to deliver the following:

### Meet Regulatory Requirements:

We will **deliver** improvements required under DWQR Enforcement Notices and Letters of Commitment to prevent re-occurrences of exceedances of regulatory standards for:

- **Enforcement Notices** (*Cryptosporidium*): Turriff WTW & Mannofield WTW.
- ***Anticipated Enforcement Notice (Treated Water Storage)***: Notice to be confirmed with the DWQR - enhanced monitoring programme for all Treated Water Storage Points that are out with the 10-year cleaning frequency using a risk-based approach.
- **Letter of Commitment (Haloacetic Acids)**: Londornoch WTW, Glenlatterach WTW, Penwhirn WTW.
- **Letter of Commitment (Raw Water Supplies)**: Improvements to up to 54 supplies (to be confirmed through risk assessment).

We will also **prioritise delivery** of improvements, in agreement with the DWQR, for sites at risk from HAA and other non-trivial failures:

- **Letters of Commitment (Bradan / Haloacetic Acids)**: Enhancements to improve disinfection and reduce disinfection by-products at Bradan WTW.
- **Letter of Commitment (Haloacetic Acids)** and Persistent Non-Trivial Failures: Stornoway WTW, Glendevon WTW and Camphill WTW.

We will also **develop** solutions for other sites at risk of HAA or persistent non-trivial failures and continue to review their priority for investment in line with ongoing risk assessment within available funding:

- **Letter of Commitment (Haloacetic Acids)**: Castle Moffat WTW; Inverary WTW; Killylour WTW; Camps WTW; Lochinvar WTW; Greenock WTW.
- **Letters of Commitment (Daer / Haloacetic Acids)**: Development of strategic replacement options for Daer WTW to deliver long-term solution for manganese, disinfection by-products and other needs (potential delivery SR33).
- **Persistent Non-Trivial Failures**: Rawburn WTW; Lomond Hills WTW; Boardhouse WTW; Hopes WTW; Roberton WTW.

To support the above, we will:

### Maintain or improve current levels of service over the long-term for water quality:

- **Ensuring microbiological quality of drinking water whilst minimising the taste of chlorine:** We will enhance disinfection processes at our water treatment works in line with our disinfection policy, prioritising improvements (e.g. automatic shutdown) using our Water Risk Assessment Platform to ensure they meet regulatory requirements to minimise microbiological risks. This will also include provision for the installation of ultra-violet (UV) disinfection systems to reduce risks in relation to *Cryptosporidium*. We shall also continue to inspect and maintain our Treated Water Storage assets to reduce the risk of bacteria ingress and subsequent failures at customers' taps.
- **Reducing organics and disinfection by-products (DBP):** To help deliver our regulatory commitments relating to DBPs, we will take a catchment-based approach to managing organics in our source waters and continue to develop partnerships with landowners and other stakeholders to assess and implement opportunities for nature-based or catchment solutions. Where these are not effective or suitable, we will utilise enhanced treatment technologies such as ion-exchange or ozone-granular activated carbon (GAC) to reduce organics. We will also continue to monitor the levels of organics in our source waters and optimise treatment processes to reduce the risk of DBP formation.

- **Improving aesthetics performance:** To reduce the risk of customers being supplied with discoloured water from our distribution network, we will continue to take a risk-based approach to cleaning and conditioning water supply pipes or replacing them where required. Our activities to improve catchment management and treatment processes will also reduce the risk of discolouration and taste and odour originating from our source waters and WTW. This will include the delivery of further investment at Carron Valley WTW to minimise the risk of customers being affected by repeat taste and odour events.
- **Continue to make progress to deliver a lead-free Scotland by:** removing ~3,000 lead communication pipes per year in response to sample results, when requested by customers or when identified through our mains replacement work to support the removal of all lead from Scottish Water's network by 2045. We will also continue to develop plans with stakeholders to deliver a lead-free Scotland in the future, including supporting customers to remove their lead supply pipes.
- **Maintain (or improving where possible) water quality service levels at our SR21 exit position by**: maintaining our assets in line with the prioritisation criteria set out by our management approaches and within the proposed funding scenario**.** This will ensure that the condition and performance of our existing asset base will not compromise total drinking water compliance or increase the number of DWQR declared incidents or risks above long-term tolerable thresholds.

The investment proposed for SR27 (summarised in Table 1) represents an increase from SR21 to ensure that we not only deliver appropriate levels of maintenance to sustain the performance of the existing asset base, but also target the highest risks to water quality by enhancing our assets to meet the challenges of climate change and changing regulatory requirements, in line with Ministerial Objectives and our Long-Term Strategy, to deliver continuous improvement for customers.

*Table 1: SR27 Water Quality Investment Summary by Investment Area*

| Investment Hierarchy | Investment Category | Investment Area | Proposed Investment (£m 23/24) |
|---|---|---|---|
| **Cat 1** | **AR3** | Water Distribution | 30 |
| | | Water Storage | 403 |
| | | Water Treatment | 432 |
| **Cat 2a - Regulatory** | **WQ Enforcement (Non-Compliance)** | Water Storage | 18 |
| | | Water Treatment | 504 |
| | **WQ - Lead** | Lead Management | 35 |
| **Cat 2b - Regulatory** | **WQ Expectations (Other Commitments and Non-Compliance)** | Raw Water & Catchment Management | 7 |
| | | Water Treatment | 151 |
| **Total** | | | **1,581** |

The Investment Planning Technical Appendix provides detailed information on the investment scenarios considered and the optioneering process.

SR27 investment into Water Quality makes up 19% of the total SR27 Investment of £8.3bn, as shown below.

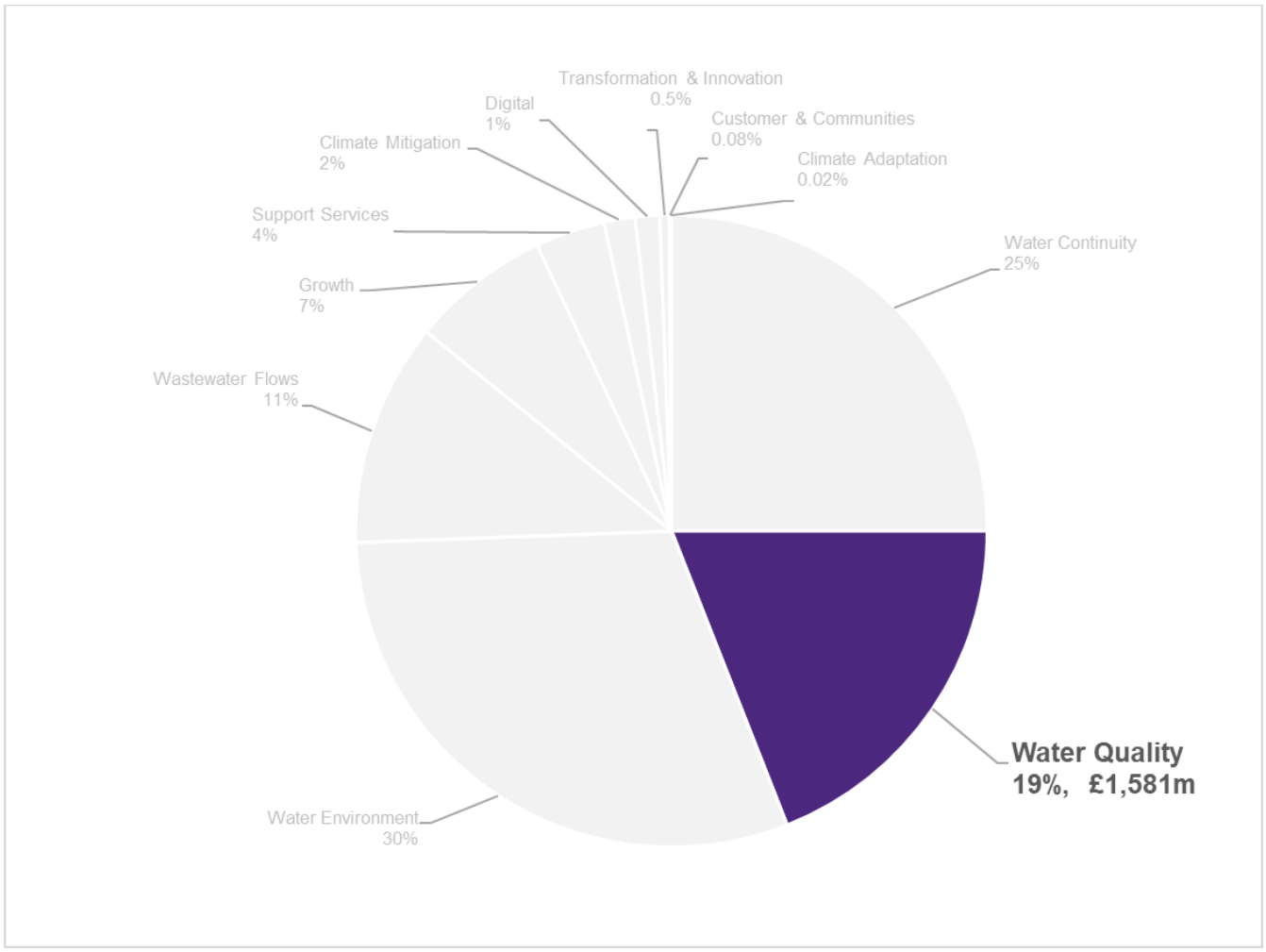


*Figure 1: Water Quality investment as a proportion of the total SR27 investment*

# 2 Background

## 2.1 Scope of Technical Appendix

The Water Quality investment area covers all investment required to maintain or improve service outcomes relating to the quality of drinking water supplied to customers. The investment requirements for Water Quality have been identified from risks associated with the ability of our assets to supply customers with safe, clear and great tasting water which meets regulatory requirements, customer expectations, Ministerial Objectives and our Long-Term Strategy to ensure that Scotland's tap water remains a source of national pride.

The investment proposed under Water Quality will target the highest risks associated with maintaining the performance and service provided by the existing asset base, whilst delivering the enhancements required to further improve performance against the challenges of climate change and changing regulatory requirements. The activities delivered by this investment will include managing the quality of our raw water sources and improving supplies fed directly from our raw water network, whilst maintaining and improving key water treatment works processes, treated water storage assets, trunk and distribution mains (in relation to discolouration), and lead management. Nature-based solutions such as peat restoration and improved farming practices will also continue to reduce risks to water quality whilst delivering Net Zero benefits, as proposed under the Flourishing Scotland investment area.

This technical appendix details the drivers behind the investments, identifies the needs that will be addressed during the next regulatory period (2027-2033), and outlines the benefits for the Scottish population. It provides an overview of the allocation strategy for the investment, the methodology used for selecting options, and a balanced delivery plan for Water Quality investments across SR27.

## 2.2 Context

The investment needs presented in this document are required to meet Scottish Water's legislative obligations, including the Ministerial Objectives, and align with Scottish Water's Long-Term Strategy and policies to address existing areas of unsatisfactory service performance and risk, including non-compliance with regulatory standards, whilst mitigating risks to service associated with the key long-term challenges posed by an extensive and complex asset base, changing regulatory requirements and environmental changes.

**Legislative Requirements**

Scottish Water has a duty to supply wholesome water under the **Water (Scotland) Act 1980**, with wholesomeness being defined by **The Public Water Supplies (Scotland) Regulations 2014** (as amended in 2017 and 2022) (referred to as the Regulations). These set out the regulatory standards and requirements governing the quality of water supplied by Scottish Water with the primary objective of protecting public health and are enforced by the Drinking Water Quality Regulator (DWQR) for Scotland.

The Regulations were updated in 2022 to transpose the requirements of **EU Directive 2020/2184 for the Quality of Water Intended for Human Consumption (Recast)**, commonly known as the Recast Drinking Water Directive (rDWD). This introduced new and revised regulatory standards for a number of parameters, including haloacetic acids, chlorate, bisphenol-A and per- and polyfluoroalkyl substances (PFAS). Although compliance with the new standard for haloacetic

acids (HAA) represents a key challenge for Scottish Water in SR27, other parameters will require ongoing monitoring to further understand the level of risk for the longer term. Although not yet reflected in the Regulations, it is expected that the regulatory standard for lead will also reduce from 10µg/l to 5µg/l by 2035 in line with the rDWD.

Recognising the challenges posed by a changing climate, policy relating to the water industry in Scotland is currently under review by the Scottish Government in collaboration with Scottish Water and other stakeholders. As this work has yet to be concluded through the parliamentary process, any associated investment requirements have not been included. However, as set out through Scottish Water's Long-Term Strategy (below), climate change could impact the ability of our assets to maintain current levels of service for water quality, including regulatory standards, particularly due to deteriorating raw water quality. Initial progress on addressing these challenges is therefore required in SR27.

### Ministerial Objectives

Our investment plans for Water Quality in SR27 are required to meet the following Ministerial Objectives:

- Make progress towards the realisation of the long-term vision of the water industry.
- Maintain or improve current levels of service over the long-term for water quality.
- Understand the condition of assets, in particular those of a critical nature for maintaining service delivery, and develop an evidence-based strategy to inform the long-term asset replacement needs of the industry.
- Comply with our drinking water quality duties, and prepare plans to address failures and the risk of failures to comply with drinking water quality standards.
- Prepare investment plans to remove the contact of potable water with lead pipes in our networks and work with stakeholders to take steps towards a lead-free Scotland.
- Continue to implement and evolve plans for adaption measures necessary to protect services from climate change.

### Long-Term Strategy

The key objectives of Scottish Water's Long-Term Strategy to 2050 to deliver the outcome of ensuring that Scotland's tap water remains a source of pride are:

- Maintain the excellent quality of tap water, by continually improving how we treat and distribute water to ensure it is always safe, clear and tastes great to drink.
- Work across our drinking water catchments to improve the resilience of the water environment, to help tackle the changes in raw water quality caused by climate change that can lead to unpleasant tastes and smells in drinking water.
- Play our part in creating a lead-free Scotland, removing all lead from the public water supply network, and working with the Scottish Government and other stakeholders to support customers to remove lead from their properties.

### Key Challenges

- **Climate and wider environmental change** - impacting particularly on raw water quality through increasing levels of organics, particulate matter, microbiological loading and nutrient loading (leading to algal growth). This will compromise our ability to meet both well-established regulatory standards and those more recently introduced through the increased potential for microbiological failures (including detections of *Cryptosporidium*),

the formation of disinfection by-products and the generation of taste and odour compounds.

- **An extensive and ageing or deteriorating asset base** - the need for asset repair, refurbishment and replacement will be ongoing for the more complex treatment processes installed over the past 25 years, as well as for older assets requiring end-of-life replacement.

During SR21 we have seen a significant increase in investment demand as we expand our understanding of the risks across the asset base and observe changes in our raw water sources. This trend is expected to continue in SR27 to further add to the current volume of needs, which will be addressed by cyclical reprioritisation through SR27 to ensure risks are mitigated. Therefore, appropriate levels of investment are required to ensure that the key needs can be addressed at a rate which maintains the overall risk position at an acceptable and sustainable level. Failure to do this will compromise our ability to maintain current levels of service and meet regulatory requirements, with lower levels of customer satisfaction and trust.

## 2.3 Past Performance

This section sets out our past performance across key performance metrics from 2002 to the present (aligning to the WICS SR27 methodology), key performance improvements that have been delivered in this period and trends emerging from historical analysis.

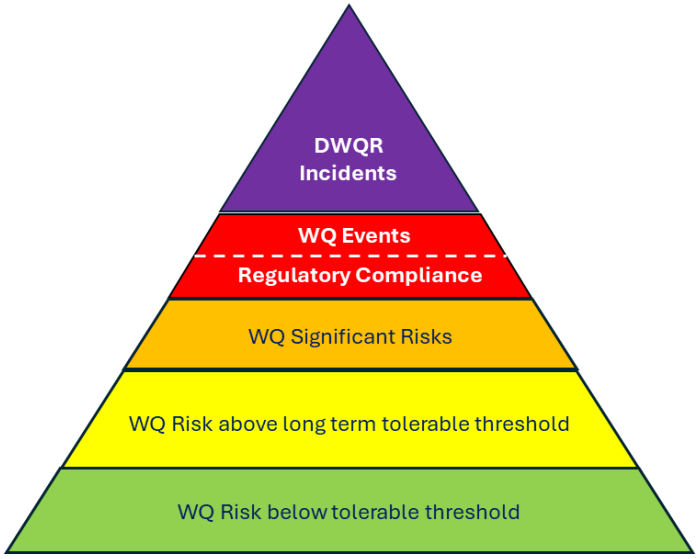


*Figure 2: Water Quality Risk Triangle*

For context when discussing performance, Figure 1 shows how water quality is regulated by the DWQR and the triangle sets out all the areas water quality is reported on:

- **Incidents** – Water Quality exceedances, disinfection failures, significant customer contacts (DWQR Criteria).
- **Events** – exceedances (from all samples), disinfection failures and elevated contacts.
- **Regulatory exceedances** – samples from the statistical regulatory programme only.
- **Significant risks** – to be reported to DWQR once identified with an interim control plan.
- **Risks** – to be reduced over the long-term in line with the investment strategy.

Related outcome measures include the Number of DWQR Incidents, Total Drinking Water Quality Compliance and the Number of WQ Risks Above Long-Term Tolerable Level.

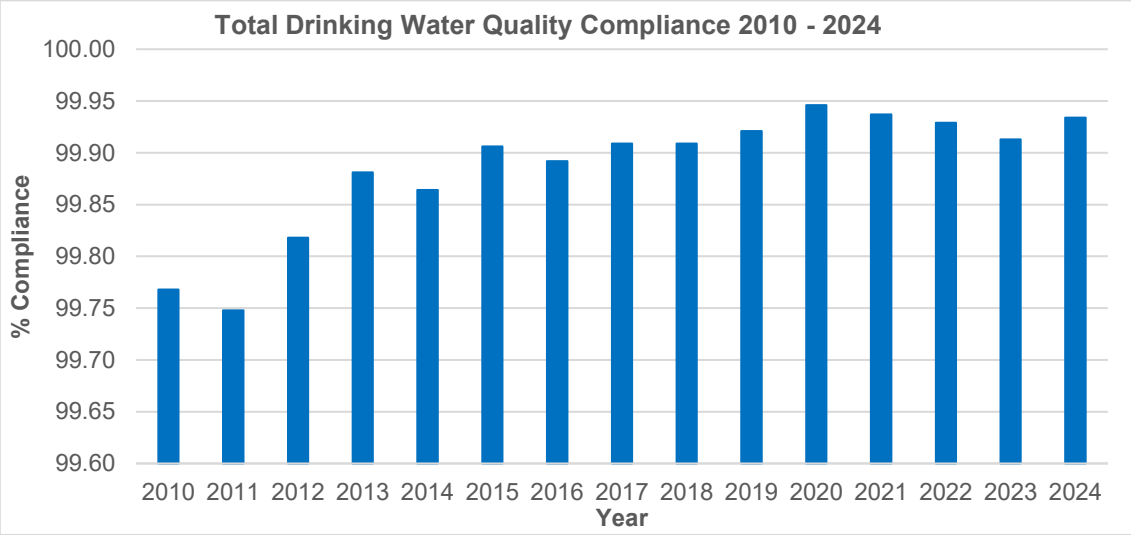


*Figure 3: Total Water Quality (WQ) compliance 2010 - 2024*

Total water quality compliance with regulatory standards has increased from 99.27% in 2002 to 99.93% in 2024 (Figure 3: Total Water Quality (WQ) compliance 2010 - 2024) reflecting the significant improvements delivered for customers since the formation of Scottish Water. However, key challenges, such as changing regulatory standards, climate change (with increasing temperatures leading to the deterioration in source water quality), ageing / deteriorating assets and associated risks have the potential to compromise our ability to maintain or improve service in line with our Long-Term Strategy outcomes, Ministerial Objectives and current regulatory requirements, without appropriate levels of investment.

Although water quality performance has improved since 2002, compliance in 2023 reduced from 99.93% to 99.91% because of an increase in sample failures, partly due to the introduction of new regulatory standards for chlorate and haloacetic acids (HAA), along with increased bacteriological failures at treated water storage assets. This has since improved back to 99.93% in 2024.

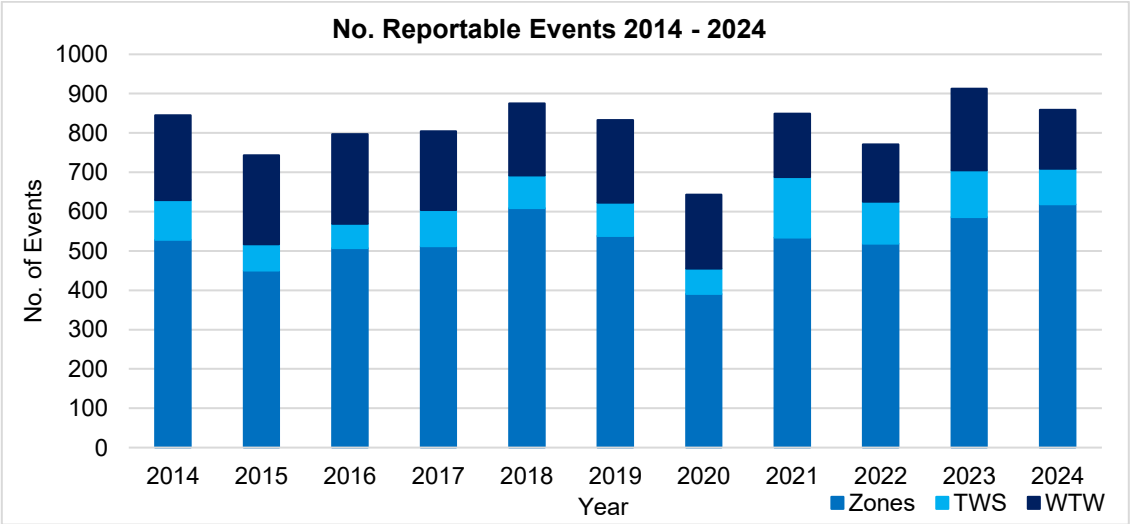


*Figure 4: Reportable WQ Events 2014 - 2024*

Since 2014 the number of reportable water quality events has remained steady at ~800 per year, and the number of these declared as incidents by the DWQR has reduced from 43 to remain at ~30 per year (Figure 4). Asset capability and maintenance accounted for nearly 60% of the declared incidents from 2020 to 2024, with people or procedural factors being the lead cause for 33%.

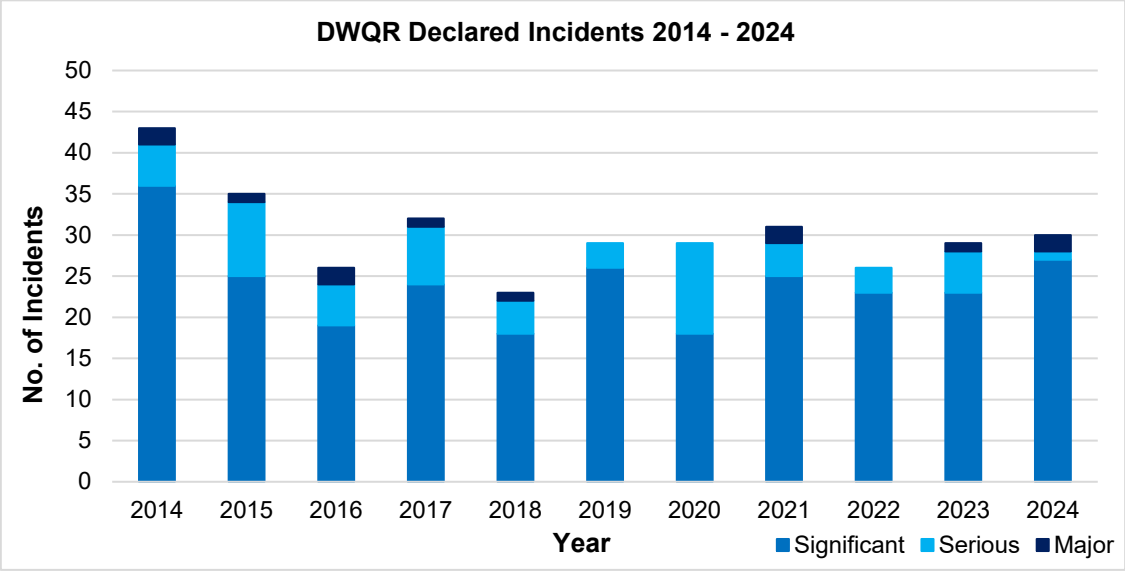


*Figure 5: DWQR Declared Incidents 2014 – 2024*

During SR21, a number of supplies have failed to meet the regulatory requirements for microbiological quality, including 7 to 8 detections of *Cryptosporidium* per year (e.g. Turriff). Several systems are also impacted by increasing levels of naturally occurring organic matter in source waters linked to increased temperatures due to climate change, resulting in elevated levels of disinfection by-products at customers' taps (e.g. Glenlatterach).

The investment in water quality described in this technical appendix will enable us to sustain our performance by addressing concerns on the quality of our raw water sources and maintaining and enhancing our treatment facilities, thereby preventing an increase in reportable water quality events and declared incidents.

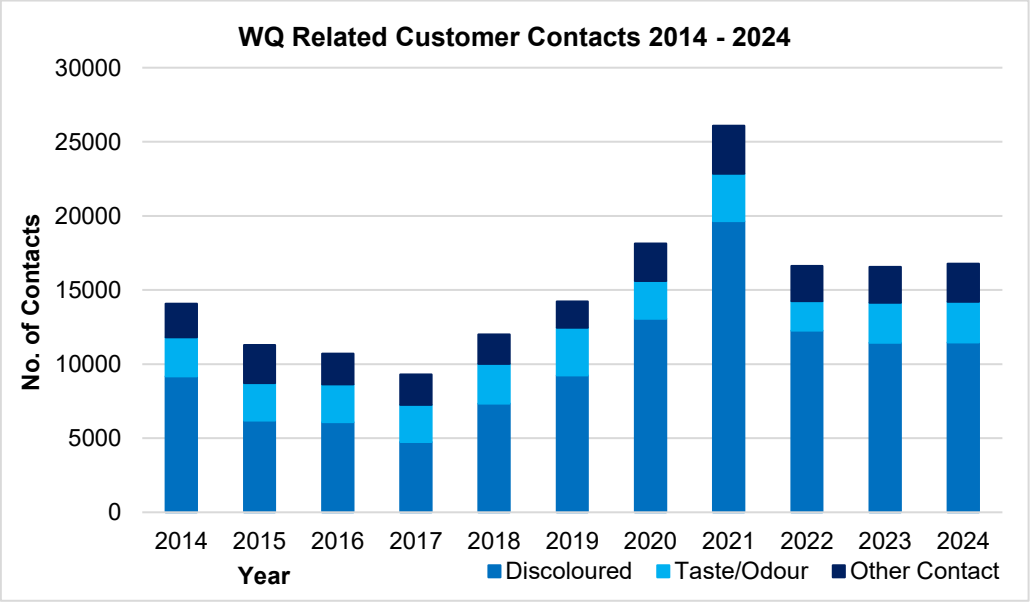


*Figure 6: Water Quality Related Customer Contacts 2014 - 2024*[1]

After a drop in customer contacts from 2014 to 2017, the number of WQ related contacts has increased to an average of 17,000 since 2022 (Figure 6), with the majority associated with discoloured water. The peak of contacts recorded in 2021 was due to discolouration as a result of high manganese levels at Daer WTW in South Lanarkshire. In addition during the SR21 period,

[1] Elevated contacts and events with significant numbers of contacts are included in the risk triangle, total contacts are used as a secondary diagnostic measure

customers have also been directly impacted by taste and odour issues (e.g. Geosmin at Carron Valley).

In 2024, over two-thirds of customer contacts relating to water quality were associated with discolouration with a further 16% associated with taste and odour. Customers have also been impacted by discoloured water resulting from sediment deposition and biofilm development in the distribution system, which can be disturbed following events in the network such as bursts. Our investment in water quality aims to reduce discolouration in the network and taste and odour incidents, enhancing customer experience and improving our performance in these areas.

## 2.4 SR21 Delivery: Investment in Water Quality in SR21

This section accounts for our delivery of SR21 water quality investments and how Scottish Water has met the SR21 Ministerial Objectives by undertaking a number of key interventions.

This includes operational steps in SR21 which have mitigated chlorate formation in water supplies, following the introduction of a new regulatory standard of 250µg/l in 2023. Chlorate forms through the breakdown of sodium hypochlorite, used as the primary disinfectant at most water treatment works and supplementary dosing sites. Higher strengths of sodium hypochlorite, long storage times and higher storage temperatures increase chlorate formation risk. Focus has been on lower-cost operational and procurement changes to reduce these factors and minimise failures by 2027. However, some sites may require additional investment for cooling facilities where operational measures do not sufficiently reduce the risk.

Investment in SR21 has seen the completion of a new Bonnycraig WTW to minimise the risk from *Cryptosporidium* for 9,000 customers in the Peebles area. The innovative new works, based on ceramic membrane filtration technology, was initially constructed off site as modules, saving on costs and time and reducing the impact on the operation of the original treatment process.

As part of our transformation programmes this new approach has learning and benefits which are now being used for other sites adopting ceramic membranes with construction commencing in SR21. These include Eela Water WTW, where a new treatment works will address microbiology and asset condition needs to improve supplies to 5,000 customers in the north of mainland Shetland. At Black Esk WTW, serving 40,000 customers in the Dumfries, Lockerbie and Annan areas, a new water treatment works will improve supplies by addressing needs relating to microbiology, disinfection by-products and discolouration.

Improvements will also be delivered for 6,000 customers in the Keith area where a new Herricks WTW, based on dissolved air flotation and rapid gravity filters, will reduce the risk from *Cryptosporidium*. At Carron Valley WTW, process enhancements are being made to address microbiology, taste and odour and other needs to improve supplies for 220,000 customers in the Stirling and Falkirk areas. Additionally, 180,000 customers in Fife will benefit from disinfection and resilience improvements being delivered at Glenfarg WTW.

To address water quality needs, support development and improve resilience on Islay, a new water treatment works based on nano-filtration membrane technology will be constructed at Torra. A transportable treatment unit (TTU) currently being used at Torra may then be used to address a supply risk at Crathie WTW, which supplies ~35 customers in Royal Deeside.

Project investment appraisal and design work continues in preparation for investment to be delivered in SR27, which includes a new water treatment works at Turriff and a new process stream at Mannofield WTW, both based on ceramic membrane technology, to meet DWQR Enforcement Notice requirements to minimise the risks from *Cryptosporidium*. Other SR27 investment which requires development during the remainder of SR21 includes that to meet the requirements of Letters of Commitment to the DWQR relating to haloacetic acids, raw water supplies, Londornoch, Penwhirn, Glenlatterach, Stornoway, Castle Moffat and Glendevon.

In addition to base maintenance activities at water treatment works, key AR3 activities in SR21 include the strategic replacement of Craighead WTW, similar to the plant being delivered at Herricks, to improve the reliability of supplies to 5,000 customers in the Huntly area. Remedial works are also being undertaken at ~200 treated water storage assets to reduce the risk of water and bacteria ingress from external sources.

During SR21 we have continued to make progress to Scottish Water's network being lead free by 2045 through the expected replacement of ~17,000 lead communication pipes by 2027 (aligning to the Ministerial Objective). We have also undertaken pilot studies to understand the practicalities, costs and customer impact of undertaking customer-side lead pipe replacement to the first point of use in a property. This work will inform updates to Scottish Water's Lead Strategy with respect to the risks associated with phosphate disengagement, ongoing maintenance requirements for phosphate dosing in the meantime, and the potential replacement of customer-side lead pipes by Scottish Water where economic to do so.

Learning has also been taken from operational events and incidents, such as the discolouration event in 2021 which affected customers supplied from Daer WTW in South Lanarkshire because of low reservoir levels leading to high manganese concentrations. This has led to improved awareness of this type of risk and the risk control measures required at Daer and other sites to reduce the potential for a similar event occurring in the future.

SR21 has also seen a significant increase in our inspection capacity and capability to support our ongoing asset maintenance activities. Our inspection programme to date across non-infrastructure and infrastructure assets has delivered ~4,000 site visits and ~20,000 inspections at a rate of ~800 inspections/month. The programme involves more than 25 Contractors and 200 staff and will see us invest ~£120m in inspection related activities over the SR21 period. This investment has led to an increased understanding of asset condition to inform decision making in relation to managing Water Quality risk in line with our Management Approaches.

## 2.5 SR27: Drivers of Investment

There are a number of key challenges to maintaining or improving service relating to water quality including:

- **Changes to legislation** – new and revised drinking water standards through the implementation of the Public Water Supplies (Scotland) Amendment Regulations 2022 to reflect the requirements of the recast European Drinking Water Directive including haloacetic acids. Future expected changes include the reduction of the lead standard from 10ug/l to 5ug/l by 2035.
- **Climate and wider environmental change** - impacting particularly on raw water quality through increasing levels of organics, particulate matter, microbiological loading and nutrient loading (leading to algal growth). This will compromise our ability to meet both well-established regulatory standards and those more recently introduced through the increased potential for microbiological failures (including detections of *Cryptosporidium*),

the formation of disinfection by-products and the generation of taste and odour compounds.

- **An extensive and ageing or deteriorating asset base** - the need for asset repair, refurbishment and replacement will be ongoing for the more complex treatment processes installed over the past 25 years, as well as for older assets requiring end-of-life replacement.

The **Long-Term Strategy** recognises these challenges and risks and sets out the expected level of investment demand required to mitigate them to deliver the outcome of ensuring that Scotland's water supply remains a source of pride.

The DWQR also support and recognise these drivers for investment in their Annual Report 2023:

- DWQR recognises that despite good progress being made on improving water quality it cannot be taken for granted and have identified "*deteriorating condition and age of many*" water quality assets as a concern, with "*good performance [in some cases] is only achieved by the ongoing effort and diligence of Scottish Water's operational staff*".
- DWQR also outline its concerns regarding the effects of climate change combined with "*the current scale and pace of investment in the maintenance and replacement of water assets which may not be sufficient to safeguard the consistently high quality of our drinking water for future generations".*

Based on the above context and challenges, and to meet Ministerial Objectives, the main drivers for investment in SR27 are:

**Meeting Stakeholder Expectations and Regulatory Requirements** – ensuring compliance with regulatory standards and reducing areas of significant risk to public health, including delivering or developing improvements required under DWQR Enforcement Notices and Letters of Commitment to prevent re-occurrences of exceedances against regulatory standards:

- **Enforcement Notices (*Cryptosporidium*):** Turriff WTW & Mannofield WTW.
- ***Anticipated Enforcement Notice (Treated Water Storage)*:** to be confirmed by the DWQR.
- **Letter of Commitment (Haloacetic Acids):** (Failing) Londornoch WTW, Glenlatterach WTW, Penwhirn WTW; (High Risk) Inverary WTW, Killylour WTW, Camps WTW, Lochinvar WTW, Greenock WTW.
- **Letter of Commitment (Haloacetic Acids) and Persistent Non-Trivial Failures:** Stornoway WTW, Glendevon WTW, Camphill WTW and Castle Moffat WTW
- **Letter of Commitment (Raw Water Supplies):** Improvements to up to 54 supplies (to be confirmed through risk assessment).
- **Letters of Commitment (Bradan / Haloacetic Acids):** Enhancements to improve disinfection and reduce disinfection by-products at Bradan WTW.
- **Letters of Commitment (Daer / Haloacetic Acids):** Development of strategic replacement options for Daer WTW to deliver long-term solution for manganese, disinfection by-products and other needs (potential delivery SR33).
- **Persistent Non-Trivial Failures:** Rawburn WTW; Lomond Hills WTW; Boardhouse WTW; Hopes WTW; Roberton WTW.

**Maintaining Service and Reducing Risk** – in addition to areas of enforcement / commitment, address areas of unsatisfactory performance either directly impacting customers or at high risk of

doing so e.g. repeat discolouration events and persistent non-trivial failures at water treatment works. This includes mitigating significant risks to meeting current regulatory standards or Scottish Water policy requirements (e.g. disinfection, auto-shutdown, organics, lead) and asset maintenance requirements to maintain current service:

- **Ensuring microbiological quality** (including *Cryptosporidium*) of drinking water across our source-to-tap systems, whilst minimising the taste of chlorine, including the disinfection and auto-shutdown capability of our treatment works.
- **Reducing organics** and disinfection by-products (DBP) to meet regulatory standards and to improve overall water quality.
- **Improving aesthetics** performance to reduce the risk of customers being supplied with discoloured water from our treatment works or distribution network, whilst reducing the risk of customers being affected by taste and odour issues.
- Continuing to make progress in removing all lead pipes from Scottish Water's network by 2045 whilst working with stakeholders to deliver a **lead-free Scotland** in the future.
- **Maintain** (or improving where possible) water quality service levels at our SR21 exit position by maintaining our assets in line with our management approaches.

**Understanding and Managing Risk** – continuous development and improvement to our Water Supply Risk Management processes and undertake activities in line with our functional risk register and approved Board risk positions to:

- Reduce the number of risks above long-term tolerable thresholds
- Reduce the number of DWQR declared incidents.

# 3 Customers and Stakeholders

## 3.1 Our Customers and Stakeholders

Delivering consistently excellent water quality is our highest priority, with our customers viewing the quality of the public water supply in Scotland as a source of national pride. Supplying clear, great tasting water to customers which is free from pathogens and chemical contaminants is of primary importance for maintaining public health and confidence. Without appropriate investment, a lack of key treatment capability could directly impact the health of our customers and compromise Scottish Water's ability to support a flourishing Scotland.

### *3.1.1 Customers*

From 2017 to 2020, customer contacts relating to water quality increased from ~9,000 to ~18,000 before stabilising at ~17,000 from 2022 to 2025. The net increase seen during this time was primarily due to incidents originating from raw water sources, lack of treatment capability and disturbances in the distribution system following events like pipe bursts, leading to customers being particularly affected by issues such as discolouration and poor taste and odour. The perception of our customers of the quality of the water they receive through their taps is initially influenced by its aesthetic quality.

Although less apparent, other water quality incidents can impact customers, for example when supplies fail to meet the regulatory requirements for microbiological quality, which may lead to boil water notices, or when increasing levels of naturally occurring organic matter in source waters results in elevated levels of disinfection by-products at customers' taps.

Such events affect the confidence of customers and stakeholders, potentially compromising their trust in Scottish Water and the public water supply, and reflect the challenges our assets are now facing due to changing environmental conditions. This highlights the ongoing need to both maintain and, in many cases, improve the capability of our assets to deliver reliable high levels of service expected by customers. Progress is being made during SR21 to deliver water quality improvements across several systems, with further investment required during SR27 and beyond.

The process for customer engagement, along with the methodology for evaluating customer support for the proposed investment, is detailed in the Customer Research Technical Appendix.

### *3.1.2 Stakeholders*

Scottish Water operates within a framework of diligent oversight and collaboration, engaging with multiple stakeholders who ensure that the public water supply meets the highest standards. These stakeholders include the Scottish Government (SG), the Water Industry Commission for Scotland (WICS), the Drinking Water Quality Regulator for Scotland (DWQR) and the Scottish Environment Protection Agency (SEPA), with the wider stakeholder group also including Consumer Scotland (CS) and the Independent Customer Group (ICG):

- The **Scottish Government** sets national policies and objectives for water supply standards and its role is pivotal in shaping the regulatory backdrop and ensuring that public health and environmental sustainability are at the forefront of water management practices.
- The **DWQR** acts as quality regulator on behalf of customers to ensure that the water supply in Scotland meets regulatory standards and is considered safe to drink. Activities include regular auditing of our assets, reviewing our performance against regulatory standards,

investigating water quality events and incidents, enforcing or seeking commitment to address areas of non-compliance and identifying investment requirements.

- **WICS** is responsible for economic regulation, ensuring Scottish Water operates efficiently. The economic regulator scrutinises financial and operational plans to guarantee that investments deliver value for money while maintaining and improving service quality.
- **SEPA** focuses on environmental protection, ensuring compliance with environmental regulations and sustainability goals. This oversight ensures that water treatment processes minimise environmental impact, safeguarding ecosystems and biodiversity.
- **Consumer Scotland** represents the interests of water customers, ensuring that their needs and concerns are prioritised. Consumer Scotland works in partnership with businesses, consumer bodies, the public and third sectors to promote the interests of consumers, understand consumer vulnerabilities and promote good business practice.
- The **ICG** works closely with Scottish Water to provide independent insights and perspectives on customers priorities, ensuring customers interests are central to decision making.

The interaction between these stakeholders and Scottish Water is collaborative and crucial to building the investment requirements for SR27. For instance, DWQR has enforced actions to address the presence of *Cryptosporidium* in supplies from Turriff WTW and Mannofield WTW, ensuring immediate and long-term improvements in water quality. Scottish Water has also issued or updated Letters of Commitment in relation to Glenfarg WTW, Black Esk WTW, Carron Valley WTW and Daer WTW, where investment will be delivered or commence in SR21. In addition, Letters of Commitment relating to Bradan WTW and Haloacetic Acids will require investment in SR27.

### *3.1.3 Engagement*

Customer insights are a key part of our investment considerations and as per our Customer and Stakeholder Engagement Technical Appendix, we have engaged with our customers and stakeholders across a breadth of topics both specifically on our SR27 plans and as part of our ongoing engagement programme. The summary of feedback received on Drinking Water Quality can be seen in Table 2.

*Table 2: Customer Insights on Drinking Water Quality (Customer Insights Technical Appendix)*

| Research Question | Key Insight |
|---|---|
| What are customers **perceptions of drinking water quality** in Scotland? | Customers consistently express high satisfaction with the quality of drinking water in Scotland, often making connections to national pride and Scotland's identity. Many customers believe the water in Scotland is "the best in the world" and leads in taste and quality.<br><br>For many customers, the quality of the drinking water that Scottish Water provides is the most tangible and visible aspect of service, and perceive this as the core of what they are paying for. |
| What is the **perceived impact** of drinking water quality issues on customers? | The impact of water quality issues varies depending on the individual circumstances of the customer, and the nature of the water quality issue. Customers are concerned by potential health impacts in the event of quality issues. Households with children are concerned about children drinking water when out of sight, and businesses are concerned about their ability to operate, as well as risks to health and safety for staff and customers. Customers expect Scottish Water to communicate quickly around the safety of water in the event of issues. |

| Research Question | Key Insight |
|---|---|
| What are customer **expectations** of Scottish Water regarding **drinking water quality?** | Customers do not have a strong understanding of the work required to maintain drinking water quality and might not understand why investment in this area is required. Customers who perceive drinking water quality to already be very high, might be less likely to prioritise investment in this area. However, once informed of issues such as Scottish Water's three Long-Term challenges, they generally support investment to maintain the quality of water in the future, with some supporting Scottish Water's ambitions to further increase reliability and quality.<br><br>Some customers are aware of role of other industries and organisations in the safeguarding of drinking water quality e.g. agriculture and expect Scottish Water to work together with these sectors. |
| What are customer **expectations** for dealing with **lead in the network**? | Customers generally have little knowledge of the potential presence of lead in drinking water. When discussed, most customers are concerned by the health risks of lead pipes.<br><br>A significant proportion of customers are unsure whether they have lead pipework in their own properties. Many customers are unsure about their responsibility regarding internal and external pipework at their properties, which hampers proactive action currently, as does the cost and upheaval of replacement. Knowledge of Scottish Water's pipe replacement policy, free water testing and information on the health risks is likely to motivate many customers.<br><br>Most customers believe that there are no/very few lead pipes still present in Scottish Water's network, assuming that they have already been eradicated. Customers can be shocked and concerned to learn that lead is still present in the network. Overall, customers expect that SW will replace any lead still found to be present in the water mains and in the communication pipe. |

Also of relevance to the Water Quality investment area are the customer insights relating to Asset Repair, Refurbishment and Replacement (as summarised below in Table 3) which is seen as important by both household and non-household customers. Whilst customers understand the requirement for asset maintenance and the challenges posed by ageing infrastructure, there is less awareness of the scale of infrastructure in the network.

*Table 3: Summary of Customer Insights on Asset Repair, Refurbishment and Replacement*

| Research Question | Key Insight |
|---|---|
| What is customer **understanding & acceptance** of aging assets as a challenge? | Customers are generally surprised to hear about the scale of Scottish Water's infrastructure, and to learn its age. Customers understand and acknowledge that ageing assets are a challenge for Scottish Water. They recognise the need for investment in updating and replacing these older assets. |
| What are customer **expectations** of Scottish Water in maintaining assets? | Asset maintenance is a concept that people intuitively understand. It is felt to be highly important, and core to Scottish Water's purpose as an organisation, as it is an area that is clearly Scottish Water's sole responsibility. Customers recognise the need for investment and want to see lasting solutions put in place. Making things last is seen as an important area for Scottish Water's focus, appealing to all customers and older customers in particular. They are keen to reduce the risk of service failures, as well as avoid unnecessary costs.<br><br>Customers expect this to be an ongoing area of investment with a focus on preventing future problems, and generally also expect Scottish Water to maintain or replace infrastructure before it fails to avoid issues with our services. Customers may perceive fixing assets on failure to ultimately cost more money over time. Some customers seek assurance that money is being spent on parts of the system at risk of failing, to demonstrate that investment is not being made unnecessarily. |
| What are customer **expectations** around climate adaptation of assets? | Once hearing about the scale of challenges from climate change, customers believe it is important to protect infrastructure against the impacts of climate change and there is an expectation for long-term solutions to be used. |

### *3.1.4 Demonstrating Customer and Stakeholder Support*

Our customers are generally highly satisfied with drinking water quality levels in Scotland and perceive water in Scotland as a source of pride, with water quality being the most valuable aspect of the services provided by Scottish Water. However, customers are concerned about their health in the event of a water quality issue, but most do not understand what is required to maintain a good standard of drinking water quality. Customers that perceive the quality to be high do not believe investment is required in this area. In SR27, we will comply with our drinking water quality duties and prepare plans to address failures and the risk of failures to comply with drinking water quality standards. We are committed to making adequate investments to maintain these high standards, driven by the demands of our customers who prioritise the purity and safety of their drinking water.

Our customers understand the concept of asset maintenance but generally do not understand the level of asset maintenance required and the current ages of our assets. In SR27, by prioritising investment in asset maintenance (£893m) and improvements in infrastructure and treatment facilities (£741m) we can reassure customers and stakeholders that their water continues to meet high regulatory standards.

Although customers are concerned about the health risks associated with lead contamination many do not believe or are aware that there are many lead pipes left in the supply network. In SR27, we plan to invest £36m to reduce lead in our network, driven by concerns among customers and stakeholders about possible health issues arising from drinking water that comes into contact with lead pipes (this also aligns with the Ministerial Objectives). Addressing these concerns through the replacement of lead pipes, along with providing clear information about health risks and offering free water testing, will reassure customers and encourage support of such initiatives. Investment in this area not only protects public health but also reinforces our commitment to maintaining the highest standards of water quality.

# 4 Our Investments

## 4.1 Approach

To meet the objectives of the Long-Term Strategy, investment to improve the capability of our assets is required as a minimum to maintain current service levels at acceptable levels of risk to counter the impacts of climate change. This investment is covered through asset maintenance, which includes Asset Repair, Refurbishment and Replacement (AR3). To achieve further service improvements and make progress towards our Long-Term Strategy and the Water Sector Vision, additional investment will be required (Enhancement). In SR27, initial progress on the long-term objectives will focus on addressing areas of non-compliance with regulatory standards and issues directly impacting customers, whilst reducing the highest risks to service or compliance.

The investment needs outlined in Section 2 reflect the increasing demands on the asset base through a changing environment and regulatory requirements, highlighting the areas where improvements to asset capability are required to meet these new challenges to safeguard public health and improve customer service for the long term. The priority investments will deliver regulatory commitments and address other service issues primarily relating to microbiology (including *Cryptosporidium*), disinfection by-products and discolouration. Our SR27 Plan also includes enhancements to reduce the risks of non-compliance against these and other parameters relating to taste and odour, as well as making continued progress to reduce the risk of exposure to lead.

Needs which are subject to regulatory enforcement and regulatory commitment relating to non-compliance will be prioritised, followed by regulatory commitments relating to high risk of non-compliance, and other areas of non-compliance and high risk not yet subject to regulatory commitment or enforcement.

### *4.1.1 Long-term outcomes and Performance Requirements*

The Water Quality investment area aligns with Scottish Water's Long-Term Strategy to 2050 and the delivery of the outcomes to ensure that Scotland's tap water remains a source of pride. The long-term outcomes aimed at ensuring excellent water quality are:

- Maintain the excellent quality of tap water through continuous improvement of treatment and distribution processes to guarantee that water is safe, clear and tastes great to drink.
- Enhancing the resilience of the water environment through a catchment management approach, to address changes in raw water quality caused by climate change, thereby preventing unpleasant tastes and smells in drinking water.
- Play our part in creating a lead-free Scotland by removing all lead from the public water supply network and working with the Scottish Government and other stakeholders to support customers to remove lead from their properties.

The delivery of the Long-Term Strategy objectives relating to water quality will be based on the following principles:

- Ensuring current levels of service are sustained through ongoing asset maintenance, with necessary improvements to asset capability to mitigate the impacts of climate change.
- Delivering required improvements to levels of service to meet changing regulatory requirements, Scottish Water policy positions or economic considerations.
- Understanding source-to-tap risks through Scottish Water's water supply risk management processes and identify controls to manage these risks, leveraging opportunities to address multiple hazards simultaneously to deliver the sub-outcome strategies outlined in *Table 4*.

*Table 4: How We Will Measure Delivery Against Our Outcomes*

| Outcome | AR3 / Enhancement | Description | Performance measure / Target |
|---|---|---|---|
| **Asset Maintenance** | AR3 | Our management approaches cover various asset groupings and have been economically appraised to determine the most effective approach to maintain our assets, including an assessment of costs, benefits, risks, and carbon. Significant areas of investment to maintain water quality relate to Water Treatment Works (WTW) instrumentation, chemical storage and dosing, operational technology, treated water storage, and network discolouration management. | - Total DWQ compliance (taps, SR and TW) % compliance<br>- Number of DWQR declared incidents (Nr)<br>- WQ Hazards above long term tolerable level |
| **Minimising Disinfection byproducts (Organics)** | Enhancement | Minimising the formation of disinfection byproducts and protect public health, by managing our catchments to improve source water quality, limiting the levels of naturally occurring organic matter in raw water sources, and increase the capability of our treatment processes to remove natural organic material. | - Trihalomethanes (THM)<br>- Haloacetic acids (HAA) |
| **Reduce Microbiology Risk** | Enhancement | Reducing microbiological risk to our water supplies by improving the capability of our water treatment processes, including effective clarification, filtration and disinfection, securing our distribution systems, protecting public health, and preserving the reputation of Scotland's drinking water. Minimise the potential development of biofilms in distribution systems by managing organics levels. | - *Cryptosporidium*<br>- Number of DWQR declared incidents (Nr) |
| **Reduce Discolouration** | Enhancement | Enhancing treatment processes to remove iron, manganese, and organic material ensuring regulatory compliance and reducing the deposition of material in our network. Improving networks management practices to reduce the likelihood of customers experiencing discoloured tap water. | - Discolouration to customer contacts target (nr/1,000 pop) |

| Outcome | AR3 / Enhancement | Description | Performance measure / Target |
|---|---|---|---|
| | | Effectively manage organics levels to reduce the potential for discolouration events as a result of biofilm development in distribution systems. | |
| **Taste and Odour** | Enhancement | Preventing the formation of compounds causing poor taste and odour in our source waters, including those relating to algae. Ensuring our water treatment processes reduce the presence of organic matter and chlorine disinfection responsible for the generation of taste and odour compounds to undetectable levels, while minimising the levels of chlorine in water, always ensuring water is safe to drink. | - Taste & Odour Customer contacts (nr/1,000 pop) target.<br>- WQ Hazards above long term tolerable level |
| **Chemicals and Compounds** | Enhancement | Improving treatment works capabilities to comply with regulated chemical contaminants and developing understanding of emerging chemicals and compounds to identify suitable technologies to control them. | - Total DWQ compliance (taps, SR and TW) % compliance |
| **Lead** | Enhancement | Removing all lead pipes from the public water supply network by 2045 and supporting customers to remove their lead pipes through enhanced stakeholders collaboration, whilst enabling the withdrawal of plumbosolvency control. | - Lead pipes in public network (Nr)<br>- Indicator of lead in customer supply pipes (to be defined - working assumption % of samples with lead levels > 3 ug/l - %) |
| **Improve Raw Water Supplies** | Enhancement | Improve supplies to properties or communities which currently do not meet the water quality standards under the Regulations, meeting commitments to the DWQR. | - Total DWQ compliance (taps, SR and TW) % compliance.<br>- Number of DWQR declared incidents (Nr) |
| **Reduce levels of risk** | Enhancement | Develop strategies to reduce the risk of contamination to supply due to the absence of auto-shutdown and run-to-water capability at WTWs, and contingency plan for | - Total DWQ compliance (taps, SR and TW) % compliance. |

| Outcome | AR3 / Enhancement | Description | Performance measure / Target |
|---|---|---|---|
| | | areas which currently represent increased levels of risk not reflected above, as assessed through the Water Risk Assessment Platform (WRAP) | - Number of DWQR declared incidents (Nr) |

This strategy supports the delivery of Ministerial Objectives relating to Service Standards, Asset Maintenance, Drinking Water and Climate Change Adaptation and Mitigation. Key considerations in identifying the SR27 investment needs relating to each of the sub-outcome areas above are set out later in this document. Progress towards the long-term outcomes in SR27 will focus primarily on maintaining current levels of service and addressing areas of non-compliance against regulatory standards subject to regulatory commitment, whilst reducing unacceptable levels of risk to supplies.

### *4.1.2 Building our Approach for AR3*

In SR21, Scottish Water introduced Management Approaches for key asset groups and service areas which set out the policy of how and when we will intervene to manage assets. Our approach is directed by our long-term outcomes, Ministerial Objectives, current legislative requirements, and Board risk appetite statements which set the performance levels for critical and non-critical assets.

Management Approaches for each asset type have been maturing since 2023 to become economic appraisals. Impacts of climate change have also been considered, considering a range of climate hazards as identified through the Scottish Water Climate Change Risk Assessment.

Our management approaches include two primary considerations:

- **When to intervene** – this considers the point in an asset's life when an intervention should occur. This includes whether to intervene after failure (responsively) or on a planned basis before failure and, if planned, at what stage to intervene to maximise the useful life of the asset while minimising the chance of failure. A definition of each intervention approach is provided in
- Table *5*
- **How to intervene** – this considers what intervention is used to restore asset condition / performance. This includes options for investigations and repairs, decisions on whether to refurbish or replace. Decisions on whether to enhance or improve the resilience of an asset when it is being refurbished or replaced are considered as part of a sub-outcome approach and made on a case-by-case basis as part of systems planning.
- Table 5: Scottish Water Definitions for Intervention **Approaches**
- provides a description of all intervention types.

*Table 5: Scottish Water Definitions for Intervention Approaches*

| Intervention Approach | Definition |
|---|---|
| **Responsive** | The intervention is responsive when an asset has failed and is impacting service provision and/or we identify that an immediate, no-choice intervention is required. |
| **Planned** | The intervention is planned when an asset has a historic service failure, or we identify that an intervention is required, at our choice, to reduce the risk of asset failure. |

*Table 6: Scottish Water Definitions for Intervention Types*

| Intervention Type | Description |
|---|---|
| **Investigation** | Activities focused on gathering asset information which is required in the decision-making process prior to one of the other asset intervention types. This includes inspection programmes to identify the condition of our assets. |
| **Operational and Maintenance Activities** | Responsive or planned processes and practices that support an asset to continue to operate and achieve its expected operational life that do not modify the asset itself. |
| **Repair** | Fixing an asset to ensure it can continue to operate and achieve its expected operational asset life (this includes replacement of component parts) |
| **Refurbish** | Renovation / overhaul of older or damaged equipment or replacement of parts of the asset to bring the asset back to a workable condition to extend the expected life of the asset |
| **Replace** | Replacement of an asset (equipment, unit, or process) when it is at the end of its serviceable life, or the asset has failed and cannot be repaired or refurbished (or it is not economic to do so), or when a change in performance or capacity is required. |

Key Management Approaches informing the asset maintenance requirements for Water Quality include Water Treatment Works (chemical storage and dosing, filtration, sludge, process civils, mechanical and electrical, water instrumentation), Operational Technology, Treated Water Storage and Distribution Infrastructure Discolouration.

The investment needs for asset maintenance have been developed primarily from a combination of analytical models (used to predict the overall level of investment required for a particular asset type) together with Management Approaches (used to identify the site / asset specific needs in line with policy criteria). In addition, some investment requirements are associated with routine inspection and maintenance programmes, with others developed from historical run-rates of ongoing activities.

Analytical models which consider previous maintenance requirements to predict future requirements are utilised to inform investment requirements and plans at an asset type level. The process for the analytical models is described in a separate technical appendix (Investment Planning Technical Approach).

Both original Management Approaches and those developed to economic appraisals have been used inform the criteria on which specific assets shall be identified for intervention, with appropriate adjustments to further improve performance or ensure affordability. The criticality of assets and impact to service is also considered in the policy option selection.

Several assets have resilience included to allow for maintenance and equipment breakdowns e.g. duty and standby chemical dosing equipment, multiple filtration units to allow for one unit to be offline or storage to allow for system outages. These assets may have responsive management approaches where the assets are fixed on failure. Some key assets also have critical spares to minimise the risk of impact to service.

We also have planned intervention programmes to replace membranes, sand media and granular activated carbon to maintain required performance of filtration units and sustain water quality. Understanding the condition of assets is important and monitoring water quality performance can indicate potential issues for further investigation or programme acceleration. Our filter processes performance monitoring can lead to earlier asset intervention such as membrane, sand media or granular activated carbon replacement to maintain water quality. We proactively inspect several civil assets e.g. clarifier units, treated water storage tanks to monitor condition and ensure maintenance arranged to maintain service.

### *4.1.3 Building our Approach for Enhancement*

The requirements for Water Quality enhancement investment during SR27 originate from a range of confirmed needs relating to non-compliance, or represent a high risk to compliance, with regulatory standards, several of which have been escalated through regulatory enforcement or commitment to be addressed within an agreed timeframe. In addition, some investment requirements are associated with Scottish Water policy positions to reduce risk or improve service where the current status is considered unacceptable from a customer service perspective or where progress is required to achieve Long Term Strategy objectives.

All investment requirements are aligned with the needs on the Development List, (established through the Investment Planning and Prioritisation Framework (IPPF) approach introduced for SR21) as agreed by stakeholders. The more defined needs set out in this Technical Approach have been validated against the Water Risk Assessment Platform (WRAP) and agreed with the DWQR, with supporting evidence provided through a range of sources including needs statements and regulatory commitments.

A range of information sources have been used to identify the needs initially and provide the supporting evidence for these and the subsequent investment requirements to address them. The typical information sources are summarised by project development stage as outlined in *Table 7* below:

*Table 7: Stage / Gate Information Sources*

| Stage | Information Sources |
|---|---|
| **Pre-Gate 30** | To include one or more of the following:<br>• Asset / system risk and performance data;<br>• SR21 Development List;<br>• SW / DWQR Needs Statements;<br>• Letters of Commitment to the DWQR;<br>• DWQR Enforcement Notices; |

| Stage | Information Sources |
|---|---|
| | • Stakeholder / customer correspondence / engagement.<br>• Needs originating from Scottish Water strategies and policies (including Management Approaches). |
| **Gate 30 – 90** | As above plus:<br>• Project Investment Appraisal stage documentation, confirming needs, considered options, costs and benefits appraisal:<br>  • Gate 30 – Stage 1<br>  • Gate 40 – Stage 2<br>  • Gate 50 – Stage 3a<br>  • Gate 70 – Stage 3b<br>  • Gate 80/90 – Stage 4<br>• Target costs based on detailed design (Gate 80). |
| **Post Gate 90** | As above plus:<br>• Project spend profiles to confirm remaining expenditure into SR27. |

Although several needs, particularly for DWQR enforcement or commitment, relate to specific parameters for a water supply system or site, many systems or sites have multiple investment needs. Although these may be of varying priority, a holistic approach to their resolution is required to identify the most cost-beneficial approach, particularly for treatment assets where multiple factors can impact performance in relation to a range of parameters. These sites are being progressed through a Core Programme for improving water treatment capability which commenced in SR21 and will continue in SR27. The investment needs for this programme are captured through a combination of needs statements and Stage 1 of the project investment appraisal (PIA) process, with supporting evidence relating to the option selection and cost-benefits captured though subsequent PIA stages.

## 4.2 Optioneering

### *4.2.1 Optioneering Process*

The investment scenario options are built based on three key principles:

- Support new connections: providing adequate standards of service to our new customers. Whilst the Water Continuity Technical Appendix contains the growth funding to support house building in Scotland, Water Quality investment is required to ensure these new properties can sustainably receive excellent quality drinking water.
- Deliver for our existing customers: this includes carrying out essential works to maintain existing asset performance, customer experience, and health and safety, meeting legislative, regulatory and community standards and progress towards Net Zero by 2024. It also involves investing in asset enhancement to improve resilience, reliability and sustainability of service.
- Consider future customers: replacing ageing assets now to ensure resilience of supply to future customers, preventing unsustainable costs being passed on to them in future.

We use our investment hierarchy approach to develop a balanced investment portfolio across all investment areas, including water quality, to prioritise projects and programmes based on our objectives, customer expectations, stakeholder needs and available funding. This approach is outlined in

*Table 8: Our Investment Hierarchy Approach*

, which links the principles with three investment need categories:

- **Category 1** covers 'must do' investments, which are required as a minimum to meet customers' expectations on level of service. This category accounts for the majority of the investment.
- **Category 2**, which accounts for the next biggest share, includes 'should do' investments aimed at delivering regulatory compliance and meet the expectations of DWQR.
- **Category 3** covers investment choices to improve service for existing customers, enabling growth, replacing ageing assets to protect service levels for future customers.

*Table 8: Our Investment Hierarchy Approach*

| | Customer & performance centric investment needs | Description | Investment allocation approach | Mapping to FD | |
|---|---|---|---|---|---|
| Deliver for existing customers | 1 Maintain core service performance for existing customers | Essential works to maintain existing asset performance, customer experience and health & safety | Minimum needed to maintain service. Already prioritised significantly so budget reduced as a last resort, after all other non-discretionary expenditure reduced to minimum levels | AR3 – asset category 1,2&3 | Core expenditure |
| | 2 Meet current regulatory & community commitments | Meet legislative (RBMP3), regulatory (water quality), (IUW) community (e.g., Seafield odour) and progress Net Zero by 2040 | SR15 and matched funding<br>Then allocated portion of Enhancement funding | Enhancement (incl. matched funding )<br>SR15 | |
| | 3A Improve service for existing customers | Investing in asset enhancement to strengthen resilience, reliability and sustainability of service | No ring-fenced allowance. Absorbed within Enhancement<br>Allocated portion of Enhancement to support internal flooding and low pressure | Enhancement<br>Incl. ring-fenced allowance | Remaining allocation prioritised within these areas |
| Support new connections | 3B Provide a service for new customers | New development and connections, including temporary works | Currently £100m committed and known sites like Bertha Park are advancing | Enhancement | |
| Consider future customers | 3C Replace long-life assets for future customers | Proactively replacing aging assets to tackle back log and underlying issues; water mains (Asbestos cement pipes), civil infrastructure with lifetime of 40-60 years). Aim to prevent unsustainable costs being passed on to future customers | Consequential allocation as there is high demand from existing assets that impact current service. FD & investment scenarios do specify investing in long-life asset replacement. Future customer needs re-prioritised | AR3 – category 2 Civils and water mains, pressurised sewers | |

An initial unconstrained investment scenario has been developed to fulfil all the principles outlined in *Table 9*, ensuring the delivery of all essential requirements to maintain the current level of services, as well as enhancing performance while minimising risk. From this unconstrained investment scenario, additional investment scenarios have been derived by strategically reducing or eliminating investments in certain areas. These "constrained" scenarios aim to meet Ministerial Objectives at a lower cost, but come with associated risks, as the limitation on investment may impact performance improvements and ultimately affecting customer service enhancements.

### *4.2.2 Unconstrained Options*

The development of investment planning scenarios is a crucial step in ensuring that strategic and financial objectives are aligned with the Water Sector Vision and our Long-Term Strategy. The initial step involved generating a comprehensive suite of options to encapsulate potential outcomes and investment needs. The unconstrained options include all the necessary investment demands to meet the current draft SR27 Ministerial Objectives, covering legislative requirements, commitments to stakeholders, and customer priorities.

The formulation of investment planning scenarios is essential for aligning strategic and financial objectives with the vision for the water sector and our Long-Term Strategy. The initial phase involved creating a comprehensive range of options to encompass potential outcomes and investment requirements. The unconstrained options incorporate all potential investment options, with a focus primarily on maintaining all assets involved in ensuring water quality performance. The total number of investment options considered was 46.

*Table 9* below provides details of the number of Water Quality investment options considered for SR27 detailed by investment category.

*Table 9: Water Quality Unconstrained options*

| Investment Hierarchy | Number of Options |
|---|---|
| Category 1 - AR3 | 22 |
| Cat 2a and Cat 2b - Regulatory | 14 |
| Category 3 - Enhancements | 10 |
| **Total** | **46** |

To identify the best suite of interventions from the above options we have undertaken an extensive optioneering process, applying testing across various performance metrics and compliance requirements to form a series of constrained options, the investment scenarios.

### *4.2.3 Constrained Options*

**High Scenario**: The investment meets Ministerial Objectives with a CPI + 6.5% per annum, maintaining the service levels achieved at the exit of SR21

**Working Reference Scenario**: The investment meets Ministerial Objectives, with a CPI + 4% per annum, the investment allows maintenance of the service levels achieved at the exit of SR21, albeit accepting more risk of burst frequency

**Flat Charge Scenario**: the reduction in investment under this "Flat Charge" scenario, with a CPI + 0% per annum, triggers reduced service levels compared to exit of SR21, with notable overall service impacts as measured by OPA and CEM.

The High Scenario includes the continuation of the inspection programme for critical assets and enhancement measures to address risks and failures at 18 WTW serving c1.45m customers. In addition, the risk of failures at 4 WTW serving 275k customers is reduced, auto shut down capability is provided where none exists, reliability of disinfection processes is ensured at priority sites and development of other WQ failure risk sites.

The Working Reference Scenario is £37m lower than the High Scenario due to a reduction in investment toward addressing the risk of failure at WTW, as one out of four is not included. Additionally, in the Working Reference Scenario our commitment to regulatory compliance is maintained.

The Flat Charges Scenario aims at reducing failures at 14 WTW serving c1.45m customers (rather than 18 WTW in the High Scenario and the Working Reference Scenario), HAA compliance risk is not addressed at any of the WTW at risk, £30m is allocated to address highest DWQR priority risks only and there are no plans on development work on HAA and other WQ failure risk sites. Under the Flat Charges Scenario, the reduced investment in regulatory compliance poses a significant risk of failing to meet the expectations relating to water quality established by our stakeholders and regulator.

*Table 10: Summary of investment under constrained scenarios*

| High (CPI+6.5%) | Working Reference (CPI+4%) | Flat Charges (CPI+0%) |
|---|---|---|
| Non-trivial water quality failures addressed. Risks to water quality and water supply reduced. | Non-trivial water quality failures addressed. Risks to water quality and water supply maintained. | Non-trivial water quality failures addressed. Risks to water quality and water supply increase. |
| £1,671m | £1,634m | £1,393 |

*Table 11* below compares the investment across the three constrained investment scenarios, summarised by Investment Programme.

*Table 11: Investment across the three constrained investment scenarios, summarised by Investment Programme*

| Investment Category | Investment Area | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|
| **AR3 Cat 1** | WTW Process Stage Civils | 26 | 26 | 26 |
| | WTW Process Stages M&E | 97 | 97 | 97 |
| | WTW Chemical Storage & Dosing | 188 | 188 | 188 |
| | WTW Filtration | 65 | 65 | 65 |
| | Chlorine Contact Tanks | 32 | 32 | 32 |
| | WTW Sludge & Washwater Handling | 27 | 27 | 27 |
| | WTW Water Quality Instrumentation | 97 | 97 | 97 |
| | Treated water storage | 357 | 357 | 319 |
| | Distribution Infrastructure – Discolouration and aeration | 56 | 56 | 56 |
| | Network Chemical Dosing | 5 | 5 | 5 |
| **WQ Enforcement Cat 2a - Regulatory** | SR21 Completion | 42 | 42 | 42 |
| | Enforcement Notices - Turriff WTW; Mannofield WTW. | 138 | 138 | 138 |

| Investment Category | Investment Area | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|
| | Letter of Commitment (Haloacetic Acids) - Penwhirn WTW; Glenlatterach WTW; Londornoch WTW. | 84 | 84 | 84 |
| | Letter of Commitment (Raw Water Supplies) - Up to 54 supplies. | 25 | 25 | 25 |
| | Enforcement Notice - Treated water storage | 16 | 16 | 16 |
| **WQ – Lead Cat 2a - Regulatory** | Lead Management | 32 | 32 | 32 |
| | Lead Communication Pipes | 23 | 23 | 23 |
| | Larchfield Lead Replacement | 4 | 4 | 4 |
| | Lead Pilot Projects | 5 | 5 | 5 |
| **WQ Expectations Cat 2b - Regulatory** | Letters of Commitment (Bradan / Haloacetic Acid) - Bradan disinfection / disinfection by-products | 53 | 53 | 0 |
| | Letter of Commitment (Haloacetic Acids) and Persistent Non-Trivial Failures - Stornoway WTW; Glendevon WTW; Camphill WTW. | 150 | 112 | 27 |
| | Persistent Non-Trivial Failures - Carron Valley WTW (taste and odour) | 17 | 17 | 17 |
| | Disinfection Improvement | 21 | 21 | 21 |
| | Improving Auto-Shutdown Capability | 24 | 24 | 24 |
| | Provision of Ultra-Violet (UV) Systems | 17 | 17 | 17 |
| | Letter of Commitment (Haloacetic Acids) - Castle Moffat WTW; Inverary WTW; Killylour WTW; Camps WTW; Lochinvar WTW; Greenock WTW. | 24 | 24 | 0 |
| | Letters of Commitment (Daer / Haloacetic Acids): Develop strategic replacement for Daer WTW. | 28 | 28 | 0 |

| Investment Category | Investment Area | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|
| | Persistent Non-Trivial Failures - Rawburn WTW; Lomond Hills WTW; Boardhouse WTW; Hopes WTW; Roberton WTW. | 12 | 12 | 0 |
| | Catchment Management | 6 | 6 | 6 |
| **Total** | | **1,672** | **1,634** | **1,393** |

**Water Quality Enforcement / Commitment**

Needs have been categorised under WQ Enforcement due to the level of risk they pose in terms of public health and require appropriate asset improvements to be delivered within timescales set out or agreed with the DWQR, either through a DWQR Enforcement Notice or a Letter of Commitment from Scottish Water to DWQR. In addition, certain activities may be required in response to DWQR Information Letters, which typically clarify the requirements of the Public Water Supplies (Scotland) Regulations 2014 (amended), or to address imminent risks to service.

### *4.2.4 Chosen Option*

The investment scenarios were tested against various performance metrics and compliance requirements to validate the scenarios' robustness and ensuring they aligned with Ministerial Objectives, customers and stakeholders' expectations, the Water Sector Vision, the Climate Change Adaptation Plan and meeting Scottish Water's Board expectations on progress towards our Long-Term Strategy and risk appetite. Based on the testing outcomes, we progressed with the Working Reference scenario (CPI+4%) as the basis for our final recommendation.

**Our final chosen option is the Reference Scenario, a matured and refined version of the Working Reference.**

We did this across all investment areas by:

- Refining the available budget associated with a CPI+4% pa customer charge profile, re-running the Financial Model using the latest modelling assumptions and the application of the most up to date top-down global efficiency factors to be applied.
- We incorporated feedback from sector stakeholders, clarification of Regulator requirements, customer research feedback and further considering the requirements of the draft Ministerial Objectives. Decisions were required to navigate these limitations while ensuring a balanced investment plan.
- Several strategic options were considered to manage budgetary constraints and investment reallocation. These included potential further removal of demand in the asset repair, refurbishment, and replacement (AR3) programme areas or reduce outcomes where there is service choice. As a result, there were upwards adjustments in some areas, and downwards adjustments in others.

This scenario balances investment needs, falls within the zone of acceptability discussed with key stakeholders of CPI plus 2 to 4%. Customer acceptability is to be tested between Draft and Final BP submissions and so providing a clear path forward for the draft Business Plan submission.

The **Reference Scenario** will deliver:

- Our Enforcement Notice Requirements – Turriff WTW; Mannofield WTW; Treated Water Storage.
- On our Letters of Commitment (LoC) - Haloacetic Acids (HAA) Sites (Londornoch, Penwhirn, Glenlatterach, Stornoway, Glendevon and Camphill); HAA/Other LoC Sites (Bradan, Daer); Raw Water Supplies (54)
- Reduced organics and disinfection by-products for the sites above.
- Improved microbiological quality of drinking water whilst minimising the taste of chlorine through improvements to disinfection and auto-shutdown capability at our treatment works.
- Improving aesthetics performance (including discolouration and Taste & Odour contacts), including additional treatment at Carron Valley to minimise the risk of repeat taste and odour events.
- Continued progress to deliver a lead-free Scotland by replacing ~18,000 lead communication pipes, and additional customer supply pipes where economic to do so.
- Stable (or improved) service levels at our SR21 exit performance level through the maintenance of our assets in line with Management Approaches.
- A reduced risk profile delivered through the Water Supply Risk Management system by reducing the number of risks above long-term tolerable thresholds and the number of DWQR declared incidents.

Although the Reference Scenario also makes provision for the development of other projects to address other areas of risk, the scenario does not support the delivery of interventions to be developed for the following:

- Letter of Commitment (Haloacetic Acids): Castle Moffat WTW; Inverary WTW; Killylour WTW; Camps WTW; Lochinvar WTW; Greenock WTW.
- Letters of Commitment (Daer / Haloacetic Acids): Development of strategic replacement options for Daer WTW to deliver long-term solution for manganese, disinfection by-products and other needs (potential delivery SR33).
- Persistent Non-Trivial Failures: Rawburn WTW; Lomond Hills WTW; Boardhouse WTW; Hopes WTW; Roberton WTW.

These shall be subject to ongoing risk review and investment prioritisation through internal governance processes and discussions through the DWQR Joint Development Group.

This information was discussed with stakeholders to identify areas of development, concern and provide an opportunity of challenge. This allowed demand profiles to be reassessed, and adjustments made to the investment allocations across portfolios.

## 4.3 Overall Strategic Option Chosen for SR27

### *4.3.1 SR27 Investment Plan*

A summary of our proposed investment on water quality for SR27 is outlined in Table 12 below.

*Table 12: Summary of investment for water quality for SR27*

| Investment Type (Primary) | Investment Category | Investment Hierarchy | Reference Scenario Total (£m, 23/24) |
|---|---|---|---|
| **AR3** | AR3 | Cat 1 | 866 |
| **Enhancement** | 2a - Regulatory | WQ Enforcement | 521 |
| **Enhancement** | 2a - Regulatory | WQ Lead | 35 |
| **Enhancement** | Cat 2b- Regulatory | WQ Expectations | 159 |
| **Total** | | | **1,581** |

## *4.3.2 Customer Benefits*

### 4.3.2.1 Performance Outcomes

The outcome measures marked with an asterisk are those that we consider there is scope to align with the measures in England and Wales.

*Table 13: The outcomes we are seeking to achieve in SR27*

| Level of Service - metric | Unit | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|---|---|---|---|---|---|---|---|
| Customer Taste & Odour contacts / 1000 customers | Number | 0.51 | 0.52 | 0.53 | 0.52 | 0.53 | 0.53 |
| Customer Discolouration and aeration contacts / 1000 customers | Number | 2.11 | 2.11 | 2.11 | 2.09 | 2.09 | 2.08 |
| Estimated number of lead pipes remaining in public network | Number | 42550 | 39550 | 36550 | 33550 | 30550 | 27550 |
| % of customers with no indication of lead in supply <3ug/l | % | 98.04 | 98.06 | 98.08 | 98.11 | 98.13 | 98.15 |
| Total drinking water compliance | % | 99.937% | 99.941% | 99.943% | 99.946% | 99.947% | 99.950% |
| WQ Hazards above long-term tolerable level. | number | 7254 | 7267 | 7180 | 6994 | 6807 | 6465 |
| Number of DWQR declared incidents | Number | 30 | 29 | 28 | 27 | 26 | 25 |

## *4.3.3 Risk and Opportunities*

As mentioned throughout this document, the key challenges to maintaining or improving service relating to water quality include:

**Climate and wider environmental change** - impacting particularly on raw water quality through increasing levels of organics, particulate matter, microbiological loading and nutrient loading (leading to algal growth). This will compromise our ability to meet both well-established regulatory standards and those more recently introduced through the increased potential for microbiological

failures (including detections of *Cryptosporidium*), the formation of disinfection by-products and the generation of taste and odour compounds.

**An ageing asset base** - the need for asset repair, refurbishment and replacement will be ongoing for the more complex treatment processes installed over the past 25 years, as well as for older assets requiring end-of-life replacement.

Our **Long-Term Strategy** recognises these challenges and risks and sets out the expected level of investment demand required to mitigate them.

To meet these challenges, Scottish Water will continue to collaborate with the wider water industry to explore opportunities for new technologies and approaches relating to knowledge development and alternative treatment processes, building on the progress made during SR21 as set out below.

Opportunities to develop our operational practices will include optimising site operation, including developing the skills of our site operators, enhanced monitoring, targeted maintenance, the use of remote operation where appropriate to do so, and the effective use of data and analytics to support these activities We are also investing in a number of innovative approaches which have the potential to improve performance and de-risk delivery (please see Section 5: Innovation)

Regulation 33 in Scotland (Regulation 31 in England and Wales) requires approval for all water supply system products. The process faces challenges due to limited DWI approved laboratories, which assess new or existing products. This issue risks a) disruption of current water treatment processes or b) delays in adopting new treatments used in other countries. We will work with UK water industry groups and Regulators to address this problem.

## 4.4 Investment Programmes

### *4.4.1 Water Treatment*

The investment demand allocated to water treatment is £1,087m, £655m of which will enhance our assets to deliver our regulatory requirements and expectations of the DWQR including Enforcement Orders and Letters of Commitment. £432m is for asset maintenance (AR3) investment, to maintain the capability of our water treatment works, including filtration and disinfection systems, M&E equipment, instrumentation and chemical storage facilities and processes.

*Table 14: Water Treatment Investments*

| Investment Hierarchy | Investment Category | Investment Area | Reference Scenario Total (£m, 23/24) |
|---|---|---|---|
| **Cat 1** | **AR3** | WTW Process Stage Civils | 28 |
| | | WTW Process Stages M&E | 97 |
| | | WTW Chemical Storage & Dosing | 175 |
| | | WTW Filtration | 72 |
| | | Chlorine Contact Tanks | 25 |
| | | ATOM Water Assets | 11 |

| Investment Hierarchy | Investment Category | Investment Area | Reference Scenario Total (£m, 23/24) |
|---|---|---|---|
| | | Loss of water supply due to obsolete membrane filtration technology | |
| | | WTW Water Quality Instrumentation | 24 |
| **Cat 2a - Regulatory** | **WQ Enforcement** | SR21 Core Programme Completion & WQ Enforcements | 288 |
| | | WQ Sites with Letters of Commitment (Dear, Bradan & Winterhope) | 216 |
| **Cat 2b - Regulatory** | **WQ Expectations** | HAA at risk, *Cryptosporidium* UV (6 sites) and development of non-trivial fails sites | 102 |
| | | Develop solutions at 16 sites (Disinfection improvements) | 23 |
| | | Auto-Shutdown / Run to waste | 27 |

### 4.4.2 Water Storage

The investment demand allocated to water storage is £421m. This includes AR3 investment for maintaining our treated water storage and secondary disinfection processes in SR27 of £403m, ensuring that we provide high quality water for our customers. This also includes enhancement expenditure to improve our ability to inspect and maintain treated water storage tanks through enhancement investment of £18m.

*Table 15: Water Storage Investment*

| Investment Hierarchy | Investment Category | Deliver / Develop | Investment Area | Reference Scenario Total (£m, 23/24) |
|---|---|---|---|---|
| **Cat 1** | **AR3** | **Deliver** | Treated water storage | 391 |
| **Cat 1** | **AR3** | **Deliver** | Sample Points | 12 |
| **Cat 2a - Regulatory** | **WQ Enforcement** | **Deliver** | Enforcement Notice - Treated water storage | 18 |

### 4.4.3 Water Distribution

The AR3 investment demand for SR27 for water distribution water quality is £30m. This includes investment to manage discolouration through maintenance activities and minimising impact on customers thereby improving customer satisfaction.

*Table 16: Water Distribution Reference Scenario investments*

| Investment Hierarchy | Investment Category | Deliver / Develop | Investment Area | Reference Scenario Total (£m, 23/24) |
|---|---|---|---|---|
| **Cat 1** | **AR3** | **Deliver** | Distribution Infrastructure – Discolouration and aeration | 25 |
| **Cat 1** | **AR3** | **Deliver** | Network Chemical Dosing | 5 |

### 4.4.4 Lead Management

We are investing £35m toward our commitment to reducing lead in our network, through replacing lead communication pipes, maintaining and optimising our phosphate equipment and undertaking additional sampling to identify presence of lead.

*Table 17: Lead Management Reference Scenario investments*

| Investment Hierarchy | Investment Category | Deliver / Develop | Investment Area | Reference Scenario Total (£m, 23/24) |
|---|---|---|---|---|
| | **WQ - Lead** | **Deliver** | Lead Communications Pipe Replacement | 34 |
| | **WQ - Lead** | **Deliver** | Lead Sampling and Risk Assessment | 1 |

### 4.4.5 Raw Water and Catchment Management

We plan to invest £7m towards catchment management to support our Net Zero activities whilst improving the quality of our raw water sources.

*Table 18: Other Programmes Scenario C investments*

| Investment Hierarchy | Investment Category | Deliver / Develop | Investment Area | Reference Scenario Total (£m, 23/24) |
|---|---|---|---|---|
| **Cat 2b - Regulatory** | **WQ Expectations** | **Deliver** | Assess peatland restoration options at all 20 catchments. | 7 |

### 4.4.6 Future Investment Requirements

Planning for the next 25 years is inherently uncertain. As part of our Long-Term Strategy, we undertook a broad-ranging and comprehensive review of the risks and opportunities across the next 25 years. The investment we have identified will secure our essential services by maintaining our existing asset base, allow us to adapt to climate change and meet our legislative requirements. Without major changes to how we currently operate the water and wastewater system and given the projected impact of climate change, we are currently forecasting that the funding needed to deliver sustainable services will need to increase over the next 25 years by almost double. Planning for this period is inherently uncertain and there are both opportunities and risks ahead.

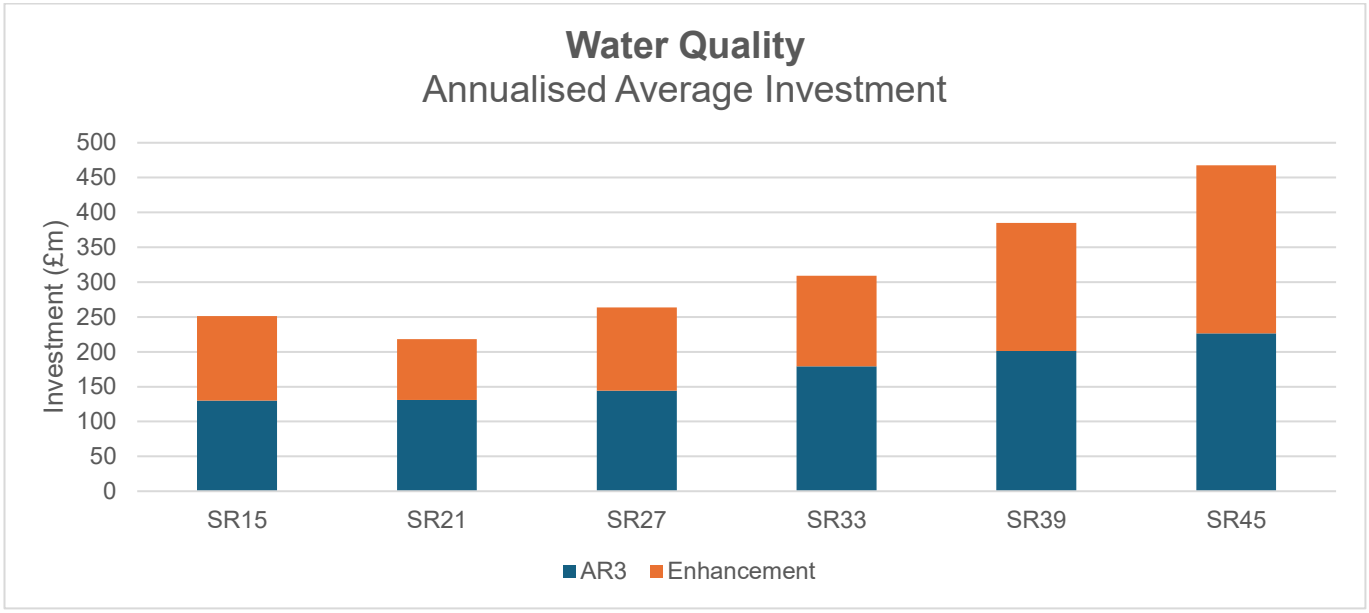


*Figure 7: Historic and projected investment - Water Quality (2015 to 2051)*

For Water Quality, the projection will see a near doubling in expenditure from SR27 to SR45 from ~£1,581m to ~£2,806m (see Figure 7). This is driven by a lesser degree by increase in AR3 expenditure largely driven by more MEICA replacements being required between SR27 and SR45 (a 75% increase in AR3 spend in this period). The majority of this additional projected expenditure to 2051 is due to enhancement requirements, including:

- Address the impacts of climate change including raw water quality deterioration and increase in microbiological risk presented by a warmer climate.
- Reduce discolouration and taste and odour issues which will be exacerbated by climate change through raw water quality deterioration
- Removal of chemicals to more stringent water quality legislation and regulatory requirements
- Lead pipe removal from SW network.

A detailed breakdown is shown in Figure 8 below.

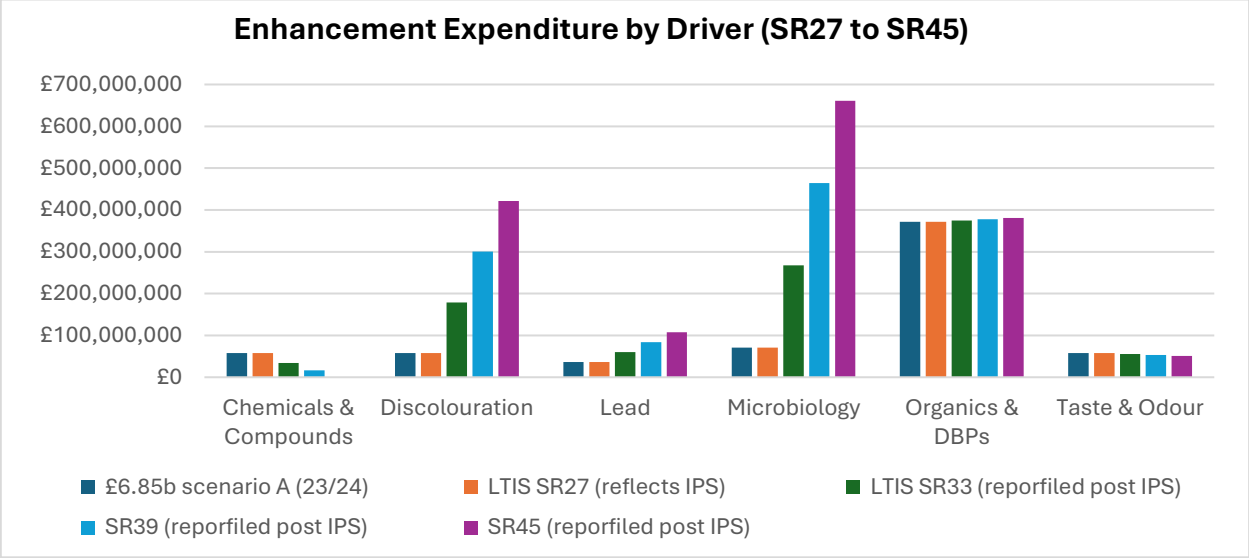


*Figure 8: Long Term Enhancement Expenditure Projection for Water Quality (2027 to 2051)*

The above demonstrates that our SR27 plans is a proportionate and incremental step to achieving the ambitions of our Long-Term Strategy. This will be influenced by a number of factors and is dependent on finding innovative ways to deliver more cost-effective solutions and driving down demand by working with customers and partners. However, it could also be influenced by new legislation and climate impacts that differ from our current projections. We will do as much as we can to reduce demand, transform, drive efficiency and in work in partnership before we seek support for future investment.

# 5 Innovation

We are committed to employing innovative strategies to enhance water quality and ensure sustainable management of resources. In the upcoming SR27 investment period, the focus will be on pioneering technologies and advanced methodologies to address emerging challenges and optimise treatment processes. By integrating cutting-edge technologies, novel methodologies and research initiatives, we aim to address both current and future challenges within the water treatment processes. This will include:

- In line with our commitment to achieving a lead-free Scotland, we will collaborate with our stakeholders to support customers to remove lead supply pipes. This will include undertaking pilot studies to develop our knowledge on the removal of customer-side lead, and progressing opportunities for the removal of lead supply pipes where economic to do so. Until lead pipes can be removed from the network we will continue to maintain and optimise orthophosphate dosing, whilst developing plans to support dosing reductions in the future as the lead risk is gradually reduced.
- Further innovation in construction techniques to see greater use of modular designs, particularly in relation to ceramic membranes and alternative treatment technologies, providing opportunities for off-site construction.
- The changes in regulatory standards have also led to research into new analytical techniques for new parameters (e.g. PFAS, somatic coliphages) increasing the sensitivity of analysis methods to help detect the early presence or prevalence of the contaminants. Progress will also be made in SR27 on the use of new techniques to optimise the operation of our treatment works (e.g. zetasizers) and understand the performance of our assets (e.g. particle counters).
- During SR27 we shall continue to develop our understanding of the impact of climate change on the quality of our raw water sources, particularly in relation to variations in rainfall patterns, extreme weather events and increasing temperatures. This shall include research and development in the following areas:
    - Understand the risks to source water treatability associated with climate change impacts, including algal blooms, taste and odour and increasing levels of organics and pathogens;
    - Evaluation of alternative treatment technologies such as nanofiltration ceramic membranes and ozone nanobubble, and the development of low chemical, low cost and low carbon treatment;
    - Assess the efficacy and environmental impacts of nature-based, in-reservoir and catchment solutions;
    - Development of monitoring and modelling techniques to predict and manage variations in raw water quality, including organics and pathogens.
    - Assessing techniques to improve our ability to prevent and control discolouration events in distribution.
- In relation to asset maintenance, through the review of our Management Approaches, we will continue to develop our knowledge in relation to several key themes including asset age, condition, criticality, deterioration, consequence and likelihood of failure along with operational and capital intervention costs.
- We will continue to develop our sustainable land management approach and seek further catchment management opportunities to reduce risks to water supplies and improve raw water quality. Working with industry will help to improve byelaws compliance and reduce the risk of cross-contamination of water supplies.

# 6 Interdependencies

This document should be read in conjunction with other Technical Appendices that have key interdependencies including:

- Climate Change Adaptation
- Climate Change Mitigation
- Water Environment
- Investment Planning
- Water Continuity

The document should also be read in conjunction with Scottish Water's Long-Term Strategy.

# 7 Conclusion

Our Reference Scenario has been selected, this aligns with Ministerial Objectives, customers and stakeholders' expectations, long term strategy for the water sector, climate change adaptation plan, meeting Scottish water's Board expectations on progress towards our Long-Term Strategy and risk appetite.

The Reference Scenario will deliver require £1,581m of investment to deliver the following:

**Meet the Expectations of Stakeholders:**

We will deliver improvements required under DWQR Enforcement Notices and Letters of Commitment to prevent re-occurrences of exceedances of regulatory standards for:

- **Enforcement Notices (*Cryptosporidium*)**: Turriff WTW & Mannofield WTW.
- **Anticipated Enforcement Notice (Treated Water Storage)**: Notice to be confirmed with the DWQR - enhanced monitoring programme for all Treated Water Storage Points that are out with the 10-year cleaning frequency using a risk-based approach
- **Letter of Commitment (Haloacetic Acids)**: Londornoch WTW, Glenlatterach WTW, Penwhirn WTW.
- **Letter of Commitment (Raw Water Supplies)**: Improvements to up to 54 supplies (to be confirmed through risk assessment).

We will also **prioritise delivery** of improvements, in agreement with the DWQR, for sites at risk from HAA and other non-trivial failures:

- **Letters of Commitment (Bradan / Haloacetic Acids)**: Enhancements to improve disinfection and reduce disinfection by-products at Bradan WTW.
- **Letter of Commitment (Haloacetic Acids)** and Persistent Non-Trivial Failures: Stornoway WTW, Glendevon WTW and Camphill WTW.

We will also **develop** solutions for other sites at risk of HAA or persistent non-trivial failures and continue to review their priority for investment in line with ongoing risk assessment within available funding:

- **Letter of Commitment (Haloacetic Acids)**: Castle Moffat WTW; Inverary WTW; Killylour WTW; Camps WTW; Lochinvar WTW; Greenock WTW.
- **Letters of Commitment (Daer / Haloacetic Acids)**: Development of strategic replacement options for Daer WTW to deliver long-term solution for manganese, disinfection by-products and other needs (potential delivery SR33).
- **Persistent Non-Trivial Failures**: Rawburn WTW; Lomond Hills WTW; Boardhouse WTW; Hopes WTW; Roberton WTW.

**Maintain or improve current levels of service over the long-term for water quality:**

- **Ensuring microbiological quality of drinking water whilst minimising the taste of chlorine:** We will enhance disinfection processes at our water treatment works, including automatic shutdown, prioritising improvements using our Water Risk Assessment Platform to ensure they meet regulatory requirements and our disinfection policy to minimise microbiological risks to an acceptable level. This will also include provision for the installation of ultra-violet (UV) disinfection systems to reduce risks in relation to *Cryptosporidium*. We shall also continue to inspect and maintain our Treated Water Storage assets to reduce the risk of bacteria ingress and subsequent failures at customers' taps.

- **Reducing organics and disinfection by-products (DBP):** To help deliver our regulatory commitments relating to DBPs, we will take a catchment-based approach to managing organics in our source waters and continue to develop partnerships with landowners and other stakeholders to assess and implement opportunities for nature-based or catchment solutions. Where these are not effective or suitable, we will utilise enhanced treatment technologies such as ion-exchange or ozone-granular activated carbon (GAC) to reduce organics. We will also continue to monitor the levels of organics in our source waters and optimise treatment processes to reduce the risk of DBP formation.
- **Improving aesthetics performance:** To reduce the risk of customers being supplied with discoloured water from our distribution network, we will continue to take a risk-based approach to cleaning and conditioning water supply pipes or replacing them where required. Our activities to improve catchment management and treatment processes will also reduce the risk of discolouration and taste and odour originating from our source waters and WTW. This will include the delivery of further investment at Carron Valley WTW to minimise the risk of customers being affected by repeat taste and odour events.
- **Continue to make progress to deliver a lead-free Scotland by:** removing ~3,000 lead communication pipes per year in response to sample results, when requested by customers or when identified through our mains replacement work to support the removal of all lead from Scottish Water's network by 2045. We will also continue to develop plans with stakeholders to deliver a lead-free Scotland in the future, including supporting customers to remove their lead supply pipes.
- **Maintain (or improving where possible) water quality service levels at our SR21 exit position** by maintaining our assets in line with our management approaches**:** This will ensure that the condition and performance of our existing asset base will not compromise total drinking water compliance, or increase the number DWQR declared incidents or risks above long-term tolerable thresholds.

The investment proposed for SR27 represents an increase from SR21 to ensure that we not only deliver appropriate levels of maintenance to sustain the performance of the existing asset base, but also target the highest risks to water quality by enhancing our assets to meet the challenges of climate change and changing regulatory requirements, in line with Ministerial Objectives and our Long-Term Strategy, to deliver continuous improvement for customers.

# Water Continuity
## Technical Appendix 002

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# 1 Executive Summary

The Water Continuity investment area covers all investment required in the SR27 period to maintain or improve service outcomes relating to the provision of a continuous supply of drinking water to customers which is both reliable and resilient for the long term. The reliability and resilience of Scotland's water supplies delivered in a sustainable way are key components of the shared Water Sector Vision to support a flourishing Scotland. This frames Scottish Water's Long-Term Strategy to 2050 and the outcome to ensure that **Scotland's tap water remains a source of pride**. The proposed investment will deliver our regulatory commitments in line with legislation and Scottish Water strategies and policies, including the requirements of the draft SR27 Ministerial Objectives to:

- Make progress towards the realisation of the long-term vision of the water industry.
- Understand the condition of assets, in particular those of a critical nature for maintaining service delivery and develop an evidence-based strategy to inform the long-term asset replacement needs of the industry.
- Continue to implement and evolve plans for adaption measures necessary to protect services from climate change.
- Identify and provide new strategic capacity that will meet the demand of all new housing development and the domestic requirements of commercial and industrial development for the 2027-33 period.
- Review and update existing plans to address the resilience of our networks, systems and supplies, and take steps to secure further improvements to resilience to ensure continuity of service.

In SR27 and beyond, there are a number of key challenges, such as climate change, changes in population and ageing / deteriorating assets, which have the potential to increase our risk profile, compromising our ability to meet regulatory requirements and maintain service without appropriate levels of investment. As a result of these challenges, over the next 25 years the amount of water available in the environment for public water supplies is expected to fall short of demand requirements by ~240 megalitres per day (ML/d) during drought conditions, exacerbated by Scotland being one of the highest per-capita water users in Europe. Peak demand for water during warm, dry spells can also exceed the capacity of some of our water treatment works or parts of our distribution network requiring response measures such as tankering to maintain supplies and pressure.

Conversely, our assets and ability to maintain supplies face increasing threat from more extreme weather conditions such as storm events, leading to power interruptions or localised flooding, or varying wet / dry conditions resulting in ground movement causing pipes to burst. In addition, our critical, large infrastructure assets, such as dams and trunk mains, require ongoing inspection and maintenance to ensure that they not only maintain supplies for the long-term but do not pose a risk to others from catastrophic failure. It is also critical that our control, automation and security systems are maintained in line with industry standards and continue to protect our assets from external threats.

To identify the best suite of interventions to meet the above challenges, we have undertaken an optioneering process, with the investment scenarios being tested against various performance metrics and compliance requirements to validate their robustness. The scenarios align with Ministerial Objectives, customers' and stakeholders' expectations, the long-term strategy for the Water Sector Vision and the climate change adaptation plan, whilst also meeting regulatory

requirements and Scottish Water's Board expectations on progress towards our Long-Term Strategy and risk appetite.

The Working Reference Scenario (CPI+4%) was recommended as it offers the best balance between progress towards our Long-Term Strategy, contribution to the Water Sector Vision, meeting the Ministerial Objectives and customer charges, both currently and for future generations. The Investment Planning Technical Appendix provides detailed information on the investment scenarios considered and the optioneering process. The Reference Scenario will require £2,076m (2023/24 Cost Base) of investment in Water Continuity to deliver the following outcomes aligned to the Ministerial Objectives and our Long-Term Strategy to 2050:

## Adapting to Climate Change and Increasing Resilience

- **Continue to develop our understanding of the impact of climate change** on our water resources and assets and develop plans to mitigate these risks. This will include updating our Water Resource Plan and exploring wider catchment planning opportunities with stakeholders.
- **Improving drought resilience in key areas:** by addressing the supply-demand balance deficit in the Dundee area and reducing the deficit gap in areas including Edinburgh & Lothian and Fife. We will also continue to improve our drought management capability and implement our Strategic Drought Plan.
- **Ensure that we have water treatment production and network capacity** in key locations at risk of supply interruptions during peak demands (including Tiree, Kenmore, Balmichael, and Turriff), prioritising the highest risk areas.
- **Improve our understanding of and reduce the demand for water:**
    - Reduce leakage by 9.9% (equivalent to 45 ML/d) in SR27
    - Develop options for influencing domestic customer demand such as information from household monitors and water efficiency labelling of domestic appliances**.**
    - Roll out smart metering for 136,000 Non-Household Customers: expected to deliver demand reduction of 65ML/d in SR27 (with 25 ML/d contributing to network leakage reduction and a further 15ML/d realised in SR33).
- **Improve our resilience:** by improving power resilience to regional power outages and increasing connectivity of our water supply systems. In addition, we will update plans to address resilience of supplies to wider hazards (e.g. flooding) and make progress to secure improvements. We will also improve our response and recovery plans and capability.

## Maintaining Service and Reducing Risk for Customers

- **Maintain current service levels:** We will maintain and operate our assets in line with our water risk management processes, including inspections of key critical assets (e.g. dams and trunk mains) to identify and mitigate emerging risks, undertaking repairs, refurbishment and replacement across the asset base to maintain performance. We will also ensure that our key control, automation and security systems (e.g. System Control and Data Acquisition (SCADA), telemetry) remain fit-for-purpose in line with industry standards and regulatory requirements.
- **Maintain interruptions performance:** maintaining the number of interruptions our customers experience which are greater than 6 hours and reducing the number of customers experiencing 6 or more interruptions in a year or 10 or more in 3 years. We will do this by increasing our mains rehabilitation rates, with a programme focused on Asbestos Cement (AC) pipes, which represent the highest proportion of failures, and the maintenance of water pumping stations.

- **Maintaining (or improving) low pressure performance:** Continuing to address issues resulting in persistent low-pressure.

### Understanding and Managing Risk

- Continuous development and improvement of our Water Supply Risk Management (WSRM) processes and undertake activities in line with our functional risk register and approved Board risk positions to reduce the number of risks above long-term tolerable thresholds.

The above interventions and investment will allow us to improve our resilience to climate change and other threats to reduce the risk of long-term interruptions to supply, whilst maintaining the existing asset base to maintain or improve levels of service. Investments are summarised in Table 1 below, showing the costs and benefits to our customers.

*Table 1: Investment Summary by Programme (2023/24 price base, post-efficiency)*

| Investment Category | Investment Summary | Proposed Investment (£m 23/24) |
|---|---|---|
| **AR3 Cat 1** | Abstraction, Sources and Raw Water Transfers | 451 |
| | Water Treatment | 30 |
| | Water Transmission | 113 |
| | Water Pumping Stations | 33 |
| | Water Distribution & Demand management | 855 |
| | Other programmes | 378 |
| **Enhancement Cat 2a – Regulatory** | Water Treatment | 1 |
| **Enhancement Cat 2b – Regulatory** | Water Treatment | 17 |
| **Enhancement Cat 3** | Water Distribution & Demand management | 31 |
| | Resilience | 103 |
| | Other programmes | 65 |
| **Total** | | **2,076** |

The Investment Planning Technical Appendix provides detailed information on the investment scenarios considered and the optioneering process.

SR27 investment into Water Continuity makes up 25% of the total SR27 Investment of £8.3bn, as shown below.

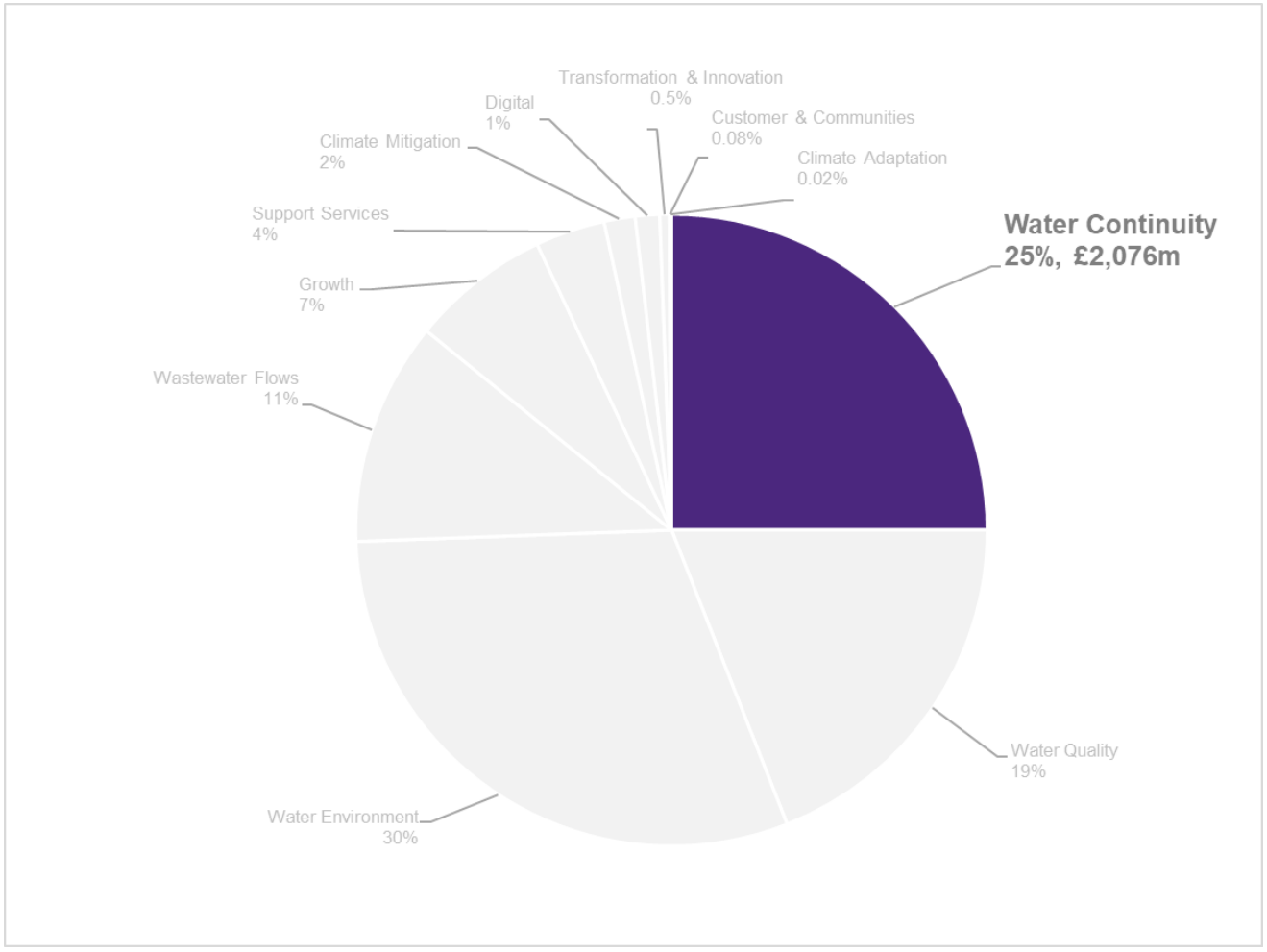


*Figure 1: Water Continuity investment as a proportion of the total SR27 investment*

# 2 Background

## 2.1 Scope of Technical Appendix

Scottish Water supplies ~1.8 billion litres of water to 2.64 million households and 161,000 businesses across Scotland every day. The Water Continuity investment area covers all investment required during the SR27 period (2027-33) to maintain or improve service outcomes relating to the provision of a continuous supply of drinking water to customers which is both reliable and resilient for the long term, meeting regulatory requirements, customer expectations, Ministerial Objectives and our Long-Term Strategy to ensure that Scotland's tap water remains a source of national pride.

The investment proposed under Water Continuity will target the highest risks associated with maintaining the performance and service provided by the existing asset base, whilst delivering the enhancements required to mitigate the challenges from climate change and other threats. This will include reducing the supply-demand deficit gap, improving the resilience of our assets and continuing to maintain assets across our source-to-tap systems which are key to maintaining supplies to customers. This includes structural assets such as intakes, dams, raw, trunk and distribution mains, pumping stations and buildings, along with ancillary assets and supporting systems such as valves, metering, SCADA, telemetry, security and power supplies, and improving our response and recovery capability. Also included is investment required to address long-term sludge storage risks at water treatment works sites.

This technical appendix details the drivers behind the investments, identifies the needs that will be addressed during the SR27 period and outlines the benefits for the Scottish population. It provides an overview of the allocation strategy for the investment, the methodology used for selecting options, and the most efficient delivery plan for Water Continuity investments across SR27.

## 2.2 Context

The investment needs presented in this document are required to meet Scottish Water's legislative obligations, including the Ministerial Objectives, and align with Scottish Water's Long-Term Strategy and policies to address existing areas of unsatisfactory service performance and risk, whilst mitigating risks to service associated with the key long-term challenges as set out below:

**Legislative Requirements**

Key legislation relating to the Water Continuity investment area includes:

- **The Water (Scotland) Act 1980** - sets out Scottish Water's duty to provide a supply of wholesome water to every part of its limits of supply. The 'Act' gives Scottish Water powers to protect the supply network and resources through corrective action (repairs), preventing misuse, contamination and wastage of water, restricting hose pipe use and also to supply water during a drought.
- **The Water Resources (Scotland) Act 2013** makes it a statutory duty for Scottish Ministers to take such reasonable steps as they consider appropriate for the purpose of ensuring the development of Scotland's water resources. It gives Scottish Water powers to monitor and manage the quality of water in the water environment that is likely to be used for human consumption and sets out a legal framework for Water Shortage Orders which enables Scottish Water to carry out various actions to conserve water and access additional sources.

- **The Reservoirs (Scotland) Act 2011**, enforced by SEPA, sets out the regulatory requirements on Scottish Water, as a registered reservoir manager, for the safe construction and operation of reservoirs above 25,000m$^3$. The Act requires the appointment of supervising and inspecting engineers to oversee the ongoing inspection and maintenance of reservoir structures, including matters to be taken in the interest of safety (MIOS) within a specified timescale.
- **The Security and Emergency Measures (Scottish Water) Directions (SEMD) 2019**, set by Scottish Ministers, require Scottish Water to have plans in place to ensure the provision of essential water supply in a civil emergency or any event threatening national security.
- **The Security of Network and Information Systems (NIS) Regulations 2018** provide legal measures to boost the level of security (both cyber & physical resilience) of network and information systems for the provision of essential and digital services. As a designated 'supplier of an essential service', Scottish Water is required to comply with the regulations, which are regulated by the DWQR, primarily in relation to its SCADA, Human-Machine-Interface (HMI) and other control equipment used on operational sites.
- **The Public Water Supplies (Scotland) Regulations 2014 (as amended),** the primary purpose of which is to define and ensure the provision of wholesome water, is also applicable to the Water Continuity investment area in terms of the quality of new or alternative sources which may be required to address long-term supply-demand balance deficits or support short-term drought response activities.

  The Regulations also place a duty on Scottish Water to assess, control and report water quality risks across all water supply systems. To achieve this, a Water Supply Risk Management (WSRM) system, covering both quality and continuity risks, has been developed and implemented in line with the requirements of British Standard EN15975-2, with independent approval being achieved in December 2023. The key investments proposed under this Technical Appendix have been validated by the new risk system where applicable.
- **The Landfill (Scotland) Regulations 2001**, enforced by SEPA, require all long-term waste storage facilities to meet minimum criteria, with any storage facility where material is stored on site for more than one year should meet the requirements of the regulations.

Other relevant legislation to note but primarily covered by the Water Environment investment area:

- The European **Water Framework Directive (WFD)** which became law in Scotland as the **Water Environment and Water Services (Scotland) Act 2003** (WEWS Act). The WEWS Act aims to protect and improve the ecological status of the water environment while safeguarding the social and economic interests of those who depend on it. River basin management planning is the method to achieve this, with the first River Basin Management Plan (RBMP) established in 2009.
- **The Water Environment (Controlled Activities) (Scotland) Regulations 2011** (as amended 2013, 2017, and 2021) brought into effect the requirement of Section 20 of the WEWS Act, more commonly known as the Controlled Activities Regulations (CAR). Under CAR, Scottish Water must have authorisation for abstraction of its water sources and has a duty to take all reasonable steps to secure efficient and sustainable water use.

Recognising the challenges posed by a changing climate, the Scottish Government, in collaboration with Scottish Water and other Industry stakeholders, is developing policy for the

future of the Scottish water industry and how it can respond to the impacts of the climate emergency. As this work has yet to be concluded, any associated investment requirements have not been explicitly included as part of the proposals for the Water Continuity investment area. However, as set out through Scottish Water's Long-Term Strategy and Climate Change Adaptation Plan, climate change could impact the ability of our assets to maintain current levels of service relating to water continuity, and progress on addressing these challenges will be required in SR27. The policy changes or requirements under consideration include:

- The proposed approach to planning for Scotland's water resources.
- Proposals for Scottish Water to undertake water resource and strategic drought planning.
- Proposals to increase action on leakage as required by the recast Drinking Water Directive (rDWD).

**Ministerial Objectives**

Our investment plans for Water Continuity in SR27 are required to meet the following Ministerial Objectives:

- Make progress towards the realisation of the long-term vision of the water industry.
- Understand the condition of assets, in particular those of a critical nature for maintaining service delivery and develop an evidence-based strategy to inform the long-term asset replacement needs of the industry.
- Continue to implement and evolve plans for adaption measures necessary to protect services from climate change.
- Identify and provide new strategic capacity that will meet the demand of all new housing development and the domestic requirements of commercial and industrial development for the 2027-33 period.
- Review and update existing plans to address the resilience of our networks, systems and supplies, and take steps to secure further improvements to resilience to ensure continuity of service.

**Long-Term Strategy**

The key objectives of Scottish Water's Long-Term Strategy to 2050, relevant to Water Continuity, to deliver the outcome of ensuring that Scotland's tap water remains a source of pride are:

- Continue to ensure no one has persistent low water pressure and fewer people experience recurring low pressure.
- Reduce the amount of water lost through leakage by 20% to 380 million litres per day, focusing on the areas where it benefits people and the environment the most.
- Improve the resilience of our treatment works and pipes and improve our planned maintenance and operational response to reduce the amount of water which is lost and the impact on the environment in the event of a burst.
- Accelerate the replacement of our water mains pipes that we know are more likely to burst due to their material.
- Reduce the amount of water abstracted and treated every day, helping to make us more resilient to the worst drought Scotland has experienced.

- Consider localised solutions to reduce demand and maximise the water available from our existing sources in areas at risk of water scarcity, before developing new sources.
- Improve connectivity of our existing systems to increase flexibility to move water around and improve resilience in times of drought, particularly in Edinburgh, Fife and Dundee.

**Key Challenges**

- **Climate and Demographic Change** – with a prediction of warmer, drier summers, population increase and migration from west to east of Scotland over the next 25 years, the amount of water available in the environment for public water supplies is expected to fall short of demand requirements by 240 megalitres per day (ML/d) during drought conditions[1], further exacerbated by Scotland being one of the highest per capita water users in Europe. Conversely, our assets and ability to maintain supplies also face increasing threat from more extreme weather conditions such as storm events leading to power outages or localised flooding, and varying wet / dry conditions resulting in ground movement causing pipes to burst and leakage to increase.

- **An extensive and ageing or deteriorating asset base** – our source-to-tap system includes 173 operational impounding reservoirs, 747 water pumping stations, over 49,000km of pipes and other supporting assets and systems which need to be operated and maintained to provide a continuous supply to over 5 million domestic customers, along with commercial and industrial users, across Scotland. Our critical, large infrastructure assets, such as dams and trunk mains, require ongoing inspection and maintenance to ensure that they not only maintain supplies for the long-term but do not pose a risk to others from catastrophic failure. Progress is also required to mitigate other high risks to service, including the risk of short-term interruptions to supply associated with asbestos cement pipes. It is also critical that our control, automation and security systems are maintained in line with industry standards and continue to protect our assets from external factors.

## 2.3 Past Performance and Challenges

### *2.3.1 Resilience and Long-Term Interruptions*

Although the majority of supply interruptions are classified as short-term (less than 3 hours), our assets are facing increasing risks from a wide range of hazards with the potential to have greater impact on customers through long-term interruptions to supply which exceed our corporate risk appetite. These risks include environmental and demographic change which will impact the availability of water to sustain supplies, particularly under worst-historic drought conditions. Events may also be caused by failure of strategic assets serving large populations and / or which present significant challenges to the quick restoration of supplies.

Although such events are rare, those seen during SR21 have had the potential to have a significant impact on customers, such as the flooding of the Inchgarth raw water storage and pumping station complex in 2022, potentially compromising supplies from Mannofield Water Treatment Works (WTW) serving customers in Aberdeen.

During Storm Arwen in 2021, supplies to 1.5 million customers were maintained through the use of standby power generation at 43 water treatment works and 15 other sites. However, supplies

[1] Scottish Water Climate Change Adaptation Plan

to 18,000 customers were disrupted due to the loss of mains power caused by storm damage to the power network, with some small rural communities experiencing long-term interruptions.

In 2023, draft Water Shortage Orders (WSO) were developed for supplies in parts of the country in response to low rainfall and warm weather in the spring and early summer, and emergency measures were deployed to maintain water supplies on parts of Skye.

These events highlight the ongoing requirement to ensure that Scottish Water's resilience capability is sufficient to meet current and future challenges, and is consistent with the 4 Rs of resilience for the water industry[2]:

- **Reliability** – reducing the likelihood of an asset failing and impacting on customers, through its original design and construction, through to its ongoing inspection and maintenance.
- **Resistance** – providing additional capability by hardening assets to specific threats to mitigate the risk of damage or disruption.
- **Redundancy** – providing additional capability to the asset base, such as installing back-up or ensuring spare capacity, so if one part fails, another can take over.
- **Response and Recovery** – where things do go wrong, we have the right technology in place to give us early warning of potential incidents and the right plans and equipment ready to use to implement an effective and quick recovery, avoiding or limiting direct customer impact.

#### 2.3.1.1 Water Availability

Since the formation of Scottish Water, significant improvements have been delivered to ensure that our raw water sources and water treatment works can maintain supplies during dry weather and periods of high demand. Our original service levels for raw water yield were based on maintaining treated water supplies during a drought event with a 1:40 (2.5%) probability of occurring in any given year. In addition, environmental improvements have been delivered to meet Water Framework Directive requirements relating to our abstraction and compensation flows, with the latest River Basin Management Plan requirements to be completed by December 2027 (see the Water Environment Technical Appendix).

As we have increased our hydrological modelling capability and our understanding of the impact of climate change on raw water yields, we now consider it more appropriate to plan for a more severe drought of 1:150 (0.67%) probability, which is broadly aligned with the worst historic droughts on record. Other areas of the UK are required to plan to maintain supplies during more extreme plausible droughts of 1:500 (0.2%) probability but more work is required to understand plausible droughts in Scotland.

Ongoing climate change and forecast changes in population mean that the risks associated with our ability to maintain water supplies during periods of peak demand or during extended periods of dry weather will continue to increase. Our water resources and storage capacity have historically been designed and managed on the basis that Scotland enjoys frequent rainfall, particularly in winter, which can regularly recharge our sources. However, with reduced rainfall during periods when customer demand is likely to be higher, our limited storage volumes are expected to deplete at a faster rate, putting both supplies and water quality at risk3. At the same

[2] UKWIR: Resilience-performance-measures-costs-and-stakeholder-communication (2017)
[3] Scottish Water Climate Change Adaptation Plan

time, there may be new demands on Scotland's water to provide increased irrigation to support agriculture, changes in land use and potential new industries.

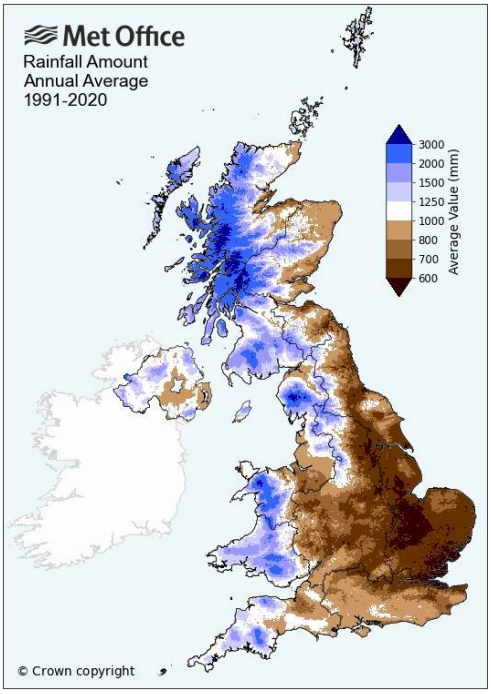


*Figure 2: Annual Average Rainfall 1991-2020 (source: Met Office)*

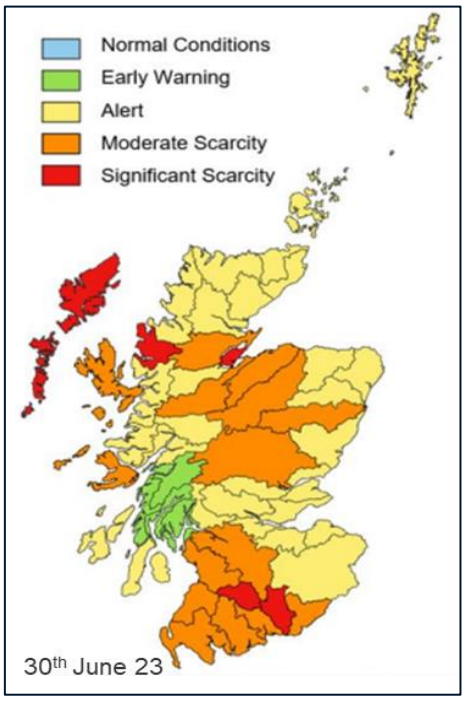


*Figure 3: Water Scarcity Map - June 2023 (source: SEPA)*

Since 1991 the east of Scotland has experienced lower than average rainfall (Figure 2: Annual Average Rainfall 1991 – 2020) and, although the west has seen higher than average levels, water scarcity can be experienced across any part of the country in any given year, such as in 2023 when low rainfall during the spring resulted in much of the country being at moderate or significant scarcity by early summer (Figure 3: SEPA Water Scarcity Map – June 2023).

Scottish Water routinely monitors the levels of its water sources and, as drought conditions develop, appropriate response measures are prepared and deployed in line with its system and regional based drought plans. These plans aim to provide full or partial resilience for events equivalent to the worst-historic drought on record without imposing restrictions on customer use.

The development of drought conditions across 77 reservoir systems is monitored through a series of drought triggers (Figure 4), starting with Close Monitoring (green), progressing to Drought Watch (yellow), Drought Warning (amber) and Drought Impacts (red). Since 2018, there have been 5 years when the total number of systems entering drought trigger has exceeded 30, with Drought Impacts being recorded in 5 years. This results in high levels of activity being required by water resources, operational and delivery teams to mitigate the drought risk and maintain supplies. It is also critical that our drought response options are tested to ensure they deliver the level of mitigation expected, and that our drought plans and supporting hydrological models are reviewed and updated to ensure they remain fit-for-purpose.

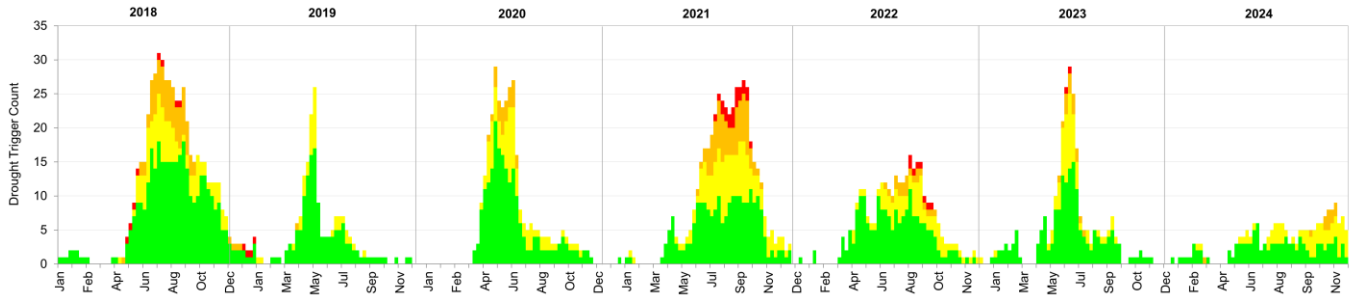


*Figure 4: Drought Triggers 2018 - 2024*

It is forecast that the availability of raw water supplies during low rainfall periods equivalent to a 1:150 event will fall short of customer demand by 240 ML/d by 2050. This compares to a current deficit of 60 ML/d, without taking into account climate change impacts expected by this time, or 160 ML/d with climate change impacts. The impact of climate change, both now and in the future, increases the risk of long-term supply interruptions or restrictions in water use being required through Water Shortage Orders, particularly for east-central Scotland where the projected combined deficit is 122 Ml/d.

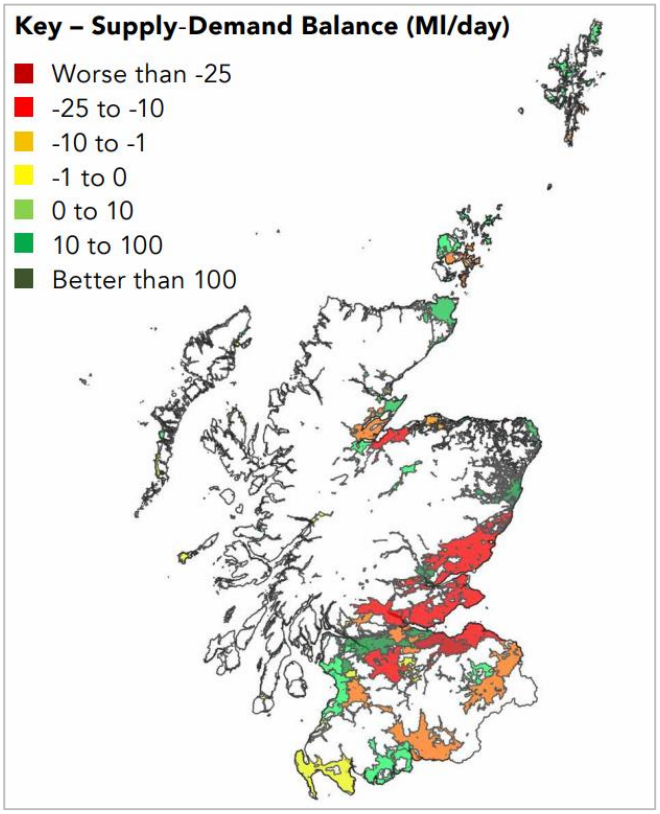


*Figure 5: Supply-Demand Balance Forecast 2050*

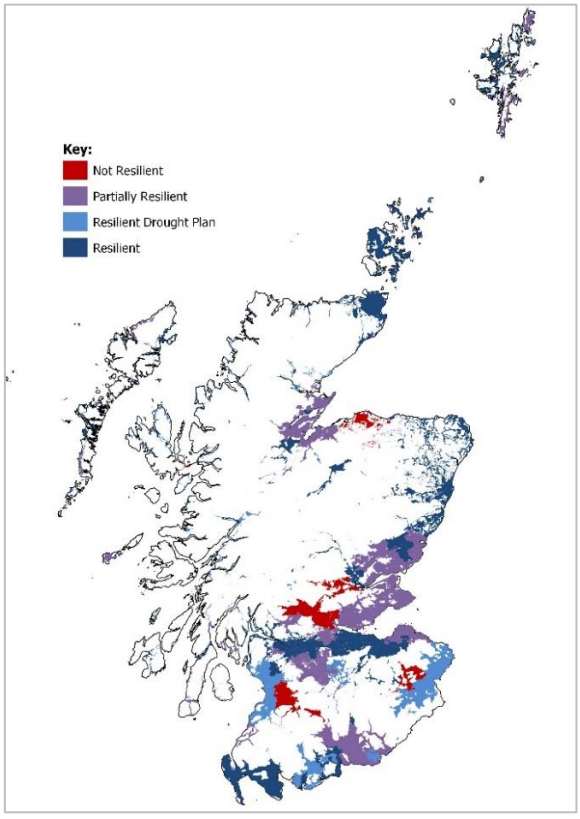


*Figure 6: Current Drought Plan Resilience 2025 (without climate change impacts)*

Although drought plans will continue to play a key role in mitigating these risks (Figure 6: Current Drought Plan Resilience), where sufficient drought resilience cannot be achieved in a way which is sustainable for customers, operators and the environment either now or in the future, other measures such as alternative sources and increased connectivity will be required to deliver resilience to a 1:150 drought event.

Although the drought planning and response activities have avoided the requirement for customers to be directly impacted by water use restrictions (e.g. hose pipe bans) as a result of drought, during high-risk periods customers are reminded to use water wisely through national

and targeted press campaigns to reduce the demand on supplies and to protect the environment.

In addition to the risks associated with raw water availability, a number of supplies across the country are also constrained by the capacity of the water treatment works and networks serving the area, particularly during peak demand periods (e.g. Tiree, Balmichael). This can cause both temporary and longer-term challenges, with response measures such as tankering being required to maintain supplies for short periods, through to potentially constraining development by not meeting the requirements of the local populations. Similar to drought resilience measures, this may also drive the need for new sources and additional connectivity with neighbouring systems, along with new water treatment works or additional process streams to provide addition capacity.

However, with levels of domestic demand for water in Scotland being amongst the highest in Europe, a significant change in how water is viewed and used in Scotland will also be required as part of the range of measures to meet the challenges relating to water availability and to safeguard public water supplies and the environment.

#### 2.3.1.2 Water Demand

The total demand for water for the public supply is reported as the volume of treated water leaving our water treatment works and passing into the distribution system, referred to as distribution input (DI), the breakdown of which is shown in Figure 7. ~21% of total DI is supplied to non-domestic (industrial and commercial) customers, 51% supplied to 5.4 million domestic customers, and 25% attributed to total leakage.

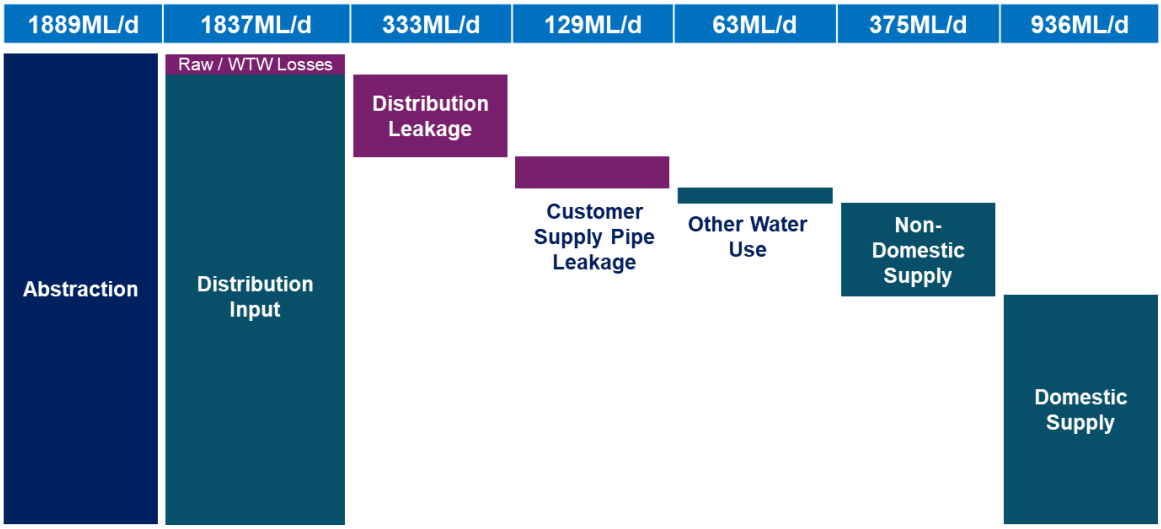


*Figure 7: Distribution Input Waterfall Diagram*

Average per-capita consumption (PCC) in Scotland is equivalent to ~180 litres per person per day (l/p/d), although this varies significantly across 189 Water Resource Zones (WRZ) due to a combination of locations (urban and rural) and the varied socio-demographic distributions across Scotland. This represents an increase from pre-Covid levels of 165 l/p/d, attributed to hybrid working, and puts Scotland amongst the highest per-capita consumers in the UK and Europe (Figure 8).

With an increasing population, the prediction of higher temperatures and greater frequency of drought conditions, reducing the level of consumption will play an important role in closing supply-demand deficits and further improve the sustainability of water abstraction. This will help

to protect our water sources, relieve pressure on the distribution network during periods of peak demand and protect the environment by only abstracting what is required. Reducing demand will also help support a flourishing Scotland by enabling growth and development. This will be achieved by working with both domestic and non-domestic customers to increase awareness about the amount of water consumed and its impact, highlighting ways to save water, whilst understanding the benefits, and expanding the use, of smart meter technology and other innovations.

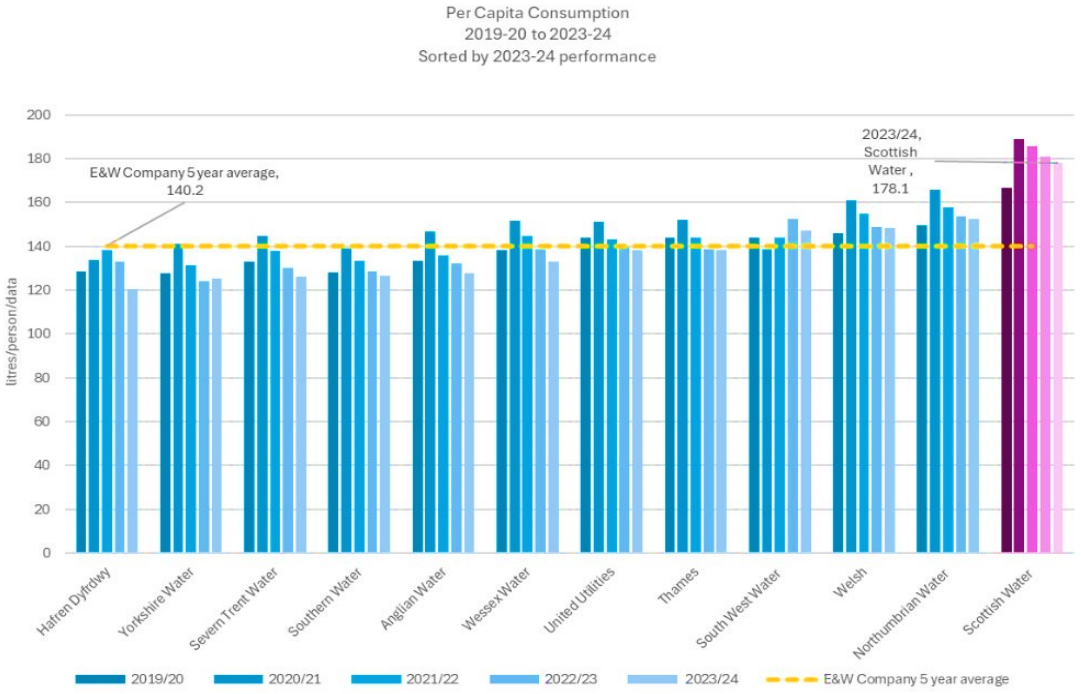


*Figure 8: Average Domestic Water Consumption*

In early 2025, a domestic smart monitoring trial was launched in Dundee to explore if providing homeowners with regular information about their water use would change their usage patterns and to assess the potential for significantly reducing domestic demand. This trial is expected to report in 2028 with the results informing the role of smart monitors in reducing domestic demand in the future.

The domestic smart metering trial follows a successful pilot in SR21 with 3,000 non-household / business users in Inverness and Orkney and a nationwide rollout of smart metering for 136,000 business customers is now planned. The non-household programme is targeting a sustainable demand reduction of 80Ml/day to be fully realised in SR33. Within SR27 we are forecasting the roll-out to deliver a 65Ml/day reduction through initially prioritising deficit zones to address water supply constraints. The projected 80Ml/day demand reduction comprises:

1. **Customer Side Leakage (32Ml/day)**: Early identification of leaks, bursts, and continuous flow (including plumbing losses) currently measured as usage / demand, enabling proactive resolution and accurate billing.
2. **Network Leakage (40Ml/day)**: Enhanced visibility of consumption patterns allowing more efficient detection and repair of Scottish Water network leaks, contributing 25ML/d of the overall leakage reduction targeted in SR27 and a further 15ML/d in SR33.
3. **Customer Demand (8Ml/day)**: Behavioural changes resulting from increased customer awareness of usage patterns and their impact on bills.

Scottish Water operates one of the largest and most distributed water networks in the UK with over 49,000km of pipelines across the country. Such a large network consisting of a range of pipe materials of varying ages, laid in different ground conditions presents a significant risk of losses through leakage and challenges to control leakage to sustainable levels. Without continuous activity to maintain leakage at 462 ML/d (2024), over the course of a year leakage would increase by the equivalent of 250 ML/d.

Since 2002, when leakage levels represented over 45% of distribution input (Figure 9), leakage has been reduced by over 50% and now represents 25% of DI. However, it is recognised that we should continue to reduce leakage year-on-year from 462 ML/d reported in 2024 to 380 ML/d by 2050, to support overall demand reduction. In addition to ageing / deteriorating pipes, climate change will make managing leakage more challenging, with more variable weather patterns affecting ground conditions leading to greater risk of burst pipes and leakage as a result of ground movement. We will therefore plan to increase our leakage reduction resources, increase customer awareness and seek further innovation in the use of technology to help find and fix leaks.

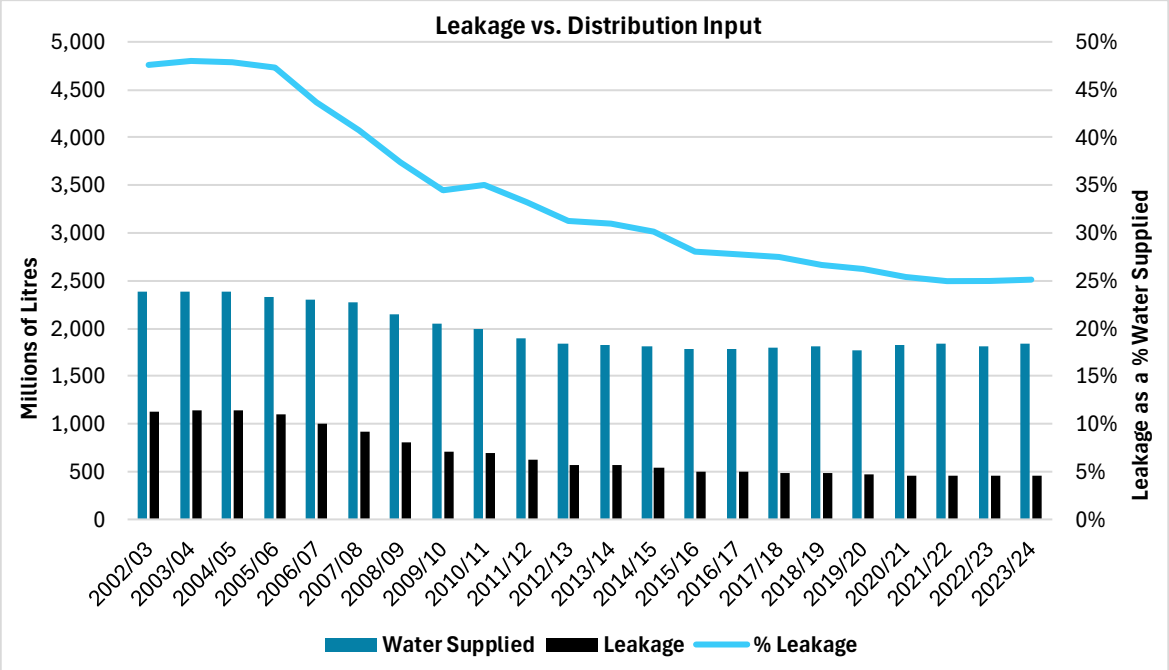


*Figure 9: Annual Water Supplied and Leakage Levels 2002 – 2024*

### 2.3.1.3 Resilience to Other Identified Hazards

Scottish Water's assets face threats from a wide range of hazards summarised in Table 2 which have the potential to disrupt supplies.

*Table 2: UK Water Industry Research (UKWIR) Resilience Hazards*[4]

| Management Control | Management Foresight | Extreme Environmental | Natural Disaster / Extreme Events |
|---|---|---|---|
| Contamination Incident | Catchment / Site Contamination | Drought / Prolonged Hot-Dry Weather | Sea Level Rise |

[4] UKWIR: Resilience: performance measures, costs-and-stakeholder-communication (2017)

| Management Control | Management Foresight | Extreme Environmental | Natural Disaster / Extreme Events |
|---|---|---|---|
| Reservoir or Dam Break | Extreme Reservoir Contamination | Excessive Cold & Ice / Snow | Solar Flare / Space Weather |
| Power Failure | Extreme River Pollution | Storms & Gales | Epidemic / Pandemic |
| Power Loss (extended) | Fire / Major Fire | Coastal Flooding | Civil Unrest |
| Cyber Attack (malicious control) | Chlorine (supply chain) | Fluvial Flooding | War |
| Cyber Attack (virus) | Supply Chain Failure | Groundwater Flooding | National Strike |
| Telecoms Failure (including telemetry) | Commodity Prices and Economic Change | Surface Water Flooding | Earthquake |
| Access Loss (for maintenance / supply) | Materials Shortages | Landslip / Subsidence | Tsunami |
| Asset Failure | Major Fuel Crisis | Lightning Strikes | Volcanic Activity |
| | Malicious Damage / Sabotage | | Aircraft Crash |
| | Security & SEMD Related | | Transport Disaster |
| | Third Party Interventions | | Nuclear Incident |

Although a number of the hazards are controlled by arrangements or factors external to Scottish Water, many hazards require steps to be taken by Scottish Water to ensure they are adequately controlled. Aligned with the four Rs of Resilience, these steps include asset maintenance to ensure the ongoing reliability of key strategic assets, enhancement to improve the resistance and redundancy of the asset base and having the appropriate response and recovery plans and equipment in place, in line with our Management Approaches.

To ensure the reliability of our assets, we will need to continue our programmes for the inspection of key infrastructure assets such as reservoir structures, aqueducts, raw and treated water trunk mains, and pipe bridges, prioritising follow-on maintenance work for delivery. This will help to reduce the risk of events such as those seen in Glasgow in 2021 and 2025 where major trunk mains failed causing disruption to water supplies and the local community due to the associated flooding and damage caused (Figure 10).

*Figure 10: Repairs to Trunk Main 2025 (left) and Flooding Following Trunk Mains Burst (right)*

To deliver our responsibilities as Reservoir Managers under the Reservoir (Scotland) Act 2011, we undertake statutory and non-statutory inspections of 173 operational and a further 85 non-operational impounding reservoirs to ensure their ongoing integrity, safeguarding supplies and protecting downstream communities from catastrophic flooding events. In addition to routine maintenance activities, measures to be taken in the interests of safety as identified by appointed inspecting engineers must be completed within designated timescales.

Through our work to understand the wider impacts of climate change on our assets and services, we have identified that some of our sites will be at an increased risk of flooding in the future, which will require enhancement investment to improve their resistance to such events. In November 2023, Ballater WTW was flooded resulting in the works being inoperable for a number of days (Figure 11).

*Figure 11: Ballater WTW Site Flooding November 2023*

During storm events in particular, our assets are dependent on the availability of temporary and permanent standby generation in order to maintain the operation of key plant and equipment in the event of power interruptions. During Storm Éowyn in January 2025, 114 water treatment works, more than half of the asset base, experienced power loss, although the direct impact on supplies was limited to ~500 households. This was due to the extensive planning in both preparing for the event and responding to issues, together with previous investment to improve the resilience of key assets through permanent and mobile standby power generation capability.

Although the connectivity between our major supply systems has improved since the formation of Scottish Water with capability to supply ~50% of customers from more than one water treatment works, some keys areas such as Dundee still have limited connectivity. With the increased risk from resilience hazards, further opportunities for increasing connectivity will be considered when developing investment to address other needs.

### 2.3.2 Short-Term Interruptions to Supply and Customer Impact

Existing risks to supply, primarily due to increasing pressures on an ageing or deteriorating asset base, can result in our customers and communities being directly or potentially affected by asset failures or constraints in the supply system. Issues which impact customers most frequently include supply interruptions due to burst water mains, with some customers being affected repeatedly. Burst mains can also have a wider impact as a result of localised flooding and damage, along with disruption as repairs are undertaken to restore supplies.

Although the number of bursts has decreased since 2010/11, the number of properties affected by interruptions to supply has increased from 143,000 in 2010/11 to 308,000 in 2022/23 (Figure 12). Whilst 70% of these are resolved within 3 hours, they still have an impact on customers and require intervention by operational teams and supporting contractors to undertake the repairs required to restore supplies quickly. (N.B: interruptions relating to storm and other events also included in Figure 12).

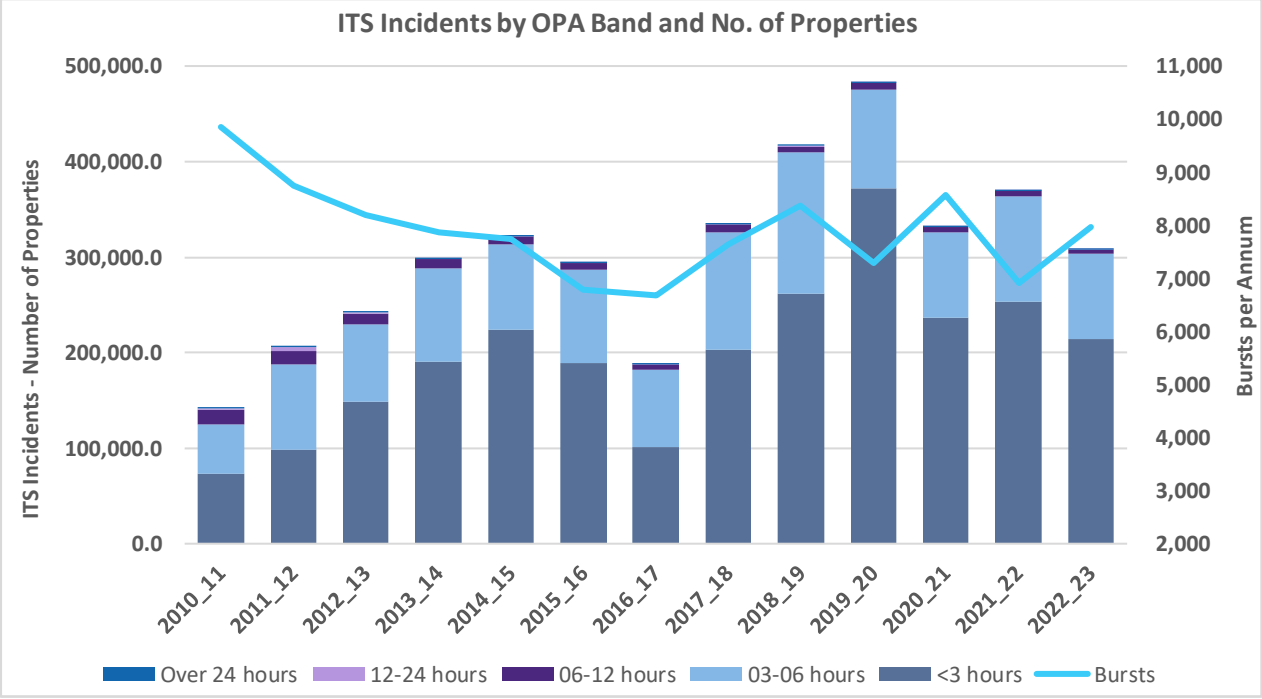


*Figure 12: Mains Bursts and Associated Interruptions to Supply*

Following high levels of mains rehabilitation in the SR02 investment period with 3,000km of pipes replaced, focus in SR06 and SR10 turned to leakage reduction, partly achieved through pressure reduction across distribution systems through the wider installation and use of pressure reducing valves (PRV). This delivered the added benefit of reducing the number of bursts seen from 2010/11 (Figure 12), extending the life of the distribution mains and allowing lower levels of rehabilitation. However, as pipes have continued to deteriorate, the benefits from pressure management have reduced over time resulting in greater variability in performance and the overall increase in burst rates seen from 2016/17 to 2022/23. Based on projections from

our Water Asset Risk Model (WARM), burst rates will continue to rise for the majority of pipe materials as over half of the asset base progresses beyond its design life by 2053.

Of particular concern are 5,000km of asbestos cement (AC) pipes, with burst rates increasing from ~160 bursts / 1000km in 2009 to ~260 bursts / 1000km in 2024. Similar to observations made by other water companies, including Welsh Water[5], the structural strength of AC pipes deteriorates over time due to the leaching of the cement (lime) portion from of the pipe wall, both internally, due to the largely soft waters across Scotland, and externally, where pipes are laid in acidic soils. Varying ground conditions as a result of wetting and drying throughout the year can also accelerate the leaching of the cement layer and create ground movements that further weaken the pipes. The observed increase in failure rates is leading to recurring supply interruptions, increased customer contacts, and interest from community representatives. With the modelled failure rate projected to double by 2045 as the pipes approach or exceed their design life of 90 years (Figure 13), accelerated replacement is required to reduce the impact on customers.

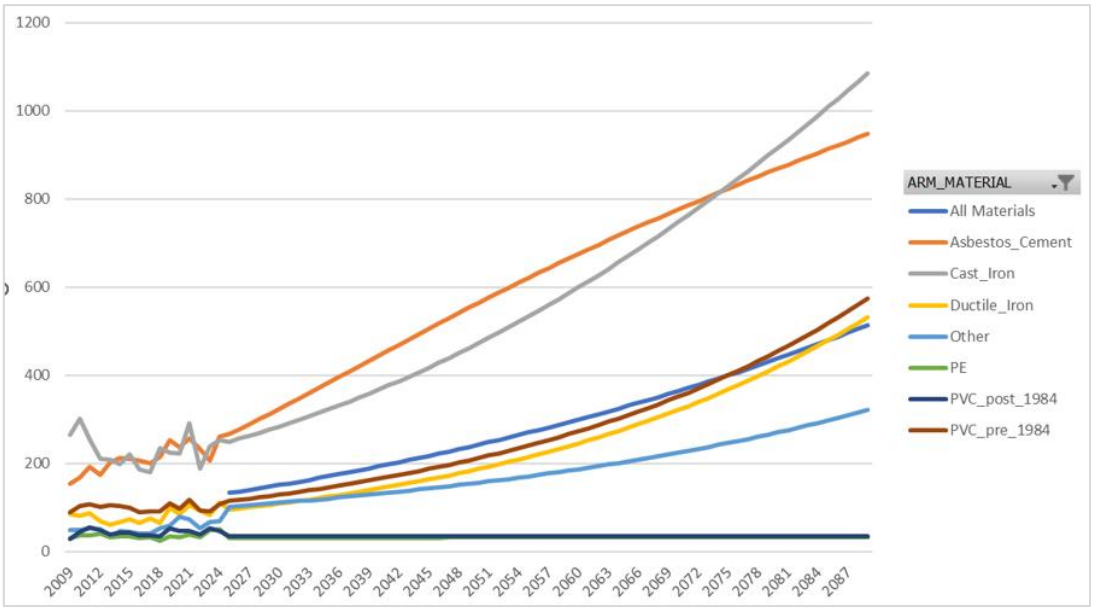


*Figure 13: Modelled Burst Rates by Pipe Material*

Asbestos cement pipes also contribute to the number of customers impacted by recurring interruptions to supply, with customers in 291 postcodes having to contact Scottish Water about a loss of supply on either 6 or more occasions in the past year or 10 or more occasions in the last 3 years (Figure 14). As 20% of mains which fail then go on to fail again, together with the overall predicted increase in bursts, there is a risk that more customers will experience repeat interruptions in the future, particularly in areas supplied by AC pipes.

[5] Enhanced Investment Case: WSH62-RS01 - Increasing Resilience of Tap Water Supply - Asbestos Cement Mains

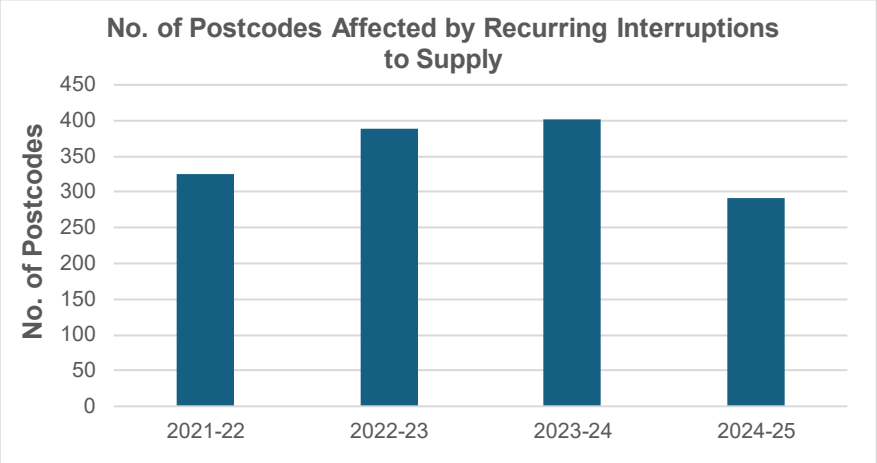


*Figure 14: Recurring Customer Interruptions*

Customers may also be impacted by variable or persistent low pressure as a result of deteriorating water mains or reduced system capacity. There are currently 39 properties on our Low Pressure Register where water pressure fails to meet the minimum service standard of 1 bar, with the potential for the number of properties on the register to triple by 2050. In addition, 90 properties experience pressures of 1 to 1.5 bar which result in customers having to contact Scottish Water regarding their supply. Customers may also experience transient low pressures, typically due to one-off events such as burst mains or periods of high demand. However, a proportion of these may become persistent if there is a continued increase in demand on local networks or ongoing mains failures.

Periods of particularly high demand may also exceed the capacity of distribution systems resulting in low pressure or, in more extreme cases, interruptions in supply as the network is unable to convey sufficient water, as seen in North-East Fife during periods of warm, dry weather, coinciding with burst mains, in April 2022 and August 2024. Some small supply systems in other popular tourist locations are also more prone to seasonal variation in demand (e.g. Skye) which may compromise supplies by putting more pressure on the availability of raw water sources or exceed the capacity of the supplying water treatment works. Such events require extensive operational responses to maintain supplies, such as tankering when in 2021 and 2022 over 2,500 tanker movements were required each year. These pressures cause concern within local communities, with customers being worried about not having water when they turn on their taps, and also due to the disruption caused by response activities to maintain service, as well as putting strain on operational teams.

Repeat events such as these are reviewed in line with Scottish Water risk governance processes and policies[6] to ensure that sustainable solutions are put in place to reduce the risk of them reoccurring or to improve how they are managed.

### 2.3.3 Maintaining Service and Ageing / Deteriorating Assets

In addition to the maintenance of strategic infrastructure and distribution mains relating to resilience (reliability) and short-term interruptions respectively, a base level of ongoing asset repair, refurbishment and replacement (AR3) is required to maintain the operation and performance of the existing asset base to maintain current levels of service (excluding the potential impacts of climate change in the future).

[6] Policy on the Use of Tankers to Maintain Continuity of Supplies

During SR21, investment needs have been identified from inspection programmes covering a range of asset types, interventions in line with frequencies set by Management Approaches, observations of risks and issues from operational sites, and water risk management processes. Many of these needs will require to be addressed in SR27.

We have 652 treated water pumping stations and 95 raw water pumping stations containing 2438 pumps. 80% of these are considered non-critical with interventions undertaken on a responsive basis as issues arise. For critical assets (as defined by the relevant Management Approach), proactive interventions are undertaken based on the condition and performance of the equipment, with condition-based monitoring being used for larger pumps to provide early warning of potential failures and reduce the cost of intervention.

To meet and sustain compliance with the NIS Regulations, investment is required to ensure that key control and automation technology on operational sites remains fit-for-purpose and can be routinely maintained to ensure the secure and reliable operation of water treatment works and pumping stations.

## 2.4 SR21 Delivery

~£1,511m has been allocated to Water Continuity in SR21, with the majority (84%) designated for Asset Maintenance (AR3) and 16% divided between Enhancement and Growth.

Investment in SR21 will see the completion of the Ayrshire Resilience Scheme, which commenced in SR15. This addresses significant risks associated with the potential failure of key assets and the extended response times required for their repair. This has involved a range of activities spanning the 4 Rs of resilience, including the provision of additional storage capacity and greater connectivity with the Glasgow supply system. This increased connectivity was enabled by utilising surplus capacity realised from leakage reduction, also allowing four water treatment works to be rationalised, reducing long-term costs for customers and supporting the delivery of RBMP3 objectives through reducing abstractions.

In Aberdeenshire, investment has replaced a pre-1984 PVC main between Peterhead and Ellon, known to be brittle due to the manufacturing technique at the time, addressing multiple repeat customer interruptions, and providing additional capacity to support growth and enable future resilience flows from Forehill WTW.

SR21 has also seen a significant increase in our inspection capacity and capability to support our ongoing asset maintenance activities. Our inspection programme across non-infrastructure and infrastructure assets has visited 4,000 sites and delivered ~20,000 inspections to date. The programme involves more than 25 contractors and 200 staff and will see investment of ~£120m in inspection related activities over the SR21 period. This investment has led to an increased understanding of asset condition and the data supports decision making to manage Water Continuity risk in line with our Management Approaches and risk management processes.

Increased inspections of our strategic infrastructure in SR21 have allowed us to intervene before assets fail and impact on service to customers. For example, inspection work undertaken on a critical trunk main which transfers water across Glasgow through the Finnieston Tunnel identified that the walls of the pipe were very thin. As the pipe was being taken out of service to undertake

repairs it began leaking but, using the information gathered from the inspection, six pipe lengths, including the leaking section, were replaced without impacting on customers.

Through our inspection programmes, we continue to work with our delivery partners to improve our inspection capability. This includes the use of non–intrusive inspection techniques, like p-CAT (a non-invasive, non-destructive technology for performing pipe condition assessment), for asset understanding to help minimise risk to interruptions to supply, water quality, environment and health and safety.

For our wider distribution network, our mains rehabilitation programmes, to address bursts and interruptions to supply, will result in the replacement of 550km of mains during SR21. We have also made significant progress in addressing recurring customer interruptions at over 200 postcode locations across Scotland.

Investment to deliver leakage reduction and improved connectivity will improve drought resilience to customers in the Afton and Turret Water Resource Zones (WRZ). We have also invested in updating our understanding of the impact of climate change on the yields from our raw water sources, and the implications of plausible droughts on our supplies. We also continue to test the feasibility of our drought response options to ensure they deliver the mitigation required during a drought event.

Our reservoir safety work will see ~350 matters in the interests of safety (MIOS) across 96 sites being addressed in SR21, including spillway repairs at Fruid Reservoir in the Borders, with other reservoir maintenance work, to varying degrees, being undertaken at the majority sites.

Investment in operational technology (SCADA, PLC and HMI) will replace obsolete equipment at over 25 sites to ensure the secure and continuous operation of our water treatment works and pumping station sites. Investment to ensure the safe and continuous operation of high voltage equipment including switchgear, transformers and pump motors will include work at Glenhove Treated Water Pumping Station, Ross Priority Raw Water Pumping Station and Balmore WTW.

## 2.5 SR27: Drivers of Investment

There are a number of key challenges to maintaining or improving service relating to water continuity including:

- **Climate and wider environmental change** - We will need to effectively manage our water resources at a catchment level. We will need to make steps to adapt, and increase our resilience, to the impacts of climate change and our impact on Scotland's precious water sources.
- **An extensive and ageing or deteriorating asset base** - the need for asset repair, refurbishment and replacement is likely to increase over the next 25 years, this includes needing to triple mains rehabilitation rates to maintain levels of service.
- **The Long-Term Strategy** recognises these challenges and risks and sets out the expected level of investment demand required to mitigate them to deliver the outcome of ensuring that Scotland's water supply remains a source of pride.

Based on the above context and challenges, and to meet Ministerial Objectives, the main drivers for investment in SR27 are:

### Adapting to Climate Change: Sustainable Supplies and Increasing Resilience

To effectively manage our water resources, we will need to take steps to adapt, and increase our resilience, to the impacts of climate change:

- Continue to develop our understanding of the impact of climate change on our water resources and assets and develop plans to mitigate these risks.
- Improving drought resilience in key areas: including Edinburgh, Lothian, Tayside, Fife and Moray.
- Ensure that we have treatment and network capacity in key locations (including Tiree, Kenmore, Balmichael and Turriff).
- Improve our understanding of our components of our demand and develop new options for influencing domestic customer demand.
- Seeking to reduce/manage leakage by 45Ml/d to an efficient/acceptable level.
- Updating our Water Resource Plan and exploring wider catchment planning opportunities with stakeholders
- Continuing to improve our drought management capability and developing our strategic drought plan.
- Improving our resilience to wider hazards, including power resilience, increased connectivity and our response and recovery capability, whilst updating our plans to address resilience of supplies.

### Maintaining Our Assets

- **Maintain current service levels:** maintain and operate our assets in line with our water risk management processes, including inspections of key critical assets (including dams and trunk mains) to identify and mitigate emerging risks, undertaking repairs, refurbishment and replacement across the asset base to maintain performance. Ensure that our key control, automation and security systems (e.g. System Control And Data Acquisition (SCADA), telemetry) remain fit-for-purpose in line with industry standards and regulatory requirements.
- **Maintain interruptions performance:** maintaining the number of interruptions greater than 6 hours our customers experience and reducing number of customers experiencing 6 or more incidences in a year or 10 or more in 3 years. Increasing mains rehabilitation rates with a programme focused on Asbestos Cement (AC) pipes which represent the highest proportion of failures and account for the majority of recuring customer interruptions.
- **Improving low pressure performance:** Continuing to reduce the number of customers on our low-pressure register.

### Understanding and Managing Risk

- Continuous development and improvement to our Water Supply Risk Management processes and undertake activities in line with our functional risk register and approved Board risk positions to reduce the number of risks above long-term tolerable thresholds.

# 3 Customer and Stakeholder Engagement

## 3.1 Our Customers and Stakeholders

### *3.1.1 Customers*

Customers' perception of the resilience of their water they receive through their taps is initially influenced through interruptions to supply. Such events affect the confidence of customers and stakeholders, potentially compromising their trust in Scottish Water and the public water supply, and reflect the challenges our assets are now facing due to variable environmental conditions, climate change, the need to protect our natural environment and deteriorating asset condition. This highlights the ongoing need to both maintain and, in many cases, improve the capability of our assets to deliver reliable high levels of service expected by customers. In addition, there is a need to for robust water resource management planning to ensure both supply and demand side interventions (reducing leakage and helping customers to be more water efficient) are in place at the right time to keep customer supplies resilient to climate change.

Customers participate in the decision-making through our customer engagement process and where the Independent Customer Group (ICG) assesses how well we have embedded customer needs into our plan.

### *3.1.2 Stakeholders*

Scottish Water operates within a framework of diligent oversight and collaboration, engaging with multiple stakeholders who ensure that the public water supply meets the highest standards. These stakeholders include the Scottish Government (SG), the Water Industry Commission for Scotland (WICS), the Drinking Water Quality Regulator for Scotland (DWQR) and the Scottish Environment Protection Agency (SEPA), with the wider stakeholder group also including Consumer Scotland (CS) and the Independent Customer Group (ICG):

- The Scottish Government sets national policies and objectives for water supply standards, and its role is pivotal in shaping the regulatory backdrop and ensuring that public health and environmental sustainability are at the forefront of water management practices.
- WICS is responsible for economic regulation, ensuring Scottish Water operates efficiently, scrutinising financial and operational plans to guarantee that investments deliver value for money while maintaining and improving service quality.
- SEPA focuses on environmental protection, ensuring compliance with environmental regulations and sustainability goals.
- Consumer Scotland represents the interests of water customers, ensuring that their needs and concerns are prioritised.
- The ICG works closely with Scottish Water to provide independent insights and perspectives on customers priorities, ensuring customers interests are central to decision making.

Scottish Water works closely with its regulators and stakeholders to carefully consider and ensure effective water resources management planning for current and future generations that address supply resilience and protect the environment.

## 3.2 Engagement

Customer insights are an important aspect of our investment considerations. As detailed in the Customer Research Technical Appendix, we have consulted with customers and stakeholders on Water Continuity as part of our ongoing engagement process.

Customer insights specifically relating to Water Continuity (Table 3) show that household and non-household customers consistently expect a reliable service, although the level of impact as a result of a supply interruption varies among them depending on circumstances. The most significant factor for all customers is the duration of any interruption.

*Table 3: Summary of customer insights on Water Continuity*[7]

| Research Question | Key Insight |
|---|---|
| What is the **perceived impact** of an interruption to supply? | The impact of an interruption to the water supply varies depending on the individual circumstances of the customers, and the duration of the interruption.<br><br>Household customers' immediate concerns are around not being able to drink, cook, shower or use the toilet. Individual factors can increase impact, such as timing (i.e. mornings whilst getting ready for the day), whether there is access to bottled water, and whether there are children in the household. The majority of households would find it very difficult to cope without water for long periods, affecting customers routines and wellbeing, and potentially incurring financial costs. Vulnerable customers are less able to cope, particularly if larger geographical areas are affected.<br><br>The impact on business customers varies according to their water dependency. Some businesses may have to close in the event of an interruption to the water supply, and other who are less reliant on water can still experience disruption and difficulty. Interim solutions such as bottled water may not be sufficient to enable some businesses to continue trading. |
| What are customer **expectations** of Scottish Water regarding **water continuity?** | Overall, most customers consider Scottish Water to be currently performing well in delivering a reliable and consistent water supply. It is viewed as a fundamental function of Scottish Water. Customers are unlikely to have considered the risks to water continuity presented by Long-Term challenges, especially given the perceived abundance of water in Scotland. When informed, they feel Scottish Water should take action to safeguard reliability. |
| What are customers **perceptions** of low pressure? | Overall, customer satisfaction with water pressure is generally high. However, customers are not aware of the technical definition of low pressure, and instead use language around taking showers, the strength of flow, or time taken to fill washing machines and kettles. Some customers have experienced variable pressure throughout the day and have made the connection to peak usage times. Whilst some customers accept this, others feel a degree of annoyance. Short-term pressure issues can cause confusion and anger, but customers affected by long term issues can feel frustrated, with many adapting their homes lives to accommodate the issue. Customers may not notice that they have pressure issues unless they are prompted to check for themselves or are told by a plumber to contact Scottish Water.<br><br>Business customers may be more affected by poor pressure than household customers. Some require their buildings being able to accommodate multiple staff using taps and using toilets, and others are concerned by the potential health and safety risk of scalding from improperly functioning boilers. Some businesses rely on consistent water pressure to operate machinery. |
| What are customer **expectations** of Scottish Water dealing with **low pressure?** | Customers are unwilling to put up with low water pressure, not wanting to wait for slow water coming through from taps, and expecting to be able to use multiple appliances freely. Most customers think that Scottish Water should be able to manage peak flow, in the same way as electricity or broadband companies do.<br><br>Some customers are unaware that Scottish Water is responsible for water pressure, and it is unclear to most customers where Scottish Water's responsibilities begin and end. When considering the issue, there is interest in more information to help customers understand how to assess water pressure (i.e. time taken to fill a kettle), and how to diagnose the cause of pressure issues. |

[7] SR27 Customer Research Technical Appendix

Also of relevance to the Water Continuity investment area are the customer insights relating to Asset Repair, Refurbishment and Replacement (Table 4) which is seen as important by both household and non-household customers. Whilst customers understand the requirement for asset maintenance and the challenges posed by ageing infrastructure, there is less awareness of the scale of infrastructure.

Table 4: Customer Insights Related to AR3

| Research Question | Key Insight |
|---|---|
| What is customer **understanding & acceptance** of aging assets as a challenge? | Customers are generally surprised to hear about the scale of Scottish Water's infrastructure, and to learn its age. Customers understand and acknowledge that ageing assets are a challenge for Scottish Water. They recognise the need for investment in updating and replacing these older assets. |
| What are customer **expectations** of Scottish Water in maintaining assets? | Asset maintenance is a concept that people intuitively understand. It is felt to be highly important, and core to Scottish Water's purpose as an organisation, as it is an area that is clearly Scottish Water's sole responsibility. Customers recognise the need for investment and want to see lasting solutions put in place. Making things last is seen as an important area for Scottish Water's focus, appealing to all customers and older customers in particular. They are keen to reduce the risk of service failures, as well as avoid unnecessary costs.<br><br>Customers expect this to be an ongoing area of investment with a focus on preventing future problems, and generally also expect Scottish Water to maintain or replace infrastructure before it fails to avoid issues with our services. Customers may perceive fixing assets on failure to ultimately cost more money over time. Some customers seek assurance that money is being spent on parts of the system at risk of failing, to demonstrate that investment is not being made unnecessarily. |
| What are customer **expectations** around climate adaptation of assets? | Once hearing about the scale of challenges from climate change, customers believe it is important to protect infrastructure against the impacts of climate change and there is an expectation for long-term solutions to be used. |

## 3.3 Demonstrating Customer and Stakeholder Support

Our customers have consistently told us that a reliable service and continuous supply of water is regarded as a priority and a core aspect of Scottish Water's role as it is essential for all customers to receive a water supply. Household customers are generally satisfied with Scottish Water's performance in the continuity of supply and approve of the contingency planning that Scottish Water has in place to support customers when events occur. There is an expectation that Scottish Water will respond to issues quickly and some refer to bottled water being provided. There is reference to unreliable weather and an increasing demand impacting the ability to provide a continuous supply of water in the future. However, Scotland is seen as a wet country and some respondents were doubtful about water shortages affecting the water supply. **In SR27, we will ensure that we have more treatment and network capacity in key locations, improving our understanding of our new demand, developing of components of our demand and new options to ensure an efficient, acceptable level of water supply.**

Our customers have said that the impact to non-household customers could be greater than household customers for interruptions to supply and low pressure. This is dependent on the type of business and therefore whether the business can continue to operate without water. **In SR27, we are planning to roll out smart metering for our non-household customers which**

**is expected to deliver demand reduction with a full roll out to 136,000 business customers.**

Our customers want long term solutions in place to mitigate the risk of aging assets and particularly where there are higher risks of assets failing and causing outages. **In SR27, we will continue to improve the resilience of our treatment works and pipes and improve our planned maintenance and operational response to reduce the amount of water which is lost and the impact on the environment in the event of a burst.**

# 4 Our Investments

## 4.1 Approach

To meet the objectives of the Long-Term Strategy, investment to improve the capability of our assets is required as a minimum to maintain current service levels at acceptable levels of risk to counter the impacts of climate change. This investment is covered through Asset Maintenance, which includes Asset Repair, Refurbishment and Replacement (AR3). To achieve further service improvements and make progress towards the Water Sector Vision, additional investment will be required (Enhancement). In SR27, our primary focus will be on maintaining our assets to ensure a consistent level of service, enhancing resilience to prevent supply interruptions, and providing network capacity to accommodate future growth.

### *4.1.1 Long-term outcomes and Performance Requirements*

The investment in Water Continuity aims at ensuring that water is available to customers every minute of the day, at an acceptable pressure, with no detriment on the environment. The 25-year long-term outcomes aimed at ensuring continuity of service are:

- Understanding and managing risk.
- Continue to ensure no one has persistent low water pressure and fewer people experience recurring low pressure.
- Reduce the amount of water lost through leakage by 20% to 380 million litres per day, focusing on the areas where it benefits people and the environment the most.
- Improve the resilience of our treatment works and pipes, and improve our planned maintenance and operational response to reduce the amount of water which is lost and the impact on the environment in the event of a burst.
- Increase the replacement of our water mains pipes that we know are more likely to burst due to their material.

### *4.1.2 Building our Approach for AR3*

In SR21 Scottish Water introduced Management Approaches (MAs) for each asset type which set out policy of how and when we will intervene to manage assets. Our approach is directed by our long-term outcomes, our Ministerial Objectives, current legislative requirements, and Board risk appetite statements which set the performance levels for critical and non-critical assets.

Management Approaches for each asset type have been maturing since 2023 to become economic appraisals. Impacts of climate change have also been considered, considering a range of climate hazards as identified through the Scottish Water Climate Change Adaptation Plan.

Our Management Approaches include two primary considerations:

- **When to intervene** – this considers the point in an asset's life when an intervention should occur. This includes whether to intervene after failure (responsively) or on a planned basis before failure, and if planned, at what stage to intervene to maximise the useful life of the asset while minimising the chance of failure.
- **How to intervene** – this considers what intervention is used to restore asset condition / performance. This includes options for investigations and repairs, decisions on whether to

refurbish or replace. Decisions on whether to enhance or improve the resilience of an asset when it is being refurbished or replaced are considered as part of a sub-outcome approach and made on a case-by-case basis as part of systems planning.

Key Management Approaches informing the asset maintenance requirements for Water Continuity include Strategic Infrastructure (trunk mains, raw water transfers, aqueducts), Water Demand Management, Distribution Mains, Water Pumping Stations and Reservoir Safety.

### 4.1.3 Building our Approach for Enhancement

The requirements for Water Continuity enhancement investment during SR27 originate from a range of confirmed needs relating to maintaining the supply-demand balance (aligned to the Long-Term Strategy), and ensuring long-term resilience of service delivery to climate change. In addition, some investment requirements are associated with Scottish Water policy positions to reduce risk or improve service where the current status is considered unacceptable from a customer service perspective or where progress is required to achieve long-term strategy objectives.

All investment requirements are aligned with the needs on the Development List, (established through the Investment Planning and Prioritisation Framework (IPPF) approach introduced for SR21) as agreed by stakeholders. This includes the long-term supply demand needs identified through our supply-demand balance and water resource models.

A range of information sources have been used to identify the needs initially and provide the supporting evidence for these and the subsequent investment requirements to address them. The typical information sources are summarised by project development stage below:

*Table 5: Our Stage/Gate Information Sources*

| Stage | Information Sources |
|---|---|
| **Pre-Gate 30** | To include one or more of the following:<br>• Asset / system risk and performance data;<br>• SR21 Development List;<br>• Stakeholder / customer correspondence / engagement.<br>• Needs originating from Scottish Water strategies and policies (including Management Approaches);<br>• Water Resource Supply-Demand Models |
| **Gate 30 – 90** | As above plus:<br>• Project Investment Appraisal stage documentation, confirming needs, considered options, costs and benefits appraisal:<br>• Gate 30 – Stage 1<br>• Gate 40 – Stage 2<br>• Gate 50 – Stage 3a<br>• Gate 70 – Stage 3b<br>• Gate 80/90 – Stage 4<br>• Target costs based on detailed design (Gate 80). |

| Stage | Information Sources |
|---|---|
| **Post Gate 90** | As above plus:<br>• Project spend profiles to confirm remaining expenditure into SR27. |

## 4.2 Optioneering

### *4.2.1 Optioneering Process*

The investment scenario options are built based on three key principles:

- Deliver for our existing customers: this includes carrying out essential works to maintain existing asset performance, customer experience, and health and safety, meeting legislative, regulatory and community standards and progress towards Net Zero. It also involves investing in asset enhancement to improve resilience, reliability and sustainability of service.
- Support new connections: providing adequate standards of service to our new customers.
- Consider future customers: replacing ageing assets now to ensure resilience of supply to future customers, preventing unsustainable costs being passed on to them in future.

We use our investment hierarchy approach to develop a balanced investment portfolio across all investment areas, including Water Continuity, to prioritise projects and programmes based on our objectives, customer expectations, stakeholder needs and available funding. This approach is outlined in the table below, which links the principles with three investment need categories:

- **Category 1** covers 'must do' investments, which are required as a minimum to meet customers' expectations on level of service. This category accounts for the majority of the investment.
- **Category 2**, which accounts for the next biggest share, includes 'should do' investments aimed at delivering regulatory compliance and meet the expectations of regulators.
- **Category 3** covers investment choices to improve service for existing customers, enabling growth, replacing ageing assets to protect service levels for future customers.

*Table 6: Our Investment Hierarchy Approach*

| | Customer & performance centric investment needs | Description | Investment allocation approach | Mapping to FD | |
|---|---|---|---|---|---|
| Deliver for existing customers | 1 **Maintain core service performance for existing customers** | Essential works to maintain existing asset performance, customer experience and health & safety | Minimum needed to maintain service. Already prioritised significantly so budget reduced as a last resort, after all other non-discretionary expenditure reduced to minimum levels | AR3 – asset category 1,2&3 | Core expenditure |
| | 2 **Meet current regulatory & community commitments** | Meet legislative (RBMP3), regulatory (water quality), (IUW) community (e.g., Seafield odour) and progress Net Zero by 2040 | SR15 and matched funding<br>Then allocated portion of Enhancement funding | Enhancement (incl. matched funding )<br>SR15 | |
| | 3A **Improve service for existing customers** | Investing in asset enhancement to strengthen resilience, reliability and sustainability of service | No ring-fenced allowance. Absorbed within Enhancement<br>Allocated portion of Enhancement to support internal flooding and low pressure | Enhancement<br>Incl. ring-fenced allowance | Remaining allocation prioritised within these areas |
| Support new connections | 3B **Provide a service for new customers** | New development and connections, including temporary works | Currently £100m committed and known sites like Bertha Park are advancing | Enhancement | |
| Consider future customers | 3C **Replace long-life assets for future customers** | Proactively replacing aging assets to tackle back log and underlying issues; water mains (Asbestos cement pipes), civil infrastructure with lifetime of 40-60 years). Aim to prevent unsustainable costs being passed on to future customers | Consequential allocation as there is high demand from existing assets that impact current service. FD & investment scenarios do specify investing in long-life asset replacement. Future customer needs re-prioritised | AR3 – category 2 Civils and water mains, pressurised sewers | |

An initial unconstrained investment scenario has been developed to fulfil all the principles outlined in Table 8, ensuring the delivery of all essential requirements to maintain the current level of services, as well as enhancing performance while minimising risk. From this unconstrained investment scenario, additional investment scenarios have been derived by strategically reducing or eliminating investments in certain areas, with the exception of Category 1. These "constrained" scenarios aim to achieve lower costs, but come with associated risks, as the limitation on investment may impact performance improvements and compliance with regulatory requirements, ultimately affecting customer service enhancements.

### 4.2.2 Unconstrained Options

The formulation of investment planning scenarios is essential for aligning strategic and financial objectives with the Water Sector Vision and our Long-Term strategy. The initial phase involved creating a comprehensive range of options to encompass potential outcomes and investment requirements. The unconstrained options incorporate all potential investment options, with a focus primarily on maintaining all assets involved in ensuring uninterrupted supply of water to customer taps. The total number of investment options considered was 87.

Table 9 below provides details of the number of Water Continuity enhancement investment options considered for SR27 detailed by investment category. To identify the best suite of interventions from the options, we have undertaken an optioneering process, applying testing across various performance metrics and compliance requirements to form a series of constrained options, the investment scenarios.

*Table 7: Water Continuity Unconstrained Options*

| Investment Hierarchy | Number of Options |
|---|---|
| Category 1 - AR3 | 46 |
| Category 2 - Commitments (e.g. Growth, NRWSA, Infra Charges, Compliance Monitoring) | 4 |
| Cat 2a & 2b - Regulatory (e.g. RBMP, Security, Sludge) | 12 |
| Category 3 - Supply & Demand / Low Pressure | 25 |
| **Total:** | **87** |

### 4.2.3 Constrained Options

The constrained investment scenarios were derived from the unconstrained investment options by either eliminating or reducing certain investments. The three constrained investment scenarios discussed in this section are as follows:

- **High Scenario**: The investment meets Ministerial Objectives and further reduces risk with a CPI + 6.5% per annum, maintaining the service levels achieved at the exit of SR21 with the exception of improving interruptions to supply performance and reducing bursts.
- **Working Reference Scenario**: The investment meets Ministerial Objectives, with a CPI + 4% per annum, the investment allows maintenance of the service levels achieved at the exit of SR21.
- **Flat Charges Scenario**: the reduction in investment under this "flat charge" scenario, with a CPI + 0% per annum, triggers reduced service levels compared to exit of SR21, with notable overall service impacts as measured by OPA and CEM.

For the Water Continuity investment area, the High Scenario includes continuation of our inspection programme for critical assets, improvements in our supply demand balance, delivery of the backlog growth projects and ensuring capacity for 130,000 new properties connections.

Under the Working Reference Scenario, there is an investment reduction of £162m in the replacement of AC mains, which will limit the rate of improvements to burst rates and supply interruption performance to 2050. In addition, the investment in enhancement and growth will be reduced by £104m and £12m respectively, which will limit how much we can improve our resilience.

The Flat Charges Scenario results in a total reduction in investment of £783 million compared to the High Scenario. Asset maintenance expenditures have been reduced by £39 million, while the investment allocated for replacing AC mains has decreased by £518 million. Additionally, there is a £207 million reduction in enhancement project investments compared to the High Scenario, and growth-related investments have been decreased by £19 million.

*Table 8: Summary of Investment for Water Continuity Under Constrained Scenarios*

| High (CPI+6.5%) | Working Reference (CPI+4%) | Flat Charges (CPI+0%) |
|---|---|---|
| Supply-demand balance position improved. | Supply-demand balance position stable. Stable Supply interruption | Reduced maintenance on dams, ancillary items, and SCADA, HMI and PLC. |
| £2,664m | £2,387m | £1,881m |

The tables below compare the investment for Water Continuity across the three investment scenarios, grouped by Investment Type and summarised by Investment Programme.

*Table 9: Investment across the three constrained investment scenarios, summarised by Investment Programme*

| Investment Hierarchy | Programme Line | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|
| AR3 Cat 1 | Improve reservoir drawdown capability as required by independent panel engineer (ARPE) | 26 | 26 | 26 |
| | Install or maintain abstraction and compensation monitoring equipment | 5 | 5 | 5 |
| | Maintain aqueducts and tunnels | 107 | 107 | 107 |
| | Maintain boreholes | 15 | 15 | 15 |
| | Maintain chemical storage (WTW) | 38 | 38 | 38 |
| | Maintain dams and ancillary items | 259 | 259 | 233 |
| | Maintain distribution mains | 972 | 810 | 454 |

| Investment Hierarchy | Programme Line | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|
| | Maintain High Voltage (HV) | 60 | 60 | 60 |
| | Maintain hydraulic models | 22 | 22 | 22 |
| | Maintain Ironworks | 37 | 37 | 37 |
| | Maintain leakage management equipment | 27 | 27 | 27 |
| | Maintain legislative compliance | 33 | 33 | 33 |
| | Maintain Motor Control Centre (MCC) | 27 | 27 | 27 |
| | Maintain pipe bridges | 43 | 43 | 43 |
| | Maintain pumping equipment | 34 | 34 | 34 |
| | Maintain raw water intakes | 16 | 16 | 16 |
| | Maintain raw water mains | 18 | 18 | 18 |
| | Maintain SCADA, HMI, PLC | 172 | 172 | 159 |
| | Maintain security systems | 10 | 10 | 10 |
| | Maintain sludge handling equipment | 34 | 34 | 34 |
| | Maintain standby generation | 14 | 14 | 14 |
| | Maintain strategic valves | 17 | 17 | 17 |
| | Maintain telemetry | 15 | 15 | 15 |
| | Maintain trunk mains | 107 | 107 | 107 |
| | Provision of emergency planning equipment | 3 | 3 | 3 |
| | Strategic Infrastructure | 2 | 2 | 2 |
| | Supply Adequacy | 32 | 32 | 32 |
| | Water Property - Operational Buildings | 49 | 49 | 49 |
| **Enhancement Cat 1** | Provision of emergency planning equipment | 5 | 5 | 5 |
| | Reduce risk of flooding from mains where it has occurred | 13 | 13 | 13 |
| **Enhancement Cat 2a - Regulatory** | Restoration of capacity to allow WTW to be operated and maintained | 3 | 3 | 3 |
| | Water Framework Directive Improvements | 2 | 2 | 2 |
| | Water Treatment Capability | 20 | 20 | 20 |
| **Enhancement Cat 2b - Regulatory** | Improvements to security as required by the Security & Emergency Measures Directive | 3 | 3 | 3 |
| | Orkney sludge strategy | 5 | 5 | 0 |

| Investment Hierarchy | Programme Line | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|
| | Resolve legacy sludge issues at named Water Treatment Works | 8 | 8 | 0 |
| | Improve energy efficiency at existing operational sites | 6 | 0 | 0 |
| **Enhancement Cat 3** | Provision of emergency planning equipment | 65 | 32 | 32 |
| | Resilience improvements to evidenced hazards | 202 | 137 | 47 |
| **Growth** | Provide capacity to meet new demand | 96 | 84 | 76 |
| | Comply with legislative requirements | 44 | 44 | 44 |
| **Total** | | 2,664 | 2,387 | 1,881 |

### *4.2.4 Chosen Option*

The investment scenarios were tested against various performance metrics and compliance requirements to validate the scenarios' robustness and ensuring they aligned with Ministerial Objectives, customers and stakeholders' expectations, long term strategy for the water sector, climate change adaptation plan, meeting Scottish Water's Board expectations on progress towards our Long-Term Strategy and risk appetite. Based on the testing outcomes, we progressed with the Working Reference scenario (CPI+4%) as the basis for our final recommendation.

**Our final chosen option is the Reference Scenario, a matured and refined version of the Working Reference.**

We did this across all investment areas by:

- Refining the available budget associated with a CPI+4% pa customer charge profile, re-running the Financial Model using the latest modelling assumptions and the application of the most up to date top-down global efficiency factors to be applied.
- We incorporated feedback from sector stakeholders, clarification of Regulator requirements, customer research feedback and further considering the requirements of the draft Ministerial Objectives. Decisions were required to navigate these limitations while ensuring a balanced investment plan.
- Several strategic options were considered to manage budgetary constraints and investment reallocation. These included potential further removal of demand in the asset repair, refurbishment, and replacement (AR3) programme areas or reduce outcomes where there is service choice. As a result, there were upwards adjustments in some areas, and downwards adjustments in others.

The **Reference Scenario** balances investment needs with acceptable customer charge increases, providing a clear path forward for the draft Business Plan submission.

## 4.3 Overall Strategic Option Chosen for SR27

### 4.3.1 SR27 Investment Plan Summary

A summary of our proposed investment on water continuity for SR27 is outlined in Table 10 below.

*Table 10: Outline of chosen investment scenario by Investment Category*

| Investment Type (Primary) | Investment Category | Reference Scenario Total (£m, 23/24) |
|---|---|---|
| **AR3** | Cat 1 | 1,859 |
| **Enhancement** | Cat 2a - Regulatory | 1 |
| **Enhancement** | Cat 2b - Regulatory | 17 |
| **Enhancement** | Cat 3 | 134 |
| **Growth** | Cat 3 | 65 |
| **Total** | | **2,076** |

### 4.3.2 Customer Benefits

The investment in water continuity is expected to yield several benefits by maintaining and enhancing performance levels. The improvements will, in turn, translate into advantages for customers and stakeholders. These interventions will lead to a reduction in instances of customers experiencing low pressure and supply interruptions, resulting from our investment in asset maintenance, aligning to customer priorities. Additionally, we will enhance sustainability by reducing leakage and per capita consumption, thereby alleviating stress on water resources and advancing our sustainability commitments, in line with guidance from WICS. The customer benefit will be delivered by the investments outlined in Section 4.4.

*Table 11: Water Continuity Performance Metrics*

| Level of service - metric | Unit | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|---|---|---|---|---|---|---|---|
| Leakage Percentage reduction of three-year average leakage* | % | 2.00% | 2.90% | 4.20% | 5.80% | 7.70% | 9.90% |
| Leakage reduction in areas with supply-demand balance deficit | % | 2.20% | 3.30% | 5.10% | 7.20% | 9.80% | 12.90% |
| Percentage reduction of consumption at non-household premises | % | 3.00% | 4.20% | 6.50% | 9.50% | 12.90% | 16.20% |
| Three-year average per capita consumption | Litres / person / day | 177 | 176 | 176 | 175 | 175 | 174 |
| Number of properties on the low pressure register | Number | 36 | 39 | 31 | 28 | 27 | 26 |

| Level of service - metric | Unit | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|---|---|---|---|---|---|---|---|
| Unplanned interruptions greater than 6 hours, excluding 3rd party | Number | 6,750 | 6,750 | 6,750 | 6,750 | 6,750 | 6,750 |
| Average minutes lost due to water supply interruptions (over 3 hours) | min | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| Repeat interruptions to water supply | Number | 270 | 300 | 275 | 250 | 225 | 200 |
| Customers supplied by systems not capable of meeting demand during a worst historic drought | Number | 2,990,000 | 2,999,000 | 3,008,000 | 3,016,000 | 3,024,000 | 2,328,000 |
| Customers supplied by systems not capable of meeting peak demand | Number | 657,000 | 693,000 | 662,000 | 663,000 | 667,000 | 346,000 |

## 4.4 Investment Programmes

### *4.4.1 Abstraction, Sources and Raw Water Transfers*

The investment demand allocated Abstraction, Sources and Raw Water Transfers is £451m, all of which is assigned to asset maintenance (AR3). This investment enables us to maintain the capability of our raw water storage assets, raw water transfers, aqueducts and our underground sources. The majority of this spend (£295m) is allocated to reservoir safety and resolving matter in the interests of safety identified by our reservoir panel engineers and £97m allocated to maintain our aqueducts and tunnels.

*Table 12: Catchment and Abstraction Investment*

| Spend Type (Primary) | MA Ref | MA Name | Description | Investment Area | Reference Scenario (£m, 23/24) |
|---|---|---|---|---|---|
| **AR3 Cat 1** | MA004 | Reservoir Safety | Resolve matters in the interest of safety | Maintain dams & ancillary items | 190 |
| | MA074 | Raw Water Storage | Maintain raw water storage assets | Maintain dams & ancillary items | 2 |
| | MA080 | Boreholes | Maintain boreholes | Maintain boreholes | 10 |
| | MA117 | Strategic infrastructure | Maintain raw water intakes | Maintain raw water intakes | 11 |
| | MA116 | Strategic infrastructure | Maintain aqueducts and tunnels | Maintain aqueducts and tunnels | 19 |
| | MA115 | Strategic infrastructure | Maintain pipe bridges | Maintain pipe bridges | 30 |
| | MA116 | Strategic infrastructure | Katrine Aqueduct refurbishment | Maintain aqueducts and tunnels | 78 |
| | MA116 | Strategic infrastructure | Maintain raw water mains | Maintain raw water mains | 5 |

| Spend Type (Primary) | MA Ref | MA Name | Description | Investment Area | Reference Scenario (£m, 23/24) |
|---|---|---|---|---|---|
| | MA004 | Reservoir Safety | Develop solutions for 11 named sites required by 2022 and delivery of solutions at 8 sites | Improve reservoir drawdown capability as required by independent panel engineer (ARPE) | 104 |

### 4.4.2 Water Treatment

The investment demand allocated to water treatment for maintaining water continuity is £48m (further investment in water treatment assets is described in the Water Quality Technical Appendix). The investment demand allocated to asset maintenance (AR3) to Water Treatment is £30m, whereas £18m are allocated to Enhancement investment.

*Table 13: Water Treatment Investment*

| Spend Type (Primary) | MA Ref | MA Name | Description | Investment Area | Reference Scenario (£m, 23/24) |
|---|---|---|---|---|---|
| **AR3 Cat 1** | MA052 | WTW Sludge & Washwater Handling | Maintain sludge MEICA handling equipment at WTW. | Maintain sludge handling equipment | 30 |
| **Enhancement** | MA006 | WT Capability Improvement | Eela Water clarifier hydraulic restriction | Restoration of capacity to allow WTW to be operated and maintained | 1 |
| | MA085 | Long Term Sludge Storage | Big Breck - Develop options to close and restore the site | Resolve legacy sludge issues at named Water Treatment Works | 11 |
| | MA085 | Long Term Sludge Storage | Develop alternative sludge disposal route options for WTW on Orkney to allow cessation of operations at Big Breck and Westray land fill sites | Orkney sludge strategy | 6 |

### 4.4.3 Water Transmission (Trunk Mains & Strategic Infra)

The investment demand allocated to water transmission is £113m, all of which is allocated to asset maintenance (AR3). This investment enables to maintain the performance of our strategic trunk main networks. The majority of this spend (£98m) is allocated to maintaining our trunk

mains (including asset renewal) and critical maintenance activities to reduce recurring incidents of interruptions to supply.

*Table 14: Water Transmission Investment*

| Spend Type (Primary) | MA Ref | MA Name | Description | Investment Area | Reference Scenario (£m, 23/24) |
|---|---|---|---|---|---|
| **AR3 Cat1** | MA116 | Strategic infrastructure | Maintain trunk mains | Maintain trunk mains | 49 |
| | MA111 | Recurring Customer Interruption | Maintenance activities on sections with recurring interruptions to supply | Maintain trunk mains | 49 |
| | MA060 | Strategic infrastructure | Maintain strategic valves | Maintain strategic valves | 2 |
| | MA116 | Strategic infrastructure | Manage the risk of failure of Sub-Sea Mains | Strategic Infrastructure | 13 |

### 4.4.4 Water Pumping Stations

The investment demand allocated to asset maintenance (AR3) to pumping stations is £33m. This investment enables us to maintain the performance of our pumping and booster station assets.

*Table 15: Water Pumping Station Investment*

| Spend Type (Primary) | MA Ref | MA Name | Description | Investment Area | Reference Scenario (£m, 23/24) |
|---|---|---|---|---|---|
| **AR3 Cat 1** | MA058 | Water Pumping Stations | Maintain Treated Water pumping | Maintain pumping equipment | 28 |
| | MA058 | Water Pumping Stations | Maintain Raw Water pumping | Maintain pumping equipment | 4 |

### 4.4.5 Water Distribution & Demand Management

The investment demand allocated to asset maintenance (AR3) for water distribution is £855m. This investment enables us to maintain the performance of our water distribution networks and maintain our interruptions to supply performance. This includes £285m to accelerate the replacement of Asbestos Cement water mains which have a disproportionate impact of our distribution assets on interruption to supply performance. This accelerated replacement will ensure all 6,000km are replaced in the next 15 years. We have allocated £31m to managing demand, aimed at reducing network and customer side losses, as well as per capita consumption.

*Table 16: Water Distribution & Demand Management Investment*

| Spend Type (Primary) | MA Name | Description | Investment Area | Reference Scenario (£m, 23/24) |
|---|---|---|---|---|
| AR3 Cat1 | MA111 | Maintenance activities on sections with recurring interruptions to supply | Maintain distribution mains | 447 |
| | | Maintenance activities on water mains to reduce the risk to service | | |
| | | Pressure transient management to minimise burst rate increase | | |
| | MA111 | Increase Asbestos Cement water mains replacement. 6,000km is replaced in the next 15yrs (remaining life and to support demand reduction). | Maintain distribution mains | 285 |
| | MA073 | Activity for ~5,500 items of leakage management equipment (DMA meters, loggers and PRVs etc) | Metering & Flow Monitoring | 54 |
| | MA018 | Maintain street iron works as required by Traffic Commissioner (Water) | Ironworks | 35 |
| | MA099 | Manage and reduce losses from the transmission and distribution networks | Supply Adequacy | 19 |
| | MA099 | Optimise the supply of water | Supply Adequacy | 3 |
| | MA099 | Manage and reduce losses from raw water and water treatment work assets | Supply Adequacy | 1 |
| | MA099 | Manage and reduce losses from customers supply pipes | Supply Adequacy | 4 |
| | MA099 | Manage and reduce customer demand (domestic and non-domestic) | Supply Adequacy | 6 |
| Enhancement Cat 3 | MA099 | Make progress towards reducing leakage and customer consumption / demand | Supply Adequacy | 19 |
| | MA011 | Resolve properties confirmed with persistent low pressure | Improve pressure at properties with persistent low pressures | 12 |

### 4.4.6 Resilience

We plan to invest £103m to enhance resilience and meet future demand. This will help improve connectivity of our existing systems to increase flexibility to move water around and improve resilience in times of drought, particularly in Edinburgh, Fife and Dundee.

*Table 17: Resilience Investment*

| Spend Type (Primary) | MA Ref | MA Name | Description | Investment Area | Reference Scenario (£m, 23/24) |
|---|---|---|---|---|---|
| Enhancement | MA087 | Water Resilience and Growth | Improve resilience of water supply systems to enable them to provide continuous water supplies | Resilience improvements to evidenced hazards | 72 |
| | MA087 | Water Resilience and Growth | Provision of New Standby Power | Provision of emergency planning equipment | 31 |

### 4.4.7 Other Programmes

The investment in other programmes related to water continuity is £442m which includes maintaining regional cross asset class programmes for AR3 and ensuring all statutory maintenance requirements are undertaken.

*Table 18: Other Programmes Investment*

| Spend Type (Primary) | MA Ref | MA Name | Description | Investment Area | Reference Scenario (£m, 23/24) |
|---|---|---|---|---|---|
| AR3 Cat 1 | MA068 | Statutory & Planned Maintenance | Statutory Maintenance items - Water assets | Maintain legislative compliance - HSS | 9 |
| | MA054 | Network Model Maintenance | Upkeep of hydraulic models to ensure they are fit to use | Maintain hydraulic models | 16 |
| | MA068 | Statutory & Planned Maintenance | Fixed wire electrical systems - Water Assets | Maintain legislative compliance - HSS | 17 |
| | MA022 | SCADA, PLC & HMI | Maintain SCADA, HMI, PLC | Maintain SCADA, HMI, PLC | 163 |
| | MA091 | HV | Maintain High Voltage (HV) - Water (Pumping stations) | Maintain High Voltage (HV) - HSS | 21 |

| Spend Type (Primary) | MA Ref | MA Name | Description | Investment Area | Reference Scenario (£m, 23/24) |
|---|---|---|---|---|---|
| | MA089 | Security | Maintain security systems | Maintain security systems | 7 |
| | MA092 | Standby Power | Maintain standby generation | Maintain standby generation | 11 |
| | MA044 | Telemetry | Maintain Remote Telemetry Unit (RTU), communication, data quality testing and remedial actions & telemetry rationalisation | Maintain telemetry - HSS | 14 |
| | MA098 | Emergency Response | Replacement or planned refurbishment / repair activities on existing equipment | Provision of emergency planning equipment | 2 |
| | MA120 | Water & Wastewater - Property and Access | Maintain Water Operational Buildings | Water Property - Operational Buildings | 49 |
| | MA091 | High Voltage | Maintain High Voltage (HV) - Water (Treatment) | Maintain High Voltage (HV) - HSS | 14 |
| | MA120 | Access to Equipment | Maintain safe access to water operational equipment | Water Property - Operational Buildings | 2 |
| | MA120 | Water & Wastewater - Property and Access | Remedial work associated with RAAC at Water Operational buildings and depots | Health, Safety, and Security | 12 |
| | MA034 | Customer Meters | Existing metering replaced when broken or out of tolerance | Maintain existing metering | 16 |
| | MA118 | MCC - W | Maintain Motor Control Centre (MCC) | Maintain Motor Control Centre | 27 |
| Growth | MA034 | Customer Meters | Meter installation for all first time registered non domestic premises as per policy and provides meters for domestic occupants | Follow market best practice metering requirements | 65 |

## 4.5 Future Investment Requirements

Planning for the next 25 years is inherently uncertain. As part of our Long-Term Strategy, we undertook a broad ranging and comprehensive review of the risks and opportunities across the next 25 years. The investment we have identified will secure our essential services by maintaining our existing asset base, allow us to adapt to climate change and meet our legislative requirements. Without major changes to how we currently operate the water and wastewater system and given the projected impact of climate change, we are currently forecasting that the funding needed to deliver sustainable services will need to increase over the next 25 years by almost double. Planning for this period is inherently uncertain and there are both opportunities and risks ahead.

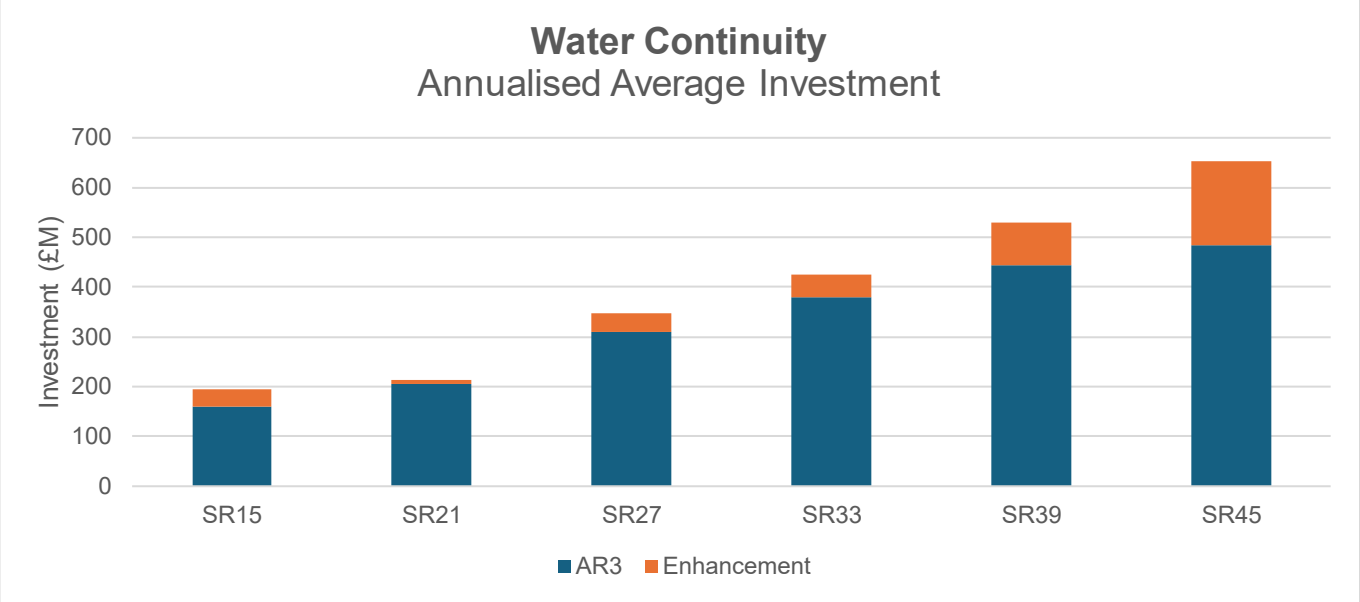


*Figure 15: Historic and projected investment - Water Continuity (2015 to 2051)*

For Water Continuity, the projection will see an increased in expenditure of ~88% from SR27 to SR45 from £2,076m to £3,912m (see Figure 15). This is mostly driven by an increase in AR3 which is primarily driven by our policy of AC water mains replacement which will see the replacement of all of these assets by the end of SR45. The increase in enhancement expenditure from SR27 to SR45 is to address:

- Water pressure issues for properties
- Improve connectivity and resilience of raw water sources to address known drought risks and reduce hazards that may impact on water continuity for customers

# 5 Innovation

## 5.1 Innovation

As part of our wider innovation strategy the following innovative approaches will help us to deliver the water continuity programme:

**Asset Risk and Optimisation (ICC to ROC)** - The Scottish Water Intelligent Control Centre transformation will deliver benefits through a combination of new ways of working, leveraging technologies, data analytics and insight, developing more proactive capabilities for early identification of service issues, whilst enabling water and wastewater system performance to be better understood and further optimised.

The programme is aligned to our strategic ambitions and will build state of the art capabilities in Scottish Water that will support the safety, well-being and development of our people to deliver World Class Water Services for our customers and take care of our environment. It will also allow Scottish Water to demonstrate to stakeholders and regulators that we can reduce our cost base by delivering more effectively and efficiently whilst sustaining high levels of service.

Gross benefits for the SR27 regulatory period are expected to be ~£36 million, predominantly delivered by a reduction in responsive asset replacements, refurbishments and repairs, and deferred asset investment through more advanced operational system planning.

**Partnership Ecosystems (Team Scotland)** – Scottish Water will evolve the Partnership Ecosystem to engage more with customers, since they will play an increasingly important role in making services sustainable. By engaging more with customers, they will better understand our challenges and increasingly support the solutions, many of which will require a change in customer behaviour. Customer support will be necessary to reduce water demand. Opportunities include the use of more efficient products, changing usage patterns and using meters to reduce consumption.

**Building on innovative approaches developed in SR21** – We will utilise new techniques to understand network mains condition, including a non-intrusive technique in SR21 which uses inverse transient analysis to check the condition of pipes, reducing cost and time on analysis.

Scottish Water will also continue to consider opportunities to use technologies such as acoustic monitoring of critical pre-stressed concrete pipes which enables condition monitoring and proactive maintenance on specific areas, if required, rather than significant intrusive investigations and pre-emptive high-cost replacement.

Scottish Water has almost half a million valves across its potable water network and some of these valves will require repair or replacement. Repairing or replacing a seized valve comes at considerable expense, with the average repair costing £10,000. A new tool, a mechanical valve release key designed to free jammed valves, was trialled in 2022. The tool uses kinetic energy to open or close stuck valves by applying kinetic shock to the spindle in a measured way. These also improve health and safety for our employees working on the network.

# 6 Interdependencies

This document should be read in conjunction with other Technical Appendices relating to the following:

- Water Quality
- Asset Repair, Refurbishment and Replacement
- Water Growth
- Management Approaches
- Climate Change Adaptation
- Investment Planning

# 7 Conclusion

The Working Reference Scenario (CPI+4%) was recommended as it offers the best balance between progress towards our Long-Term Strategy, contribution to the Water Sector Vision, meeting regulatory requirements, the Ministerial Objectives and customer charges, both currently and for future generations. The Investment Planning Technical Appendix provides detailed information on the investment scenarios considered and the optioneering process. Scenario C will require £2,076m (2023/24 Cost Base) of investment in water continuity to deliver the following outcomes aligned to the Ministerial Objectives and our Long-Term Strategy to 2050:

**Adapting to Climate Change and Increasing Resilience:**

- **Continue to develop our understanding of the impact of climate change** on our water resources and assets, and develop plans to mitigate these risks. This will include updating our Water Resource Plan and exploring wider catchment planning opportunities with stakeholders.
- **Improving drought resilience in key areas:** by addressing the supply-demand balance deficit in the Dundee area and closing the deficit gap in areas including Edinburgh & Lothian and Fife. We will also continue to improve our drought management capability and develop our Strategic Drought Plan.
- **Ensure that we have water treatment production and network capacity** in key locations (including Tiree, Kenmore, Balmichael, and Turriff), prioritising the highest risk areas.
- **Improve our understanding of and reduce the demand for water:**
    - Reduce leakage by 9.9% (equivalent to 45 Ml/d) in SR27
    - Develop options for influencing domestic customer demand such as information from household monitors, and the labelling of domestic appliances**.** We will implement all viable options to reduce water demand through supporting customers to reduce their usage (domestic / non-domestic). This will include developing intelligent networks and real time monitoring of flow and pressure.
    - Roll out smart metering for our Non-Household Customers: expected to deliver demand reduction with full roll out to 136,000 business customers.
- **Improve our resilience:** by improving power resilience to regional power outages and increasing connectivity of our water supply systems. In addition we will update plans to address resilience of supplies to wider hazards (e.g. flooding) and make progress to secure improvements. We will also improve our response and recovery plans and capability.

**Maintaining Service and Reducing Risk for Customers:**

- **Maintain current service levels:** We will maintain and operate our assets in line with our water risk management processes, including inspections of key critical assets (including dams and trunk mains) to identify and mitigate emerging risks, undertaking repairs, refurbishment and replacement across the asset base to maintain performance. We will also ensure that our key control, automation and security systems (e.g. System Control And Data Acquisition (SCADA), telemetry) remain fit-for-purpose in line with industry standards and regulatory requirements.
- **Maintain interruptions performance:** maintaining the number of interruptions greater than 6 hours our customers experience and reducing number of customers experiencing 6 or more incidences in a year or 10 or more in 3 years. We will do this by tripling the mains rehabilitation rates with a programme focused on Asbestos Cement (AC) pipes which represent the highest proportion of high impact failures.

- **Improving low pressure performance:** Continuing to reduce the number of customers on our low-pressure register.

The above interventions and investment will allow us to improve our resilience to climate change and other threats to reduce the risk of long-term interruptions to supply, whilst maintaining the existing asset base to maintain or improve levels of service.

# Water Environment
# Technical Appendix 003

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# 1 Executive Summary

This Water Environment Technical Appendix covers the SR27 investment required to maintain existing assets and to comply with legislation to ensure that there is no detriment to the water environment from our service provision.

Delivering water and wastewater service to customers has both direct and indirect impacts on our water environment. As a custodian of Scotland's water environment and in line with regulation, legislation and the increasing expectations of customers and stakeholders, we are committed to managing our interaction with the water environment responsibly, minimising negative impact on it and contributing to its improvement wherever possible.

Our SR27 plan and its proposed investment will deliver on regulatory commitments in line with legislation and Scottish Water strategies and policies, including the requirements of Draft SR27 Ministerial Objectives of:

- Maintain or improve current levels of service over the long term
- Scottish Water must improve the current level of compliance with its environmental licences for abstraction and discharge into the environment, by preparing and implementing investment plans that address the risks of impacts on the environment from its assets
- Scottish Water must prepare and implement delivery plans throughout the 2027-33 period which set out how improvements to its water and sewerage infrastructure are expected to contribute effectively to the RBMP (River Basin Management Plan) objectives
- Scottish Water must provide regular updates on the progress it has made towards delivering its obligations in respect of river basin management plans
- Scottish Water must prepare drainage and wastewater management plans, to gain a better understanding of the performance of the sewer networks and to limit the amount of plastics reaching the water environment through the sewer network.
- Scottish Water must support SEPA's work with the manufacturing sector, the Scottish Government, customers and stakeholders to control at source plastics and priority substances.
- Scottish Water must have regard to the Scottish Government's circular economy strategy (as may be amended or replaced from time to time) in its provision of water and wastewater services.
- In particular, Scottish Water must assess the potential for resource recovery from sewerage.
- Identify the expected impacts of climate change on its assets and assess the risk and likelihood,
- Make substantive progress in the 2027-33 period towards the climate change targets, and ensure it is on an appropriate trajectory to meet or exceed those targets.
- Scottish Water must prepare and implement plans to manage its 6 remaining private finance initiative contracts which end in the 2027-33 period, to secure best value for money for the future operation of the relevant facilities.
- Scottish Water must prepare such plans for its any remaining private finance initiative contracts which end after 2033.

The Water Environment investments we have made historically have delivered positive outcomes for customers. These outcomes have included more waterbodies now achieving 'Good' status or higher, bathing water quality showing continuous improvement since SR15 and reduction of pollution incidents categorised as Categories 1, 2, and 3 has also seen positive progress during the same period.

We have used the learnings in delivering these improvements in the development of our SR27 plan. However, there are a number of difficult challenges we must overcome in order to maintain and improve service provision to our customers, communities and the environment. These challenges include:

- Adapting to the impacts of climate change (e.g. the increased frequency, duration and severity of storm events and increased drought conditions),
- Changes in population (increasing population, population movement and urban creep), and
- An ageing (deteriorating) asset base.

To identify the best suite of interventions to meet the draft SR27 Ministerial Objectives and strategic ambitions we have undertaken an extensive optioneering process. The investment scenarios were tested against performance metrics and compliance requirements to validate the scenarios' robustness and ensuring they aligned with stakeholder's expectations, the water sector vision, Scottish Water's Climate Change Adaptation Plan, Net Zero goal and risk appetite.

Based on the testing of outcomes, Reference Scenario (CPI +4%) was recommended.

The Reference Scenario will require **£2,524m** of investment to deliver the following:

- Maintain assets as set out in Management Approaches
- Decreasing the number of Unsatisfactory Intermittent Discharges (UIDs) by addressing remaining 'high priority' UIDs
- Installing monitors and sensors across our wastewater system to create an increasingly intelligent network
- Reducing the number of serious pollution incidents caused by our operations by nearly 37.5%
- Maintaining our high SEPA discharge permit compliance 96.37%
- Establishing and maintaining our current final effluent and pass forward flow compliance position and developing an improvement plan, where we define and deliver first steps
- Working with SEPA and other stakeholders to risk assess the potential implications of future legislation
- Delivering all remaining RBMP3 objectives to enhance the water environment
- Maintaining our 100% sludge (bioresource) compliance performance
- Investing in a cutting edge bioresources facility to facilitate the renewable energy generation, reduce our sludge outlet risk and deliver 10% reduction in carbon footprint
- Implementing wider resource recovery from the collection and treatment of water and wastewater
- Integrate PFI assets into Scottish Water asset base; and
- Maintaining and improving water abstraction and compensation CAR compliance.

These key investments are summarised in Table 1.

*Table 1: Key Water Environment investments for SR27*

| Investment Category | Investment Summary | Proposed Investment (£m, 23/24) |
|---|---|---|
| AR3 | Wastewater ancillaries (other) | 97 |
| | Maintain inlet works including inlet, screening, grit removal and storm tanks. | 109 |
| | Maintain primary treatment including tanks, wet well, pumps, instrumentation, control & monitoring, buildings, screenings, cranes, sampling | 74 |
| | Maintain screw pumps | 25 |
| | Maintain secondary treatment including tanks, septic tanks, activated sludge assets, wet well, instrumentation, BAF filter, reed bed | 159 |
| | When development occurs in a catchment, it may be necessary to accelerate to refurbishment or replacement cycles support growth requirements | 5 |
| | Replacement of temporary chemical dosing equipment | 23 |
| | AR3 associated with PFI return | 284 |
| | Maintain bioresource treatment centres to ensure a quality product: reception & cleaning, digestion & stabilisation, storage, return liquor treatment, thermal drying and pelletising | 107 |
| | Maintain sewage pumping stations (SPS) - activities to be carried out on Mechanical, Electrical, Instrumentation, Controls, Automation (MEICA) & civil assets | 140 |
| | Maintain Supervisory Control and Data Acquisition (SCADA) - Wastewater Treatment | 49 |
| | Maintain Remote Telemetry Unit (RTU), communication, data quality testing and remedial actions & telemetry rationalisation | 25 |
| | Maintain odour equipment | 7 |
| | Maintain Motor Control Centre (MCC) - Wastewater (Network & Treatment) | 76 |
| | Maintain High Voltage (HV) - Wastewater (Network & Treatment) | 65 |
| | Water & Wastewater - Property & Access | 51 |
| | Access to equipment | 9 |
| | Statutory Maintenance items - Wastewater Treatment assets | 7 |
| | Fixed Wire electrical systems – Wastewater treatment assets | 20 |
| | Asset Transformation Operation & Maintenance (ATOM) wastewater assets | 13 |
| | Maintain water abstraction and compensation CAR monitoring, measurement and environmental flow equipment<br>Reduce risks of over abstraction and comply with regulatory reporting requirements | 1 |

| Investment Category | Investment Summary | Proposed Investment (£m, 23/24) |
|---|---|---|
| | Reduce risks of under compensation from reservoirs and improve capability to maintain environmental flows downstream of reservoirs | |
| | **AR3 Total** | **1,348** |
| **Enhancement** | Improve Bathing Waters | 25 |
| | Phosphorus, BOD and ammonia impact to be reduced at WWTWs where impact has been confirmed. These form part of RBMP3 objectives | 32 |
| | Reduce risk of malodour at Seafield WwTW | 7 |
| | Provision of appropriate equipment and analysis to demonstrate pass forward flow (PFF) spill compliance at WWTW and that flow is maintained during the event duration. | 96 |
| | PFI other returns initial work (Almond Valley, Tay project, Moray Coast, Ayrshire) | 7 |
| | Highland PFI - Sludge<br>Develop plans to generate energy and maximise value at Daldowie Bioresource Treatment Centre post PFI contract | 475 |
| | Industrial Emissions Directive (IED) compliance for existing Bioresource Treatment Centres | 40 |
| | Reduce the risk of environmental pollution from CSOs - Develop solutions to priority UIDs (catchments to be agreed with SEPA) for aesthetics & water quality | 393 |
| | Deploy Event Duration Monitors (EDM) at further locations to be agreed with SEPA | 9 |
| | Study to understand the impact of wastewater discharges on the water environment | 48 |
| | Net Zero Emissions - Understanding, measuring, managing, and reducing the impact of wastewater process emissions.<br>Improve aeration real time control capability to generate benefits in energy efficiency and reduced risk of non-compliance<br>Develop energy efficient technology strategies | 42 |
| | Improve water abstraction and compensation CAR compliance and meet<br>RBMP3 commitments | 39 |
| | **Enhancement Total** | **1,176** |

SR27 investment into Water Environment makes up 30% of the total SR27 Investment of £8.3bn, as shown below.

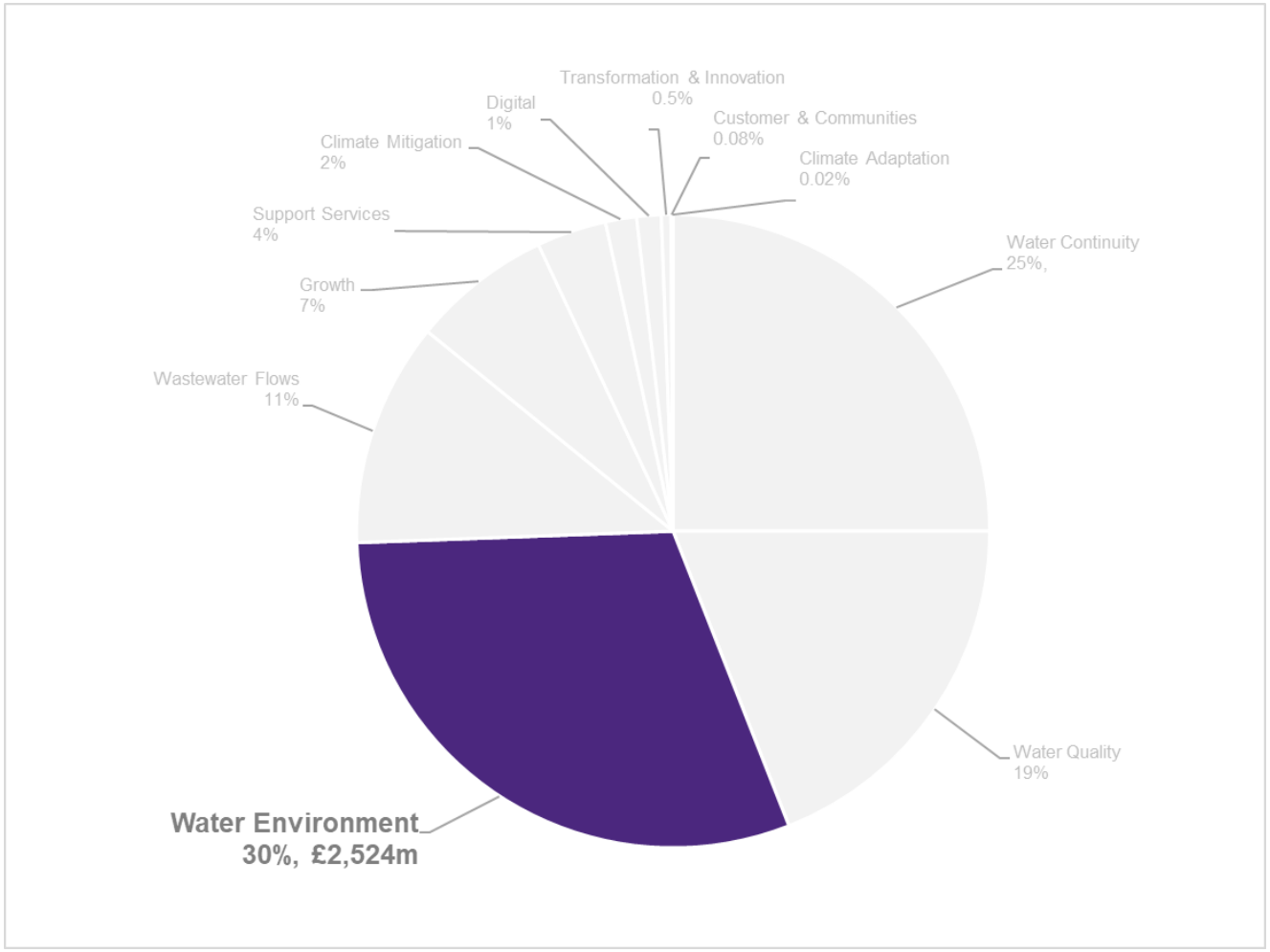


*Figure 1: Water Environment investment as a proportion of the total SR27 investment*

# 2 Background

## 2.1 Scope of Technical Appendix

The Water Environment Technical Appendix covers the investment required to ensure that our wastewater level of service continues to be maintained, and we reduce our impact on the water environment.

The investment needs for Water Environment have been identified from risks associated with the ability of our assets to deliver this service whilst meeting the requirements of regulatory standards, customer expectations and Scottish Water policies.

The investment needs presented in this technical appendix are required to address service performance and risk, whilst mitigating risks to service associated with the key long-term challenges posed by an aging asset base, evolving regulatory requirements and returning a significant PFI asset base to Scottish Water operation.

This technical appendix details the drivers behind the investments, identifies the needs that will be addressed during the next regulatory period (2027-2033), and outlines the benefits for the Scottish population. It provides an overview of the allocation strategy for the investment, the methodology used for selecting options, and the most efficient delivery plan for Water Environment investments across SR27.

Figure 2 illustrates in which chapter our specific wastewater investments are detailed, with the overall investment split across Water Environment and Managing Quantity of Flows.

| Water Environment | Managing Quantity of Flows |
|---|---|
| • All maintenance associated with Wastewater Treatment Assets<br>• Wastewater Asset Maintenance – Returning PFI contracts<br>• Wastewater Treatment Discharges - Pass Forward Flow Compliance, Instrumentation and RBMP3<br>• Wastewater Treatment Improvements – Bathing Waters<br>• Wastewater Studies<br>• Unsatisfactory Intermittent Discharges<br>• Event Duration Monitors<br>• Bioresource<br>• Water abstraction and compensation CAR monitoring and environmental flow equipment<br>• CAR compliance - fish passes | • All maintenance associated with our wastewater networks (including Combined Sewer Overflows (CSOs) and outfalls)<br>• Sewer flooding<br>• Property level protection (mitigation measures for sewer flooding)<br>• Repeat sewer flooding - initiatives to tackle repeat flooding caused by capacity constraints or blockages on our networks.<br>• Flood Risk Management Act duties<br>• Surface water management and partnership working<br>• Customer behaviour campaigns<br>• Wastewater model maintenance |

*Figure 2: Wastewater Investment Split*

## 2.2 Context

The investment needs presented in this document are required to meet Scottish Water's legislative obligations, including the Ministerial Objectives, and align with Scottish Water's Long-Term Strategy and policies. They address existing areas of unsatisfactory service performance and risk, including non-compliance with regulatory standards, whilst mitigating risks to service associated with the key long-term challenges posed by an extensive and complex asset base, changing regulatory requirements and environmental changes.

**Legislative Requirements** – Scottish Water has statutory duties that must be adhered to, these include:

**Water Framework Directive (WFD) (2000)** – European environmental legislation which aims to prevent deterioration and enhance status of aquatic ecosystems. The WFD requires the creation of River Basin Management Plans (RBMP) which set statutory objectives for Scottish waterbodies.

**Water Environment and Water Services (Scotland) Act (WEWS) (2003)** – transposes WFD water quality protections into regulatory controls over activities to protect and the enhance the water environment.

**Water Environment Controlled Activities (Scotland) Regulations (CAR) (2011)** – implements the requirements of WEWS and is the mechanism used by SEPA to authorise controlled activities (e.g., point source discharges). Authorisation requirements for discharges (i.e., licence conditions) are based on environmental need and SEPA policy at the time of issue or variation.

**Urban Wastewater Treatment Directive (UWWTD) (1991) and Urban Wastewater Treatment (Scotland) Regulations (1994)** – European environmental legislation which aims to protect the adverse effects of treatment and discharge of urban wastewater. It sets out specific treatment requirements for discharges based on population equivalent and receiving waterbody type and sensitivity.

**Bathing Water Directive (rBWD) and Bathing Water (Scotland) Regulations (2008)** - environmental legislation which aims to preserve, protect and improve the quality of the environment and to protect human health by complimenting the WFD. It sets out the standards for designated Bathing Waters and determines authorisation requirements for discharges (i.e., licence conditions).

**The Water Environment (Shellfish Water Protected Area) (Scotland) Regulations (2013)** – sets out the requirement for annual bacteriological conditions for wastewater treatment works discharges which may impact a nearby designated shellfish protected area in line with SEPA policy at the time of issue or variation.

**The Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2021** - take "all reasonable steps to ensure that discharge (containing sewage) does not result in pollution of the water environment". This refers to all actions that are practical and feasible for individuals or organisations to take in order to minimise or eliminate pollution risks. This includes implementing best practices, maintaining equipment, monitoring water quality, and responding promptly to any issues

**Ministerial Objectives** – Our investment plans for Water Environment in SR27 are required to meet the Ministerial Objectives set out in Table 2.

*Table 2: Draft Ministerial Objectives aligned with the Water Environment Technical Appendix*

| Ministerial Objectives Category | Ministerial Objectives Detail |
|---|---|
| **Standards of Service** | Maintain or improve current levels of service over the long term |
| **Environment** | Scottish Water must improve the current level of compliance with its environmental licences for abstraction and discharge into the environment, by preparing and implementing investment plans that address the risks of impacts on the environment from its assets |
| | Scottish Water must prepare and implement delivery plans throughout the 2027- 33 period which set out how improvements to its water and sewerage infrastructure are expected to contribute effectively to the RBMP objectives |
| | Scottish Water must provide regular updates on the progress it has made towards delivering its obligations in respect of river basin management plans |
| | Scottish Water must prepare drainage and wastewater management plans, to gain a better understanding of the performance of the sewer networks and to limit the amount of plastics reaching the water environment through the sewer network. |
| | Scottish Water must support SEPA's work with the manufacturing sector, the Scottish Government, customers and stakeholders to control at source plastics and priority substances. |
| **Flooding and Surface Water Management:** | Scottish Water must identify and pursue opportunities to work with stakeholders, and respond to opportunities proposed by stakeholders, to transform how rainwater and sewerage are managed in new and existing communities |
| | In particular, Scottish Water, in collaboration with other parties as appropriate, must adopt and encourage a catchment management approach to sustainable storm water management wherever practical, to reduce and prevent the impacts of sewer and surface water flooding, reduce pollution from sewer overflows, enable growth, increase resilience and create natural spaces for customers and communities to enjoy. |
| **Circular Economy:** | Scottish Water must have regard to the Scottish Government's circular economy strategy (as may be amended or replaced from time to time) in its provision of water and wastewater services |
| | In particular, Scottish Water must assess the potential for resource recovery from sewerage. |
| **Climate Change (Adaptation & Mitigation):** | Identify the expected impacts of climate change on its assets and assess the risk and likelihood, |
| | Make substantive progress in the 2027-33 period towards the climate change targets, and ensure it is on an appropriate trajectory to meet or exceed those targets |
| **Private finance initiative funded projects:** | Scottish Water must prepare and implement plans to manage its 6 remaining private finance initiative contracts which end in the 2027-33 period, to secure best value for money for the future operation of the relevant facilities. |
| | Scottish Water must prepare such plans for its any of these 6 remaining private finance initiative contracts which end after 2033. |

**Long-Term Strategy**

SR27 represents the first step on the journey to achieving Scottish Water's ambitions set out in the Long- Term Strategy for the next 25 years. These are:

- Achieve 100% compliance with existing final effluent and pass forward flow standards and reduce operational risk.
- Work with stakeholders to create an approach to focus on improving overall health of Scotland's waterbodies and adapting to changing use of Scotland's waters.
- Work with the Scottish Environmental Protection Agency (SEPA) and others to understand the implications of future legislation related to substances of concern.
- Continuous improvement in the capability of our wastewater treatment work assets to deal with changing demand and minimise their impact on the environment.
- Improve the resilience of our wastewater systems so they can cope with expected climatic changes
- Maximise the deployment of nature-based solutions
- Maximise renewable energy generation from wastewater bioresource and recover resources from bioresource, wastewater and water treatment process streams, where financially viable to do so.
- Identify and develop options to mitigate risk to the agricultural outlet.
- Address all sewer overflows that are harming the environment or not operating as they should on a dynamic prioritised basis by 2051.
- Create increasingly intelligent networks which will allow us to optimise asset operations and our response approach.
- We will monitor bathing water compliance and how this is impacted by spills from the system, and we will reduce discharges to support possible classification improvement at bathing waters.

**Key Challenges**

There are challenges in progressing these ambitions and maintaining and improving service provision to our customers, communities and the environment. These challenges include:

- **Adapting to the impacts of climate change** (e.g. the increased frequency, duration and severity of storm events and increased drought conditions),
- **Changes in population** (increasing population, population movement and urban creep), and
- **An ageing asset base** - the need for asset repair, refurbishment and replacement will be ongoing for the more complex treatment processes installed over the past 25 years, as well as for older assets requiring end-of-life replacement. This also includes PFI assets.

## 2.3 Past Performance

This section sets out our past performance across key performance metrics (aligning to the WICS SR27 methodology), key performance improvements that have been delivered in this period, and trends emerging from historical analysis.

Over the past 30 years we have made significant improvements to our wastewater infrastructure in Scotland's largest population centres (e.g. Edinburgh, Dundee, and Aberdeen) now using advanced secondary treatment systems to meet European standards required under the Urban Wastewater Treatment Directive (UWWTD). More recently, over the two previous strategic review periods, we have invested in excess of £2.9bn in improving and maintaining Scotland's public

drainage system and infrastructure, as well as delivering water quality improvements to designated Shellfish and Bathing Waters and making significant improvements to meet Water Framework Directive objectives set out within River Basin Management Plans.

### Repair, Refurbish, Replace (AR3)

To convey over one billion litres of wastewater from properties and businesses in Scotland requires an extensive network. Since the mid-1990s, the wastewater network has benefited from significant levels on investment. During operation, our assets encounter significant wear and deterioration which can impact capacity, efficiency and performance.

To help us manage this asset base, in SR21 we created Management Approaches. For each asset type we created a risk-based maintenance approach to determine the maintenance tasks and frequency that should be carried out, dependent upon asset condition.

### Unsatisfactory Intermittent Discharges (UIDs)

We have undertaken studies during SR15 and SR21 to identify and prioritise UIDs for phased improvement over SR21 and beyond. These studies have improved our understanding of how our assets operate, where they cause environmental impacts. As a result of this greater insight on our asset base and how it performs, the number of overflows classed as unsatisfactory and therefore requiring improvement, has increased as shown in Table 3.

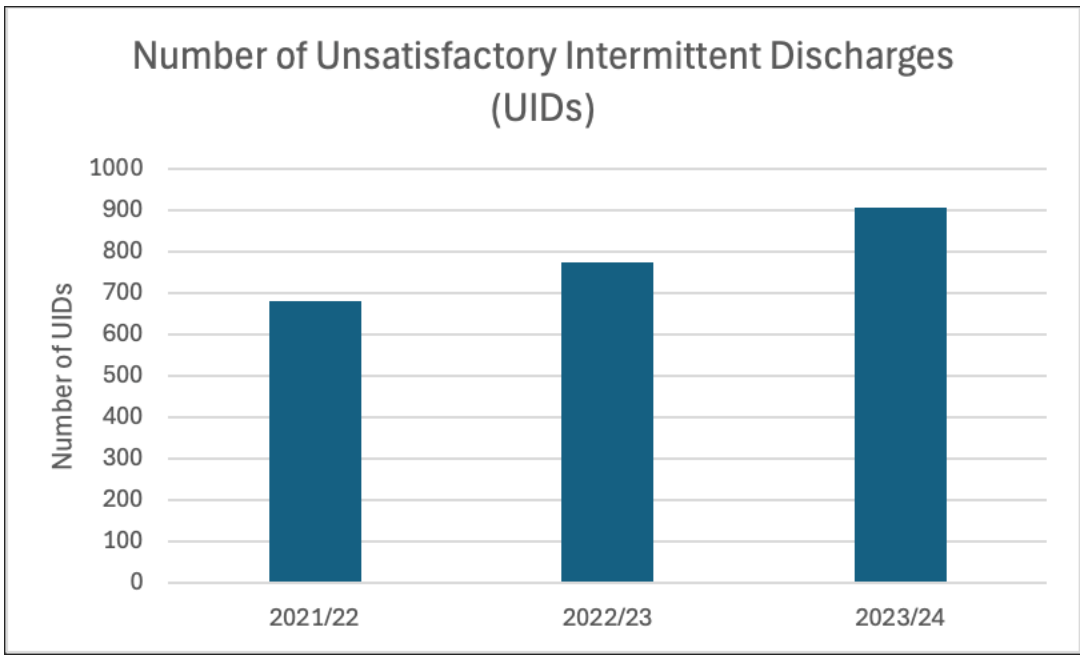


*Figure 3: Number of UIDs*

### Bathing Waters

During SR10, we studied the impact of our wastewater network and treatment assets on Bathing Water performance and developed action plans to support meeting 'Sufficient' classification. Subsequent investment in our wastewater network and treatment asset performance over SR15 and SR21 delivered these improvements and have supported and contributed to an improvement in overall Bathing Water performance and subsequent classification. This is shown in Figure 4 by the trend in increasing number of Bathing Waters classified as Sufficient, Good and Excellent from 2021 onwards.

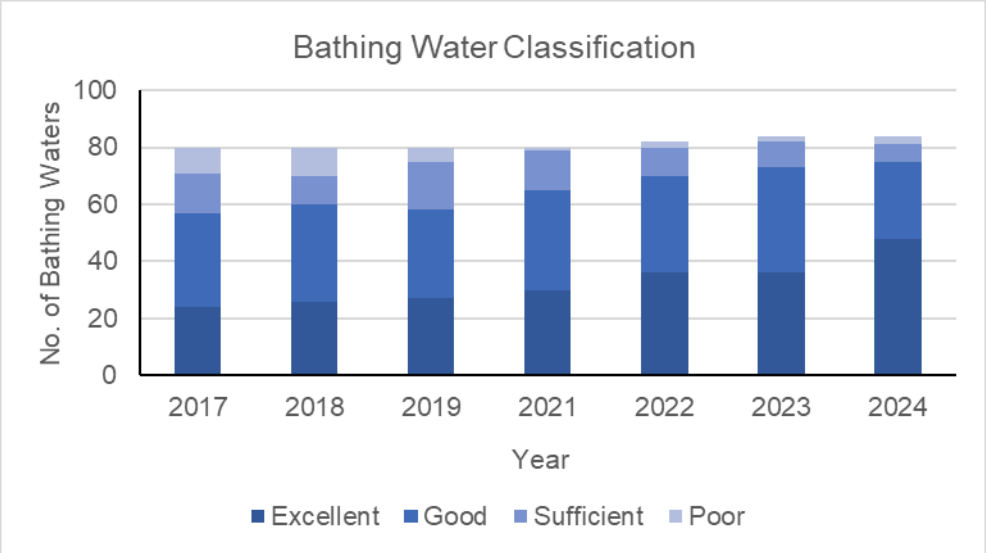


*Figure 4: Bathing water classification during SR15 and SR21*

**Wastewater Treatment Works Compliance**

During SR21, WWTW compliance has been assessed against all licensed final effluent parameters for a subset of assets defined within SEPA's Annual Monitoring Programme. The number of failing works has remained broadly stable at ~20-22 year on year, resulting in a total compliance of ~96-97%. Achieving this consistent compliance position reflects our effective management of the challenges presented by ageing assets and the impacts of climate change through deployment of proactive and reactive measures to secure compliance (e.g. the use of operational controls such as continuous final effluent monitoring). We have undertaken root cause analyses to inform our future investment decisions, and these analyses show that around a third these failures are attributed to undersized or ineffective assets and around a fifth due to operational practices. Of the remaining failures, a range of failure root causes were noted including external influences (e.g. trader discharges or adverse weather events).

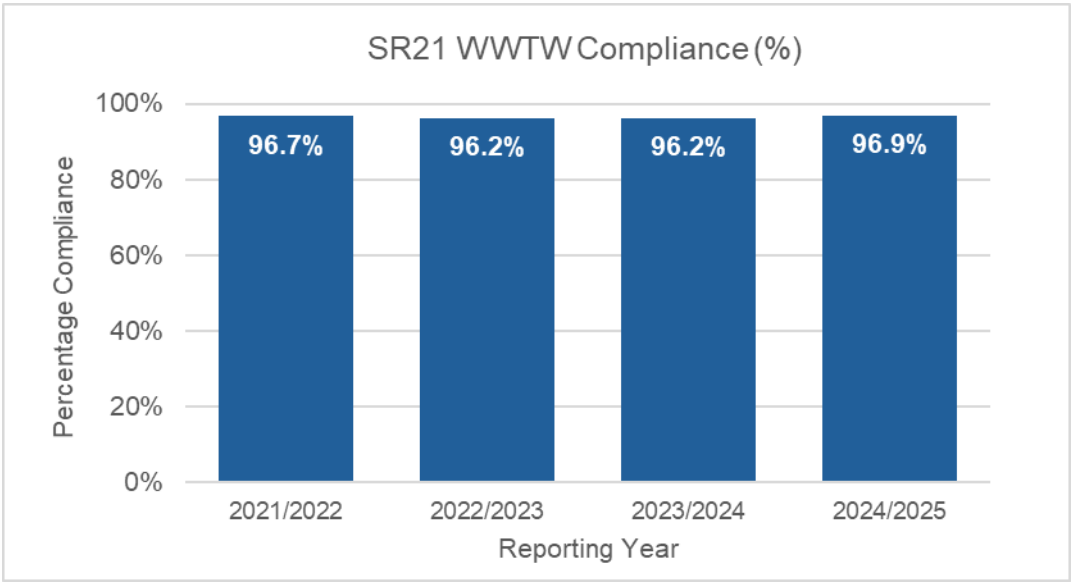


*Figure 5: SR21 WWTW Compliance*

## Environmental Pollution Incidents (EPIs)

Environmental Pollution Incidents (EPIs) are events where a watercourse is polluted via a Scottish Water asset or infrastructure. Most incidents stem from issues within the sewer network, but they can also originate from any wastewater asset or drinking water source.

Many EPIs are related to sewer blockages caused by sewer related debris such as wipes and sanitary products. Sewer blockages are more likely during extreme weather events such as prolonged and heavy rainfall.

The number of EPIs significantly decreased between SR10 and SR15 due to a targeted focus on this measure, including substantial efforts to enhance data quality. Since then, the numbers have remained relatively stable over SR15 and SR21, as illustrated in Figure 6.

Except for 2023, the annual number of Category 1 and Category 2 EPIs has remained below 10.

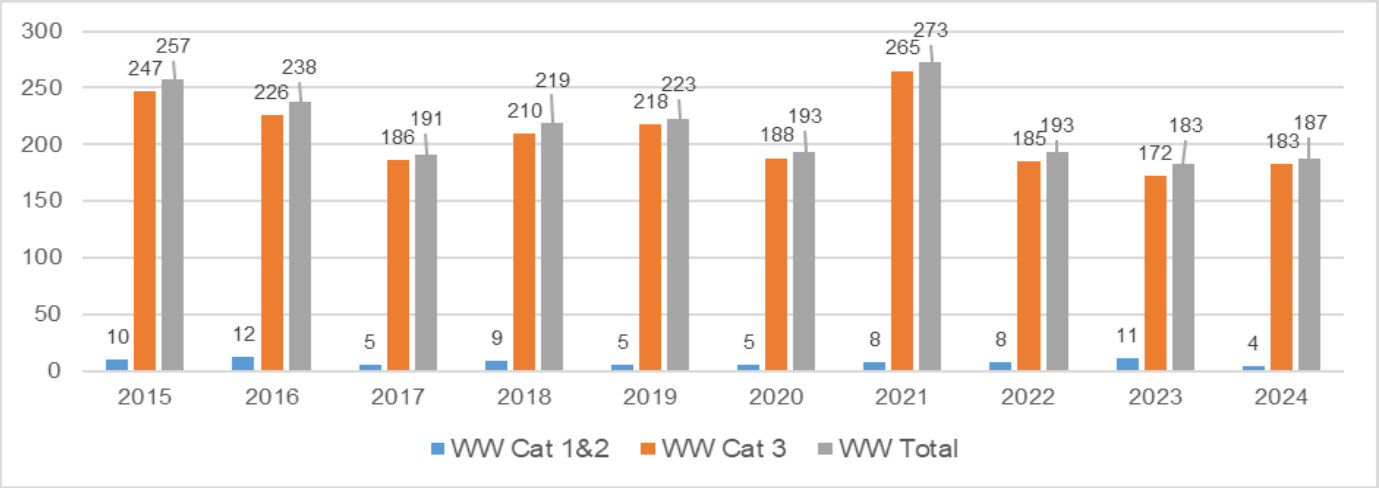


*Figure 6: Environmental pollution incident (EPI) performance during SR15 and SR21*

During this investment period, we have conducted more targeted and reactive localised Nature Calls campaigns in the Borders and North regions. These areas were selected based on historically high volumes of blockages, which can lead to EPIs. A new team has been established to primarily respond to alarms from Event Duration Monitors on our CSOs. This team has been involved in numerous EPI investigations, helping us quickly and efficiently identify the root causes. Additionally, they have supported other activities such as proactive burn walking, more targeted CSO planned maintenance, and the installation of depth monitors within the sewer network, all of which help reduce the risk of EPIs.

Our wastewater intelligent networks and increased monitoring means in certain instances we can identify operational issues and address these before a pollution incident occurs.

## Sludge (bioresource) Compliance

During SR15 and SR21, sludge (bioresource) compliance has consistently remained at 100% due to the availability of both agricultural recycling and land restoration recycling outlets, and landfill.

As assets currently under PFI are transferred back into our ownership and given future pressures on outlet availability (e.g. loss of the land restoration outlet within the next 2-5 years), residual asset life of existing facilities being returned from PFI and net zero goals means, we will need to invest significantly in our bioresource facilities to maintain this performance.

**Water Resources CAR compliance**

The chart below (Figure 7) shows CAR abstraction and compensation compliance levels from 2014-2024 annual return reporting. The performance is based on Scottish Water's assessment of annual data following SEPA's current Compliance guidance. (Note that SEPA is developing a new assessment scheme, Environmental Performance Assessment Scheme (EPAS), which will replace their Compliance Assessment Scheme (CAS) that was in place from 2012-2019. As an interim position, SEPA has provided revised assessment categories to score compliance.)

There has been an improvement in the number of fully compliant licences over time and we can now demonstrate that levels of abstraction and compensation equipment operability is consistently high. Our abstraction compliance has significantly improved in recent years increasing from 74% full compliance in 2014 (205 out of 276 sites) to 93% in 2024 (253 out of 272 sites). However, reservoir compensation compliance has remained much lower, fluctuating between 27% (25 out of 98 sites in 2021) and 52% (52 out of 100 sites in 2017) during this period, with the exception of a notable increase to 65% in 2024 (61 out of 94 sites). The higher compensation compliance in 2024 is primarily due to the unusually wet spring and summer of that year with a reduced need to adjust compensation valves.

Despite the improvement in overall compliance, compensation compliance continues to be affected by limitations in the capability of the raw water infrastructure, remote locations of assets, delivery of investment, along with the impact of operational events and the need to maximise water resources for supply.

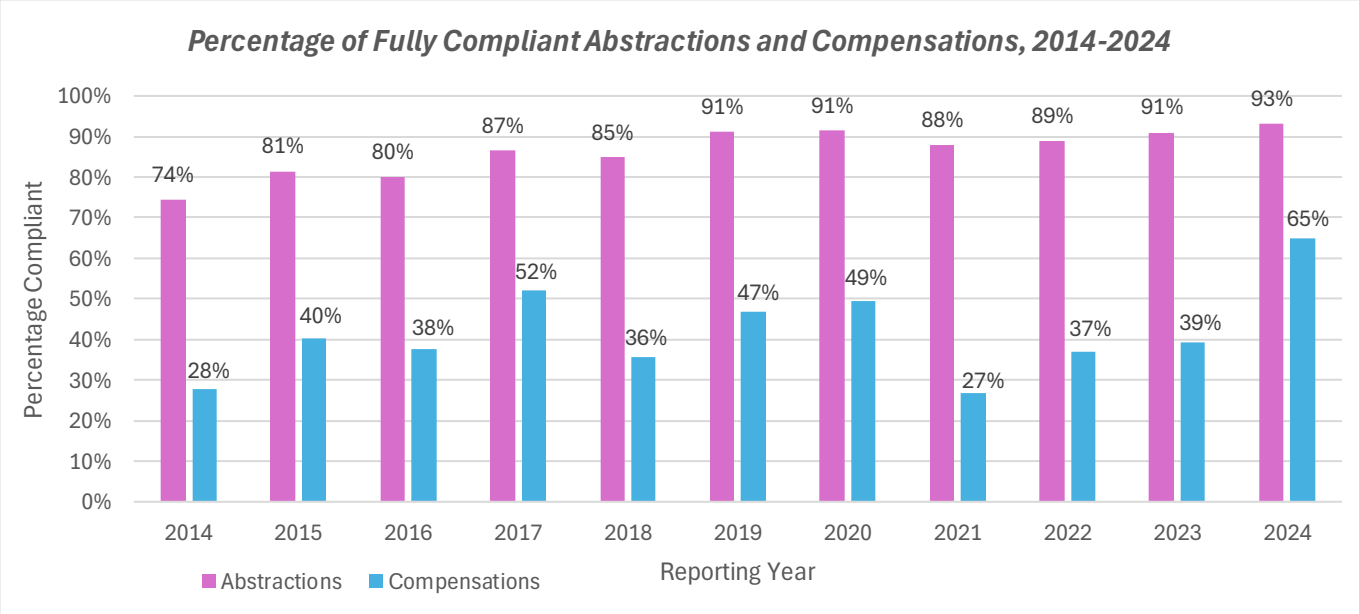


*Figure 7: Our past abstraction and compensation compliance performance*

## 2.4 SR21 Delivery

In SR21 we have continued to deliver ambitious, and often complex, programmes of work. We will utilise the learnings and developments we have made in SR21 to guide and inform our SR27 programme.

### SR21 Management Approach

We used Management Approaches (MAs) as a systematic method for determining maintenance activities across all assets. Initially developed in SR21, both maintenance and enhancement MAs aimed to capture investment triggers and ensure consistent decision-making. The updated version 2 (v2) MAs for asset maintenance incorporate cost-benefit analysis, enhanced data and analytics, and resilience requirements for climate change, leading to better-informed decisions and increased confidence in policy choices. MAs associated with enhancement are being transitioned into sub outcome strategies, which have been published in the Long-Term Strategy.

### Network improvement delivery

In December 2021, we published our **Improving Urban Waters (IUW) Route Map** with the primary commitments to improve monitoring and publication of overflow data, improve water quality and reduce the release of sewage related debris to the environment. The increased provision of data on spill occurrence and volume through the installation of 1,000 Event Duration Monitors (EDMs) has and will continue to improve our understanding of network performance. Through utilising this data and the initiation of study projects, we have confirmed the presence of UIDs, prioritised how to tackle these and undertaken high level solution development to inform and deliver investment during SR27 to remove high priority UIDs. Furthermore, targeted deployment of enhanced monitoring within drainage catchments through Wastewater Intelligent Networks (WWIN) has provided real time visibility of sewer performance, predicting reduced performance and preventing pollution incidents.

Within the Kirkcaldy Drainage Operation Area (DOA), we have trialled **'CENTAUR'**, an autonomous system which uses dynamic penstocks to control flow in the network. Through utilising existing drainage network storage capacity to reduce hydraulic incapacity this prevents or reduces CSO spills (with a 33% reduction in spill volume quantified for Kirkcaldy). We will look to explore the potential benefits from more widescale deployment of this initiative on reducing spill volumes as a solution for improving water quality during SR27.

### Treatment work improvement delivery

During SR21 we undertook widescale deployment of **ESNET systems at wastewater treatment works permitting real time monitoring of final effluent quality**, providing coverage to works serving 55% of Scotland's total population. Provision and visibility of this data has permitted a more planned and proactive response to reduced process performance in advance of possible compliance failures. In addition, this data has improved root cause analysis investigation which in turn has allowed specific needs in achieving and futureproofing compliance to be identified for future investment.

As we look to achieve compliance with a broader range of licence requirements, we better understand how inlet flow and spill data can be utilised, and where further flow monitoring is required, to assess Pass Forward Flow (PFF) compliance. This is informing a future study programme to be undertaken during SR27 to initially baseline PFF compliance and then develop and prioritise options for addressing non-compliance. We will start to deliver prioritised improvements, once identified in this period.

We have begun to understand and quantify how projected climate change will influence the variability of the flow and load influent envelopes arriving at our WWTW inlets. This knowledge is permitting a baseline resilience assessment of our treatment processes to these variable operating conditions. In support of this we have begun utilising dynamic process models to undertake future scenario planning, permitting the identification of future compliance risks and the potential for water quality impacts which in turn will inform investment planning for SR27 and beyond. Further deployment of this modelling capability could allow for optimisation of operational practices and process emissions. The capabilities of this modelling will be explored further in SR27 and outputs utilised in combination with a Net Environmental Benefit metric, currently being piloted, which will allow the holistic environmental impacts of wastewater treatment to be quantified to guide strategic decision making.

**Bioresource improvement delivery**

At Denny WWTW, we are trialling an '**Upflow Anaerobic Sludge Blanket (UASB)' reactor to understand whether an anaerobic wastewater treatment flowsheet is viable for deployment within Scotland's temperate climate and on combined systems**. This pilot seeks to validate and quantify the credentials of this technology as a chemical free, low energy and low process emission solution which permits biogas generation and capture and increasing ammonia strength in the effluent. This could unlock the potential transformation of wastewater treatment assets into resource recovery factories and achieve carbon neutrality in support of our Beyond Net Zero ambition. Performance data and operational learnings from the Denny trial are contributing to the wider 'Transforming the Energy Balance of Wastewater Treatment' OFWAT Breakthrough Project. From the Denny trial we have concluded that the influent was too weak for the technology to work as a primary treatment on combined systems. However, the technology has not been wholly ruled out as there is potential to use it as a treatment for foul only systems and sludge liquors. To influence our further consideration of this technology we await the results of the OFWAT Breakthrough Project. Variations of flowsheet configuration being tested by Thames Water and Welsh Water as part of the project, and operational and performance data from these trials, will supplement our learning on this technology and influence our determination of wider viability. and consideration of this technology for application in SR27 and beyond.

At Nigg Bioresource Treatment Centre, we trialled **co digestion of bioresource with brewery and distillery waste streams.** This resulted in increased biogas production and an agreed regulatory position for the process. We are now actively looking at other locations to introduce co digestion where capacity exists within the digester asset base. A digester degassing system was also trialled at Nigg that resulted in increased biogas capture and a reduction in process emissions from utilisation of the technology. The results of this trial have allowed us to develop business cases to deploy this technology across 5 additional treatment centres in SR27.

In 2018 we developed a Bioresource Strategy in response to preparing for the end of the PFI contracts. At the time of developing the Bioresource Strategy 80% of Bioresource was managed in PFI contracts. The Bioresource Strategy, which is our response to the assets transferring to Scottish Water ownership, will deliver benefit to society and the Environment, maximise value from bioresource and confirmed application to land was the best sustainable option, with consideration of a future focus on further resource recovery. This bioresource strategy was reviewed in 2023 by an External Company who validated it, and then it was expanded further into the long term strategy.

As per the strategy, development work will be completed in SR21, proposing the replacement of the dated drier technology at Daldowie PFI, Meadowhead PFI and Kineil Kearse with a single Advanced Anaerobic Digestion Plant, which will stop the use of natural gas and maximise the value from bioresource by the production of energy thereby the single biggest contribution to

achieving our net zero target of 2040. Moving to agriculture mitigates the current outlet risk of land reclamation capacity reached and therefore no longer available.

In preparation for a future alternative to the agriculture outlet we explored further resource recovery. We conducted technology and market scans on **Advanced Thermal Conversion Technologies (ATC)** for bioresource treatment, which use temperature and pressure to create output materials. These materials offer alternatives to land application, destroy pollutants in complex organics, and enable resource recovery. The scan helped review long-term bioresource treatment options for both large and small sites, including pyrolysis, hydrothermal carbonisation, hydrothermal liquefaction, and gasification, alongside established methods like anaerobic digestion and nature-based solutions. We now understand the costs and carbon impacts of using these technologies in treatment centres across Scotland and how they could be deployed in SR33 and beyond.

Collaborating with ATC vendors, we assessed the quality of output materials (solids, liquids, gases). A trial on hydrothermal carbonisation will explore phosphorus recovery from solid outputs, while we're also part of a gasification project with Yorkshire Water funded by OFWAT. Results from these efforts, due in 2025, will identify market opportunities, inform regulatory discussions with SEPA, and guide work for SR27.

Resource recovery potential from bioresource, wastewater, and treatment process streams was studied, assessing costs, carbon impacts, and interdependencies. Screening waste was analysed for biochar production via pyrolysis, with trials planned. Grit recovery was explored, showing cleaned grit could be used in the aggregate industry, with further research expected in SR27.

A Biocage (mesh attached inside sludge holding tanks) trial during SR21 improved solids retention within sludge holding tanks, reduced shock loading at treatment works from liquor return, increased bioresource thickness, and minimized tanker movements. More units have been deployed, with further installations planned in SR27.

An ammonia recovery trial begins at Cumnock WWTW in April 2025. Results will inform market opportunities and validate SR27 investment in ammonia recovery technology.

**PFI Return**

Several PFI assets have been transferred to Scottish Water ownership during SR21, and we have assumed operational responsibility for these.

*Table 3: SR21 PFI transfers (at the time of drafting)*

| PFI (Expiry/ Transfer Date) | Future Service Plan |
|---|---|
| **Former Highland PFI (2022)** | Maintaining service for ~105,000 customers (population equivalent) in the Inverness and Fort Willam areas (AR3) |
| **Former Aberdeen PFI (2022)** | Maintaining service for ~365,000 customers population equivalent in Fraserburgh, Peterhead, Aberdeen and Stonehaven areas (AR3) |

As these assets have transferred to Scottish Water ownership at the time of writing of this plan, the optioneering and precise AR3/enhancement investment provisions for these 'future services plans' have been included in our SR27 plan as we would any other wastewater asset investment.

**Water Service Abstraction and Compensation**

During SR21, significant investments have been made to improve compliance and equipment operability. Over 500 monitoring points for abstraction and compensation flows are used to report on 272 licenced abstractions and 94 compensations. Maintenance is handled through a rolling programme with a framework contractor, achieving consistently high operability levels despite challenges in managing extensive equipment year-round. The management approach also covers compliance improvement plans for individual sites as part of a compliance improvement programme and RBMP actions/projects which have been agreed up SEPA as part of RBMP3.

## 2.5 SR27: Drivers of Investment

There are a number of key challenges to maintaining or improving service relating to water environment quality including:

**Our Ageing Asset Base** – There is need for ongoing asset repair, refurbishment and replacement of our existing asset base (including assets returned from PFI) in order maintain/improve the level of service we provide our customers and to protect the environment. These maintenance activities will, in addition, need to be delivered to ensure that assets can continue to deliver service whilst accounting for adaptation to the impacts of climate change and growth demand through enhancement.

**Maintaining Statutory and Regulatory Compliance** – We will focus on maintaining or improving statutory and regulatory compliance to current required standards. Whilst preparing for potential new reporting through SEPAs Environment Performance and Assessment Scheme (EPAS) and preparing for potential legislative alignment with revised Urban Waste Water Treatment Directive (rUWWTD).

**Climate Change** – Climate change induced changes to the variability and intensity of precipitation will continue to influence storm water loading through our network and increase the variability of the flow and load envelope arriving at wastewater treatment works. This may increase the occurrence of overflow operation and increase the risk of WWTW non-compliance.

For compensation and abstraction activities the increased likelihood of drought conditions and reduced rainfall due to climate change will impact the yield of raw water sources and environmental flows of waterbodies which in turn makes CAR compliance more challenging.

**Urbanisation, Population Growth and Changing Spatial Distribution of Population** – Our investment will ensure our assets and the service they provide are able to cope with the increased demand for housing and associated water and wastewater infrastructure. This will ensure we can support a Flourishing Scotland. For more information see the Growth Technical Appendix.

**PFI Contract Expiry –** Five of the PFI contracts Daldowie (2026), Dalmuir (2026), AVSE (2029), Ayrshire (MSI) (2032) and Levenmouth (2040) contain limited asset handback conditions within the contracts to ensure that the PFI assets are transferred back to Scottish Water in an operable condition (typically a five year residual useful life requirement). However, this does not apply to the Tay (2029) and Moray (2031) PFI contracts where no requirement is specified**.** These PFI assets cover 37% of Scotland's population for wastewater treatment and have significant and

high-profile consequences on failure, therefore future service plans[1] as have been prepared to extend the asset life and performance by repair, replacement and refurbishment (AR3) investment to mitigate asset failure risk

**Other PFI return costs –** where it has been assessed that the transfer of PFI assets to Scottish Water ownership is best customer value, in some cases (PFI contract dependent) there may be additional transition costs such as exit payments. These are mandatory drivers of investment and do not vary by investment scenario.

[1] Infrastructure Projects Authority (IPA) guidance on PFI expiry

# 3 Customer and Communities

## 3.1 Our Customers and Stakeholders

Scottish Water interacts with the water environment in the provision of both our water and wastewater service. We abstract raw water from rivers, reservoirs, lochs and groundwater and treat this to supply drinking water to customers. Water treatment sludge, which is the byproduct of treating drinking water, typically undergoes several processes to ensure safe disposal or reuse. Domestic wastewater and rainwater is collected and conveyed to treatment facilities which remove pollutants and discharge the water back into the environment. Wastewater treatment produces a nutrient rich waste (bioresource) which is also collected and treated to create biosolids which are then safely returned to the environment.

The way in which we treat the water environment is important to our customers and we are mindful to keep our interactions with the water environment responsible, minimising negative impacts from our service on the environment and contributing to its improvement wherever possible.

### *3.1.1 Customers*

In recent years there has been increasing public interest and scrutiny of the negative impacts that UK water companies can have on the water environment. This is particularly the case for overflows and pollution incidents and their effects on river water quality and bathing waters where we have seen increasing numbers of Freedom of Information (FOI) requests.

### *3.1.2 Stakeholders*

Scottish Water operates within a framework of diligent oversight and collaboration, engaging with multiple stakeholders who ensure our water and wastewater service delivery protects and, where possible, enhances the Water Environment. These stakeholders include the Scottish Government (SG), the Water Industry Commission for Scotland (WICS), and the Scottish Environment Protection Agency (SEPA), with the wider stakeholder group also including Consumer Scotland (CS) and the Independent Customer Group (ICG).

The Scottish Government sets national policies and objectives for environmental standards and their role is pivotal in shaping the regulatory backdrop and ensuring that public health and environmental sustainability are at the forefront of wastewater management practices.

**WICS** plays a crucial role in managing Scotland's wastewater network by regulating Scottish Water's operations and ensuring they meet environmental, quality, and service objectives set by Scottish Ministers. WICS sets the revenue levels that Scottish Water needs to collect through customer charges to maintain and improve water and wastewater services. It also monitors Scottish Water's performance, ensuring they provide high-quality services and value for money. Additionally, WICS facilitates the transition to a sustainable future for Scotland's water sector, which includes addressing long-term challenges such as aging infrastructure and achieving net zero emissions by 2040. This involves working collaboratively with Scottish Water and other stakeholders to ensure the wastewater network remains fit for purpose for decades to come.

**SEPA** focuses on environmental protection, ensuring compliance with environmental regulations and sustainability goals. Their oversight ensures that water treatment processes minimise environmental impact, safeguarding ecosystems and biodiversity.

Consumer Scotland represents the interests of water customers, ensuring that their needs and concerns are prioritised. The ICG works closely with Scottish Water to provide independent insights and perspectives on customers priorities, ensuring customers interests are central to decision making.

## 3.2 Engagement

Customer insights are a key part of our investment considerations and as per our Customer and Stakeholder Engagement Technical Appendix, we have engaged with our customers and stakeholders across a breadth of topics both specifically on our SR27 plans and as part of our ongoing engagement programme.

The tables below show the key insights relevant to the Water Environment investment area.

*Table 4 Summary of customer insights on Water Environment (wastewater) topic (Customer Insights Synthesis Report)*

| Research Question | Key Insight |
|---|---|
| What is **customer understanding** of Scottish Water providing waste water services? | Whilst customers generally have a good awareness of Scottish Water, fewer are able to name Scottish Water as their waste water provider than their water provider, although awareness has risen from 49.59% to 53.59% between 20/21 to 24/25. Whilst Scottish Water is seen by some customers as providing a silent but essential service, recent media coverage of the wider UK Water industry has increased visibility of the sector as a whole. Customer often have limited knowledge and understanding of waste water processes. However, when discussed, customers acknowledge the importance of waste water services due to the potential impact on the environment. |
| What are customer **perceptions of the water environment** in Scotland? | Customers see Scotland's water environment as one of it's greatest assets. They recognise that the condition of rivers and beaches has a Scotland wide economic impact, citing clean beautiful beaches and wildlife as key drivers of tourism. They also recognise the importance of the water environment to communities as places for leisure, drivers of local employment and support of the local ecosystem.<br>However, customers from urban or semi-rural areas do not tend to give river/coastal water quality much thought unless they have a negative experience whilst visiting a beach. Customers from the North of Scotland or a rural area/island are typically very positive about river/coastal water quality. Some customers are aware of water quality being tested by SEPA and are reassured by this. The vast majority of household customers use Scotland's rivers and beaches for walking and agree that poor water quality would affect everyone. Non-household customers are generally less concerned unless it impacts their business. Customers generally assess the quality of the water environment by looking for litter, discoloured water, and bad smells.<br>Not all customers will make the connection between waste water activities and the water environment. However, customers are becoming increasingly aware as a result of recent media coverage. |
| What are customer **expectations** of Scottish Water in protecting the river and coastal water environment? | Customers are generally unaware of Scottish Water's role in protecting river and coastal waters. Most customers are not particularly concerned about the quality of these waters. Whilst customers are mostly unaware of SEPAs role in testing water quality, there is a general expectation that they should be informed if there is an issue. Future customers are keen for Scottish Water to protect nature and ecosystems as well as people. There is an expectation that Scottish Water will work with others to maintain the whole environment around bathing sites. |
| What are customer **perceptions of pollution** in the water environment in Scotland? | Customers generally do not think about the sewerage system. They can be surprised to learn that rainwater is mixed with sewage in the sewerage network, and that the sewerage network is designed to overflow into the water environment at times of high rainfall. This can cause some concern about risk to the environment and public health. Most customers are reassured on learning that these spills contain around 1% sewage, but a small proportion remain concerned. Customers are also reassured by Scottish Water's ownership model, the role of SEPA as environmental regulator, and learning that overflows protect properties from sewer flooding. More generally, environmental pollution incidents are concerning to customers, who link them with a wide range of societal, economic and environmental impacts. |

| | |
|---|---|
| What are customer **expectations** of Scottish Water in **protecting the water environment from pollution**? | It is seen as important to protect the water environment in Scotland. There is an expectation for Scottish Water to address spills and pollution incidents, linked to customers' desire to protect the natural environment. Customer concerns may be rising as a result of UK-wide media coverage around the topic.<br>Customers are keen for Scottish Water to have a plan in place to deal with challenges, such as increased rainfall and demand, whilst also protecting the natural environment. Customers expect Scottish Water to work together with other water sector stakeholders to ease the strain on Scotland's sewerage system. |

*Table 5: Summary of customer insights on Water Environment (bioresources) topics (Customer Insights Synthesis Report)*

| Research Question | Key Insight |
|---|---|
| What are customer **perceptions** on Scottish Water providing waste for bioresources? | Although customers are not generally aware of the term 'circular economy', they do identify sustainability as a key characteristic for a company to be considered admirable. Supported by explanations of the meaning within a water industry context, customers are in favour of Scottish Water embracing the concept more, drawing a contrast with 'throw away' culture. Business customers tend to prioritise circular economy objectives more highly than household customers, and would like to see more information about Scottish Water's plans to do more.<br><br>[Note that there are limited insights on this topic] |

*Table 6: Summary of customer insights on AR3 (Customer Insights Synthesis Report)*

| Research Question | Key Insight |
|---|---|
| What is customer **understanding & acceptance** of aging assets as a challenge? | Customers are generally surprised to hear about the scale of Scottish Water's infrastructure, and to learn its age. Customers understand and acknowledge that ageing assets are a challenge for Scottish Water. They recognise the need for investment in updating and replacing these older assets. |
| What are customer **expectations** of Scottish Water in maintaining assets? | Asset maintenance is a concept that people intuitively understand. It is felt to be highly important, and core to Scottish Water's purpose as an organisation, as it is an area that is clearly Scottish Water's sole responsibility. Customers recognise the need for investment and want to see lasting solutions put in place. Making things last is seen as an important area for Scottish Water's focus, appealing to all customers and older customers in particular. They are keen to reduce the risk of service failures, as well as avoid unnecessary costs.<br>Customers expect this to be an ongoing area of investment with a focus on preventing future problems, and generally also expect Scottish Water to maintain or replace infrastructure before it fails to avoid issues with our services. Customers may perceive fixing assets on failure to ultimately cost more money over time. Some customers seek assurance that money is being spent on parts of the system at risk of failing, to demonstrate that investment is not being made unnecessarily. |
| What are customer **expectations** around climate adaptation of assets? | Once hearing about the scale of challenges from climate change, customers believe it is important to protect infrastructure against the impacts of climate change and there is an expectation for long-term solutions to be used. |

## 3.3 Demonstrating Customer and Stakeholder Support

As described in our Customer and Stakeholder Engagement Technical Appendix we have also robustly and extensively tested our SR27 investment choices with our customers and stakeholders, namely our suite of scenarios as described in Section 4.2.3 and within our Investment Planning Technical Appendix.

Our customers and stakeholders have told us that they care for the water environment and the condition of Scotland's rivers and beaches. Although customers often don't have much knowledge on how wastewater services work, with increasing negative news and media pressure across the water industry regarding sewage discharges into the water environment, our customers and stakeholders are being increasingly aware. They are more engaged in this matter, particularly more so now as we are being more transparent about all our discharge data. Many of our customers are not aware of SEPAs role as the regulator but are reassured that they test bathing water quality. ***In SR27 and as aligned to the Ministerial Objective and Long-Term Strategy, we will continue to seek to meet and where possible improve our level of compliance with environmental legislation both within our sewer network and wastewater treatment sites. We will deliver solutions that are low carbon and cost effective and, where possible, nature based to meet our ambition to provide best value to the customer.***

Our customers are keen for us to embrace a 'circular economy' approach. ***In SR27 we plan to maximise renewable energy generation from wastewater bioresource, while mitigating outlet risk, and recovering resources from wastewater bioresource, wastewater and water treatment process streams where financially viable to do so. We also aim to develop and deliver plans to generate energy and maximise value at Daldowie Bioresource Treatment Centre.***

Our customers have also told us that maintaining and improving levels of service by maintaining our existing asset base is vital to them. There is an expectation that Scottish Water will replace or fix assets before any failures occur. ***In SR27 and as aligned to the Ministerial Objectives and Long-Term Strategy, we will invest in maintaining our wastewater assets to providing a continued level of service to our customers, which is core to our business. We will provide cost effective solutions to maintaining our assets, to meet our ambition to provide best value to the customer.***

We are continuing to undertake and analyse customer engagement activities and results as per our engagement plan (described in our Customer Research Technical Appendix) and therefore we look to review and revise the position described above as necessary as we develop our Final Business Plan.

# 4 Our Investments

## 4.1 Approach

To meet the objectives of the Long-Term Strategy, investment to improve the capability of our assets is required as a minimum to maintain current service levels at acceptable levels of risk to counter the impacts of climate change. This investment is covered through asset maintenance, which includes Asset Repair, Refurbishment and Replacement (AR3). To achieve further service improvements and make progress towards our Long-Term Strategy and the Water Sector Vision, additional investment will be required (Enhancement). In SR27, initial progress on the long-term objectives will focus on addressing areas of non-compliance with regulatory standards and issues directly impacting customers, whilst reducing the highest risks to service or compliance.

The investment needs outlined in Section 2 reflect the increasing demands on the asset base through a changing environment and regulatory requirements, highlighting the areas where improvements to asset capability are required to meet these new challenges to safeguard public health and improve customer service for the long term. AR3 investments will support maintaining and improving compliance of CAR and asset deterioration of assets related to Water Environment. Proposals also include enhancements to reduce the risks of non-compliance against statutory drivers that relate to Bathing Waters improvements, wastewater treatment and network sewage discharges, monitoring and instrumentation requirements to comply with statutory drivers.

Needs which are subject to regulatory enforcement and regulatory commitment relating to non-compliance will be prioritised, followed by regulatory commitments relating to high risk of non-compliance, and other areas of non-compliance and high risk not yet subject to regulatory commitment or enforcement.

### *4.1.1 Long-term outcomes and Performance Requirements*

As described in Section 2.2 the Water Environment investment area aligns Scottish Water's legislative obligations, including the Ministerial Objectives, and align with Scottish Water's Long-Term Strategy and policies to address existing areas of unsatisfactory service performance and risk, including non-compliance with regulatory standards, whilst mitigating risks to service associated with the key long-term challenges posed by an extensive and complex asset base, changing regulatory requirements and environmental changes.

The table below illustrates how we will measure delivery against our outcomes

*Table 7: How we will measure delivery against out outcomes*

| Outcome | AR3 / Enhancement | Description | Performance measure / Target |
|---|---|---|---|
| **Wastewater Asset Maintenance** | AR3 | Our management approaches cover various asset groupings and have been economically appraised to determine the most effective approach to maintain our assets, including an assessment of costs, benefits, risks, and carbon. Significant areas of investment to wastewater assets | 96.37% compliance with SEPA discharge permits<br>Number of serious pollution incidents is not |

| Outcome | AR3 / Enhancement | Description | Performance measure / Target |
|---|---|---|---|
| **Wastewater Asset Maintenance – Returning PFI contracts (6No.)** | AR3 | Maintenance needs for 4 PFI contracts that end between 2027-33 and Daldowie and Dalmuir that return at the end of SR21 | greater than 8 per year<br>Total number of pollution incidents from a sewerage asset is not greater than 34.8, per 10,000km of sewer<br>Number (UIDs) to be not greater 748 |
| **Sewer Network Discharges – Unsatisfactory Intermittent Discharges** | Enhancement | Reduce the number of unsatisfactory intermittent discharges (UIDs) from the sewer system to protect and enhance receiving waterbody quality. | |
| **Sewer Network Improvements – Event Duration Monitors** | Enhancement | Continue to improve our understanding of network performance. | |
| **Wastewater Treatment Discharges - Pass Forward Flow Compliance** | Enhancement | Work towards achieving total compliance with regulated water and wastewater treatment activities to meet specific regulatory requirements and protect receiving waterbody quality. | |
| **Wastewater Treatment Discharges – Instrumentation** | Enhancement | Increased instrumentation at WWTWs e.g. influent quality monitoring and expanded roll out of ESNET (final effluent monitoring) to achieve total compliance | |
| **Wastewater Treatment Improvements - RBMP3** | Enhancement | Implement improvement actions defined by legislation driving new standards and enhancement of waterbodies to enhance receiving waterbody quality. This includes River Basin Management Planning (RBMP) and Bathing Waters | |
| **Wastewater Treatment Improvements – Bathing Waters** | Enhancement | To improve Bathing Water status improvements and compliance at Ayr South | |
| **Wastewater Studies** | Enhancement | Conduct comprehensive studies and monitoring of water and wastewater activities to assess their environmental impact and identify enhancement needs, aligning with RBMP and rUWWTD | |

| Outcome | AR3 / Enhancement | Description | Performance measure / Target |
|---|---|---|---|
| | | objectives. Investigate the effects of climate change on water and wastewater services to determine necessary investments for climate adaptation. | |
| **Bioresource - Resource Recovery** | Enhancement | Maximise renewable energy generation from wastewater bioresource, while mitigating outlet risk, and recovering resources from wastewater bioresource, wastewater and water treatment process streams where financially viable to do so. | Percentage of unsatisfactory sludge disposal is not greater than 0 |
| **IED Compliance** | Enhancement | We Enhance Scotland's Environment:<br>Industrial Emissions Directive (IED) compliance for existing Bioresource Treatment Centres and Creation of IED Compliance Action Plans | |
| **Water Asset Maintenance - Water Environment Monitor & Comply** | AR3 | Maintain water abstraction and compensation CAR monitoring and environmental flow equipment to maintain and improve CAR compliance | Percentage of fully compliant abstraction and compensation sites.<br>Percentage operability of abstraction and compensation monitoring and measurement equipment |
| **Water - CAR compliance - automated compensation valves** | Enhancement | Improve compliance with the conditions of our CAR licences | Percentage of fully compliant compensation sites. |
| **Water - CAR compliance - fish passes** | Enhancement | Improve compliance with the conditions of our CAR licences and support RBMP objectives relating to the removal of barriers to the migration of fish | |

### *4.1.2 Building our approach for AR3*

In SR21 Scottish Water introduced Management Approaches (MAs) for each asset type which set out policy of how and when we will intervene to manage assets. Our approach is directed by our long-term outcomes, our ministerial objectives, current legislative requirements, and Board risk appetite statements which set the performance levels for critical and non-critical assets.

Management Approaches for each asset type have been maturing since 2023 to become economic appraisals. Impacts of climate change have also been considered, considering a range of climate hazards as identified through the Scottish Water Climate Change Risk Assessment.

Our management approaches include two primary considerations:

- **When to intervene** – this considers the point in an asset's life when an intervention should occur. This includes whether to intervene after failure (responsively) or on a planned basis before failure, and if planned, at what stage to intervene to maximise the useful life of the asset while minimising the chance of failure.
- **How to intervene** – this considers what intervention is used to restore asset condition / performance. This includes options for investigations and repairs, decisions on whether to refurbish or replace. Decisions on whether to enhance or improve the resilience of an asset when it is being refurbished or replaced are considered as part of a sub-outcome approach and made on a case-by-case basis as part of systems planning.

*Table 8: Scottish Water definitions for intervention approaches*

| Intervention Approach | Definition |
|---|---|
| **Responsive** | The intervention is responsive when an asset has failed and is impacting service provision and/or we identify that an immediate, no-choice intervention is required. |
| **Planned** | The intervention is planned when an asset has a historic service failure, or we identify that an intervention is required, at our choice, to reduce the risk of asset failure. |

*Table 9: Scottish Water definitions for intervention types*

| Intervention Type | Description |
|---|---|
| **Investigation** | Activities focused on gathering asset information which is required in the decision-making process prior to one of the other asset intervention types. This includes inspection programmes to identify the condition of our assets. |
| **Operational and Maintenance Activities** | Processes and practices that support an asset to continue to operate and achieve its expected operational life that do not modify the asset itself. These can be responsive or planned. |
| **Repair** | Fixing an asset to ensure it can continue to operate and achieve its expected operational asset life (this includes replacement of component parts) |
| **Refurbish** | Renovation / overhaul of older or damaged equipment or replacement of parts of the asset to bring the asset back to a workable condition to extend the expected life of the asset |

| | |
|---|---|
| **Replace** | Replacement of an asset (equipment, unit, or process) when it is at the end of its serviceable life, or the asset has failed and cannot be repaired or refurbished (or it is not economic to do so), or when a change in performance or capacity is required. |

Key management approaches informing the AR3 requirements for Wastewater assets relevant to this Technical Appendix include Wastewater Treatment Works, Sludge Treatment Centres, Sewerage Pumping Stations and Combined Storm Overflows. The key management approach informing the asset maintenance requirements for Water assets relevant to this Technical Appendix is the CAR Compliance management approach.

The investment needs for asset maintenance have been developed primarily from a combination of analytical models (used to predict the overall level of investment required for a particular asset type) together with Management Approaches (used to identify the site / asset specific needs in line with policy criteria). In addition, some investment requirements are associated with routine inspection and maintenance programmes, with others developed from historical run-rates of ongoing activities.

Analytical models which consider previous maintenance requirements to predict future requirements are utilised to inform investment needs and plans at an asset type level. The process for the analytical models is described in a separate technical appendix (Investment Planning Technical Approach).

Management Approaches have been used inform the criteria on which specific assets identified for intervention, with appropriate adjustments to further improve performance or ensure affordability. The criticality of assets and impact to service is considered in policy option selection.

Several assets have resilience included to allow for maintenance and equipment breakdowns. These assets may have responsive management approaches where the assets are fixed on failure. Some key assets also have critical spares to ensure no impact to service.

### *4.1.3 Building our approach for Enhancement*

The requirements for Water Environment enhancement investment during SR27 originate from a range of confirmed needs relating to non-compliance, or represent a high risk to compliance, with regulatory standards, a number of which have been escalated through regulatory enforcement or commitment to be addressed within an agreed timeframe. In addition, some investment requirements are associated with Scottish Water policy positions to reduce risk or improve service where the current status is considered unacceptable from a customer service perspective or where progress is required to achieve long-term outcomes.

All investment requirements are aligned with the needs on the Approved Needs List, (established through the Investment Planning and Prioritisation Framework (IPPF) approach introduced for SR21) as agreed by stakeholders. The more defined Needs set out in this Technical Approach have been agreed with SEPA, with supporting evidence provided through a range of sources including needs statements and regulatory commitments

### *4.1.4 Building our approach for PFI Expiry*

The nine Private Finance Initiative (PFI) contracts that were entered into by Scottish Water's predecessor authorities in the late 1990s and early 2000s involved the outsourcing of large elements of our wastewater customer service provision. These design, build, finance and operate (DBFO) arrangements involved major investments to achieve the UWWTD requirements at Scottish sites bills leading to a step improvement in customer service with minimal impact on customer bills as the (private) finance spreads the repayments of the up-front investment over the PFI contract period. Together with ongoing operation and asset maintenance costs these are paid to the PFI as service fees (for a fixed service provision). These service fees (£160.2m in the year 2023/24) together with a smaller element of payments met directly by Scottish Water currently cost.

In the SR21 period we have undertaken a customer best value assessment of the contractually available options to extend the Highland, Daldowie and Dalmuir PFI contracts and decided not to progress. These decisions were based on customer best value (i.e. an assessment of Totex and risk), with stakeholders (including WICS) briefed these decisions at the time.

For Aberdeen PFI the opportunity arose to buy out the PFI early (in SR21) and was again taken on a customer best value basis. These assessments have shown us that the PFI layers of overheads and profit (reflecting the DBFO original requirement) are an inefficient structure for providing an ongoing service when the design, build and finance elements are no longer required. PFI contracts are also inefficient for meeting changing customer service requirements with weakened contract risk transfer.

The below illustrates the high-level comparison of PFI to SW ownership, pre and post contract expiry.

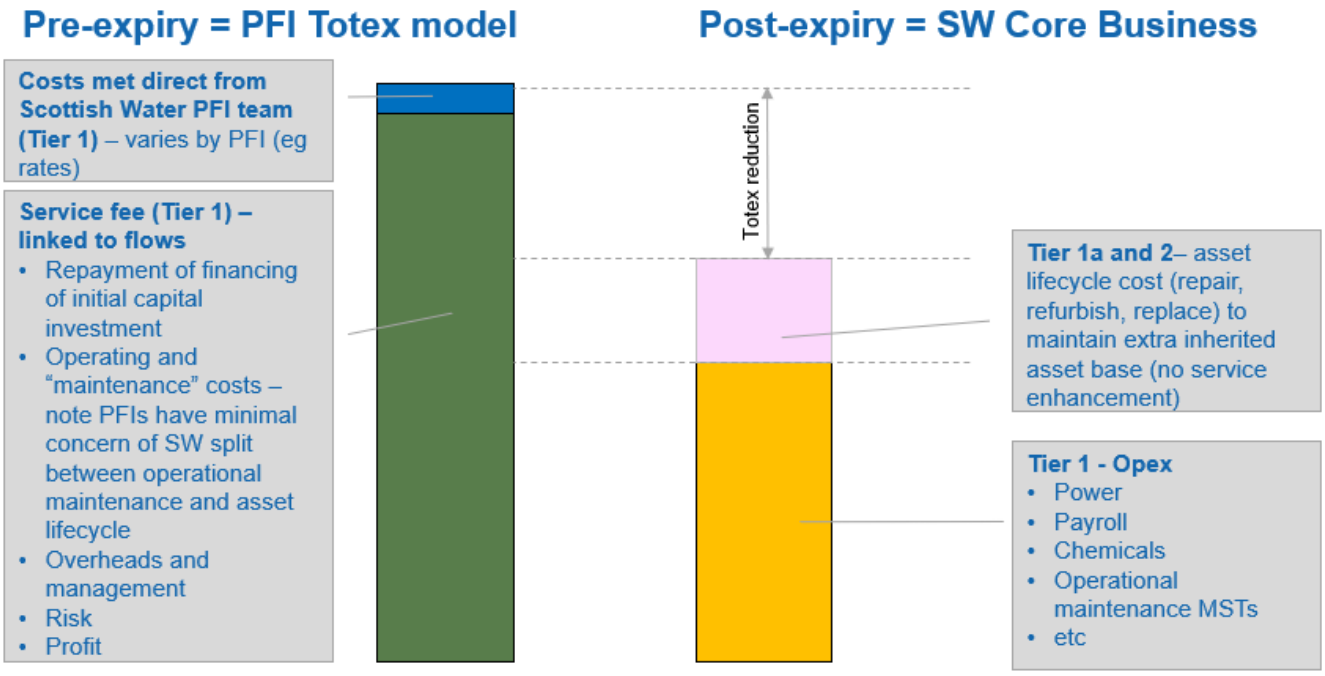


*Figure 8 Illustrative summary of PFI vs. SW ownership comparison of PFI assets*

Our planning assumption for SR27 is that customer best value will be delivered from the PFIs running to contract expiry with the assets and operations transferring to Scottish Water on expiry.

This planning assumption will continue to be validated on a case-by-case basis. The PFI contract expiry mechanisms will be used to realise the best possible inheritance for future service. Transition planning will manage the risks to customer service and safety during the changes. Future service plans reflect how ongoing customer service will be delivered after this out-sourced service is transferred to Scottish Water and as a platform for changing customer service requirements (e.g. growth and Bioresource strategy).

For the four PFIs due to expire in the SR27 period only one (Ayrshire MSI) has a contract option to extend. As described above, our plan assumes that we will allow this PFI to expire at the end of its term with a transfer of assets and operations to provide service under Scottish Water. However, we will appraise the extension option for customer best value and risk before a decision is due in March 2028 and share the findings with stakeholders (WICS). The other three PFIs due to expire in SR27 do not have an option to extend.

Our plans reflect a significant reduction in the totex of the current level customer service in moving from the PFI arrangement (service fees) to asset ownership (AR3 element of PFI) and operation (Tier 1) under Scottish Water. Even if the contract options to extend were available it would be highly unlikely to reflect better customer value. In addition, PFI contract extensions or other outsourcing arrangements are problematic for risk transfer and service change requirements. Our future service plans associated with these PFI assets are summarised below.

*Table 10: PFI future service plans*

| **PFI (Expiry Date)** | **Future Service Plan for the SR27 Period** |
|---|---|
| Daldowie PFI (2026) | Maintain service beyond 2031 when the 5-year residual life ends at the Daldowie sludge dryer (fuel) plant that processes sludge bioresource fed via a pipeline from the six Greater Glasgow treatment works (1,763,000 population equivalent) together with tankered imports from satellite sites (AR3 element of PFI)<br>Enhancement – The dated technology that provides the existing service is unsustainable in the long term for asset repair and replacement and because of the high carbon footprint of the gas consumption plus the high operating cost. Stopping gas usage at Daldowie represents 10% of our carbon footprint and is the biggest single contribution in the net zero routemap. The plan is to replace this with investment in a bioresource (energy centre) reusing many of the existing assets |
| Dalmuir PFI (2026) | Maintain service for ~540,000 customers (population equivalent) across the north west of the Greater Glasgow conurbation (AR3 element of PFI)<br>Seek benefits from previous and potential further reductions in catchment (network) infiltration.<br>Consider a change to the treatment process as invest to save and to improve service resilience. |
| Almond Valley, Seafield and Esk Valley PFI (2029) | Maintaining service for ~956,000 customers (population equivalent) in the Almond Valley, Edinburgh and the Esk Valley areas (AR3 element of PFI)<br>Enhancements – provide for customer growth across all AVSE catchments, upgrade Seafield for IED, bioresource strategy, and to improve odour (sludge handling) |

| PFI (Expiry Date) | Future Service Plan for the SR27 Period |
|---|---|
| Tay PFI (2029) | Maintaining service for ~239,000 customers (population equivalent) in Dundee and Tayside areas (AR3 element of PFI)<br>Enhancements – IED Regulations and Bioresource Strategy |
| Moray PFI (2031) | Maintaining service for 81,000 customers on the Moray Coast (AR3 element of PFI)<br>Enhancements – sludge handling for bioresource strategy. |
| Ayrshire (MSI) PFI (2032) | Maintain service for ~397,000 customers (population equivalent) in the Meadowhead, Stevenston and Inverclyde catchments (AR3 element of PFI)<br>Enhancements – Redirect sludge to new west central bioresource centre. |
| Levenmouth PFI (2040) | Continue to provide service for ~198,000 customers (population equivalent) in the south central Fife area through the PFI arrangement. |

DBFO arrangements (or similar) may offer best value in future where appropriate to spread the cost of a major upfront investment for a major change and optimise risk management. This does not apply to PFI contract extensions, as there is no major investment to be financed.

Outsourcing a full totex O&M arrangement is considered unlikely to offer best value due to high transaction costs, difficulty of meaningful risk transfer, requirement to maintain (Scottish Water) as provider of last resort, the service risk inherent in the change period and the significant IRR that outsourcing providers would require.

On the above basis (and planning assumption of transfer of ownership to Scottish Water), assets transferring to Scottish Water ownership have also followed the below optioneering process.

## 4.2 Optioneering

### *4.2.1 Optioneering Process*

The investment scenario options are built based on three key principles

- Deliver for our existing customers: this includes carrying out essential works to maintain existing asset performance, customer experience, and health and safety, meeting legislative, regulatory and community standards and progress towards Net Zero. It also involves investing in asset enhancement to improve resilience, reliability and sustainability of service.
- Support new connections: providing adequate standards of service to our new customers
- Consider future customers: replacing ageing assets now to ensure resilience of supply to future customers, preventing unsustainable costs being passed on to them in future.

We use our investment hierarchy approach to develop a balanced investment portfolio across all investment areas, to prioritise projects and programmes based on our objectives, customer expectations, stakeholder needs and available funding. This approach is outlined in the table below, which links the principles with three investment need categories. Category 1 covers ‘must do’ investments, which are required as a minimum to meet customers’ expectations on level of

service. This category accounts for the majority of the investment. Category 2, which accounts for the next biggest share, includes 'should do' investments aimed at delivering regulatory compliance and meet the expectations of SEPA. Category 3 covers investment choices to improve service for existing customers, enabling growth, replacing ageing assets to protect service levels for future customers. The investment proposed for Water Environment falls under the Categories 1, 2, 2a, 2b and 3.

*Table 11: Our investment hierarchy approach*

| | Customer & performance centric investment needs | Description | Investment allocation approach | Mapping to FD | |
|---|---|---|---|---|---|
| Deliver for existing customers | 1 Maintain core service performance for existing customers | Essential works to maintain existing asset performance, customer experience and health & safety | Minimum needed to maintain service. Already prioritised significantly so budget reduced as a last resort, after all other non-discretionary expenditure reduced to minimum levels | AR3 – asset category 1,2&3 | Core expenditure |
| | 2 Meet current regulatory & community commitments | Meet legislative (RBMP3), regulatory (water quality), (IUW) community (e.g., Seafield odour) and progress Net Zero by 2040 | SR15 and matched funding<br>Then allocated portion of Enhancement funding | Enhancement (incl. matched funding )<br>SR15 | |
| | 3A Improve service for existing customers | Investing in asset enhancement to strengthen resilience, reliability and sustainability of service | No ring-fenced allowance. Absorbed within Enhancement<br>Allocated portion of Enhancement to support internal flooding and low pressure | Enhancement<br>Incl. ring-fenced allowance | Remaining allocation prioritised within these areas |
| Support new connections | 3B Provide a service for new customers | New development and connections, including temporary works | Currently £100m committed and known sites like Bertha Park are advancing | Enhancement | |
| Consider future customers | 3C Replace long-life assets for future customers | Proactively replacing aging assets to tackle back log and underlying issues; water mains (Asbestos cement pipes), civil infrastructure with lifetime of 40-60 years). Aim to prevent unsustainable costs being passed on to future customers | Consequential allocation as there is high demand from existing assets that impact current service. FD & investment scenarios do specify investing in long-life asset replacement. Future customer needs re-prioritised | AR3 – category 2 Civils and water mains, pressurised sewers | |

An initial unconstrained investment scenario has been developed to fulfil all the principles outlined in *Table 11* ensuring the delivery of all essential requirements to maintain the current level of services, as well as enhancing performance while minimising risk. From this unconstrained investment scenario, additional investment scenarios have been derived by strategically reducing or eliminating investments in certain areas, with the exception of Category 1. These "constrained" scenarios aim to achieve lower costs, but come with associated risks, as the limitation on investment may impact performance improvements and compliance with regulatory requirements, ultimately affecting customer service enhancements.

### 4.2.2 Unconstrained Options

The development of investment planning scenarios is a crucial step in ensuring that strategic and financial objectives are aligned with the Water Sector Vision and our long-term strategy. The initial step involved generating a comprehensive suite of options to encapsulate potential outcomes and investment needs. The unconstrained options include all the necessary investment demands to meet the current draft SR27 Ministerial Objectives, covering legislative requirements, commitments to stakeholders, and customer priorities.

Table 5 outlines the unconstrained investment demand for Water Environment. The investment programmes focus primarily on maintaining current levels of service and addressing areas of non-compliance against regulatory standards subject to regulatory commitment, whilst reducing unacceptable levels of risk to supplies.

The formulation of investment planning scenarios is essential for aligning strategic and financial objectives with the vision for the water sector and our long-term strategy. The initial phase involved creating a comprehensive range of options to encompass potential outcomes and investment requirements. The unconstrained options incorporate all potential investment options,

with a focus primarily on maintaining all assets involved in Water Environment. The total number of investment options considered was 38.

The table below provides details of the number of Water Environment investment options considered for SR27 detailed by investment category

*Table 12: Number of unconstrained options considered for SR27 for Water Environment*

| Investment Hierarchy | Number of Options |
|---|---|
| Category 1 - AR3 | 19 |
| Cat 2a & 2b - Regulatory | 16 |
| Category 3 - Enhancements | 3 |
| Total | **38** |

To identify the best suite of interventions from the above options we have undertaken an extensive optioneering process, applying testing across various performance metrics and compliance requirements to form a series of constrained options, the investment scenarios.

### *4.2.3 Constrained Options*

The constrained investment scenarios were generated from the unconstrained investment options by eliminating, reducing or removing some of the investments. The three constrained investment scenarios presented in this section are:

- **High Scenario**: The investment reduces risk with a CPI + 6.5% per annum, maintaining the service levels achieved at the exit of SR21
- **Working Reference Scenario**: It is the "reference" scenario, with a CPI + 4% per annum, the investment allows maintenance of the service levels achieved at the exit of SR21, meeting Ministerial Objectives albeit accepting more compliance risk
- **Flat Charges Scenario**: the reduction in investment under this "flat charge" scenario, with a CPI + 0% per annum, triggers reduced service levels compared to exit of SR21, with notable overall service impacts as measured by OPA and CEM.

*Table 13: Summary of investment for water environment costs under constrained scenarios*

| Investment Area | High (CPI+6.5%) | Working Reference (CPI+4%) | Flat Charges (CPI+0%) |
|---|---|---|---|
| Asset Maintenance - AR3 | £1,789 | £1,620 | £1,570 |
| Enhancement | £1,125 | £1,077 | £842 |
| **Total** | **£2,914** | **£2,697** | **£2,412** |

The Table below compares the investment across the three constrained investment scenarios, summarised by Investment Programme: -

*Table 14: AR3 investment programme across the three constrained investment scenarios*

| Investment Hierarchy | Investment Area | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|
| **AR3 Cat 1** | Maintain Supervisory Control and Data Acquisition (SCADA) | 52 | 52 | 52 |
| | Maintain telemetry | 26 | 26 | 26 |
| | Maintain odour equipment | 11 | 11 | 11 |
| | Maintain treatment ancillaries - Other | 33 | 33 | 33 |
| | Maintain treatment ancillaries - including tanks, buildings, instrumentation, washwater, chemical dosing, sampling, tertiary lagoon | 110 | 110 | 110 |
| | Maintain Motor Control Centre (MCC) - Wastewater (Network) | 13 | 13 | 13 |
| | 4 - Wastewater (Treatment) | 64 | 64 | 64 |
| | Wastewater Property - Operational Buildings | 3 | 3 | 3 |
| | Enabling acceleration of capacity with provision of Part 4 capacity | 30 | 30 | 30 |
| | Maintain inlet works | 124 | 124 | 124 |
| | Maintain High Voltage (HV) - Wastewater (Network) | 19 | 19 | 19 |
| | Maintain High Voltage (HV) - WWT- Wastewater (Treatment) | 26 | 26 | 26 |
| | Maintain primary treatment | 93 | 93 | 93 |
| | Maintain Site Property and Access - Maintain fencing/gates | 10 | 10 | 10 |
| | Maintain Site Property and Access - Maintain site welfare facilities | 2 | 2 | 2 |
| | Maintain Site Property and Access - Demolish or make safe abandoned or redundant assets at operational sites | 7 | 7 | 7 |
| | Maintain Site Property and Access - Maintain | 37 | 37 | 37 |

| Investment Hierarchy | Investment Area | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|
| | Wastewater Operational Buildings | | | |
| | Maintain Site Property and Access - Remedial work associated with RAAC at wastewater Operational buildings and depots | 1 | 1 | 1 |
| | Maintain screw pumps - Network assets | 13 | 13 | 13 |
| | Maintain screw pumps – Treatment assets | 10 | 10 | 10 |
| | Maintain secondary treatment | 189 | 189 | 163 |
| | Maintain Sewage Pumping Stations -SPS - activities to be carried out on Mechanical, Electrical, Instrumentation, Controls, Automation (MEICA) & civil assets | 176 | 176 | 157 |
| | Maintain Sewage Pumping Stations - Ensure legacy SPS meet the appropriate standard - Bring legacy vested equipment up to standard. | 4 | 4 | 4 |
| | Maintain sludge treatment centres | 112 | 112 | 112 |
| | Maintain Statutory & Planned legislative compliance - Wastewater Treatment assets | 12 | 12 | 12 |
| | Maintain Statutory & Planned legislative compliance - Fixed wire electrical systems - Wastewater Network assets | 14 | 14 | 14 |
| | Maintain Statutory & Planned legislative compliance - Fixed wire electrical systems - Wastewater Treatment assets | 21 | 21 | 21 |
| | Maintain Statutory & Planned legislative | 11 | 11 | 11 |

| Investment Hierarchy | Investment Area | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|
| | compliance - Wastewater network assets | | | |
| | ATOM wastewater assets - Network assets | 8 | 8 | 8 |
| | ATOM wastewater assets - Maintain Treatment ancillaries | 15 | 15 | 15 |
| | Replacement of temporary assets | 32 | 32 | 32 |
| | Water Framework Directive Improvements | 5 | 5 | 5 |
| | AR3 associated with PFI return | 511 | 336 | 336 |
| | Maintain water abstraction and compensation CAR monitoring, measurement and environmental flow equipment | 1 | 1 | 1 |

*Table 15: Enhancement investment programme across the three constrained investment scenarios*

| Enhancement Investment Area | Investment Hierarchy | Description | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|---|
| **Sewer Network Improvements – Event Duration Monitors** | Cat 2 - Commitment | Deploy Event Duration Monitors (EDM) at locations within 5km of designated waters | 13 | 13 | 13 |
| **Wastewater Treatment Improvements – Bathing Waters** | Cat 2 - Commitment | Improve Bathing Water at Ayr South | 5 | 5 | 5 |
| **Seafield WwTW** | Cat 2 - Commitment | Reduce risk of malodour at Seafield WwTW | 8 | 8 | 8 |
| **Wastewater Treatment Improvements - RBMP3** | Cat 2a - Regulatory | Phosphorus, BOD and ammonia impact to be reduced at WwTWs where impact has been confirmed. These form part of draft RBMP3 objectives | 32 | 32 | 32 |

| Enhancement Investment Area | Investment Hierarchy | Description | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|---|
| **IED Compliance & Net Zero** | Cat 2a - Regulatory | - Industrial Emissions Directive (IED) compliance for existing Bioresource Treatment Centres<br>- Creation of IED Compliance Action Plans (Industrial Emissions Directive) | 39 | 39 | 39 |
| **Sewer Network Discharges – Unsatisfactory Intermittent Discharges** | Cat 2a - Regulatory<br>Cat 2b - Regulatory | - Reduce the risk of environmental pollution from CSOs - Develop solutions to priority UIDs (catchments to be agreed with SEPA) for aesthetics & water quality | 355 | 414 | 148 |
| **Wastewater Treatment Discharges - Pass Forward Flow Compliance** | Cat 2a - Regulatory | Provision of appropriate equipment and analysis to demonstrate pass forward flow (PFF) spill compliance at WWTW and that flow is maintained during the event duration. These form part of draft RBMP3 objectives | 52 | 28 | 13 |
| **Wastewater Studies** | Cat 2b - Regulatory | Study to understand the impact of wastewater discharges on the water environment | 26 | 26 | 26 |
| **Net Zero Emissions** | Cat 3 | Net Zero Emissions - Understanding, measuring, managing, and reducing the impact of wastewater process emissions.<br>Improve aeration real time control capability to generate benefits in energy efficiency and reduced risk of non-compliance<br>Develop energy efficient technology strategies | 56 | 44 | 19 |
| **Water - CAR compliance - automated compensation valves & fish passes** | Cat 2a - Regulatory | Improve compliance with the conditions of our CAR licences and support RBMP objectives | 2 | 2 | 2 |

| Enhancement Investment Area | Investment Hierarchy | Description | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|---|
| **Resource Recovery** | Cat 2 - Commitment | - Maximise energy generation and maximise value at Kinneil Kerse sludge treatment centre[2]. - Highland PFI - Sludge - Develop plans to generate energy and maximise value at Daldowie Bioresource Treatment Centre post PFI contract | 505 | 505 | 505 |
| **PFI Returns** | Cat 2 - Commitment | PFI other returns initial work (Almond Valley, Tay project, Moray Coast, Ayrshire) | 34 | 34 | 34 |

### *4.2.4 Chosen Option*

The investment scenarios were tested against various performance metrics and compliance requirements to validate the scenarios' robustness and ensuring they aligned with ministerial objectives, customers and stakeholders' expectations, Scottish Water's Long-Term Strategy and contributes to the delivery of the water sector vision, climate change adaptation plan, SW Board aspirations for 2033 and risk appetite. Based on the testing outcomes, we progressed with the Working Reference scenario (CPI+4%) as the basis for our final recommendation.

**Our final chosen option is the Reference Scenario, a matured and refined version of the Working Reference.**

We did this across all investment areas by:

- Refining the available budget associated with a CPI+4% pa customer charge profile, re-running the Financial Model using the latest modelling assumptions and the application of the most up to date top-down global efficiency factors to be applied.
- We incorporated feedback from sector stakeholders, clarification of Regulator requirements, customer research feedback and further considering the requirements of the draft Ministerial Objectives. Decisions were required to navigate these limitations while ensuring a balanced investment plan.
- Several strategic options were considered to manage budgetary constraints and investment reallocation. These included potential further removal of demand in the asset repair, refurbishment, and replacement (AR3) programme areas or reduce outcomes where there is service choice. As a result, there were upwards adjustments in some areas, and downwards adjustments in others.

[2] Need to be met through investment in West Central

This scenario balances investment needs, falls within the zone of acceptability discussed with key stakeholders of CPI plus 2 to 4%. Customer acceptability is to be tested between Draft and Final BP submissions and so providing a clear path forward for the draft Business Plan submission.

## 4.3 Overall Strategic Option Chosen for SR27

Our SR27 investment constitutes a foundational step in delivering our long-term strategy for the water environment. We will seek to minimise deterioration in baseline performance, begin to futureproof our assets and the service they deliver, and understand the enhancement requirements to be addressed in SR33 and beyond.

#### 4.3.1.1 Wastewater

The SR27 strategy for wastewater is summarised below:

- Undertake targeted and proactive repair, refurbishment and/or replacement (AR3) of existing wastewater assets to reduce the risk of performance deterioration and subsequent impacts to their service of protecting the water environment.
- Reduce the number of high and medium priority UIDs.
- Utilise improved information on Intermittent Discharges to determine UID status and adjust prioritisation accordingly.
- Investigate potential UIDs by utilising improved data from monitoring and modelling to understand our PFF compliance position at wastewater treatment works, sewage pumping stations and CSOs.
- Undertake an extensive study programme to identify future service risks and determine future enhancement requirements and priorities for wastewater activities post-SR27.
- Increase the monitoring and modelling capabilities of our wastewater asset base through deployment of instrumentation (e.g. influent quality monitoring) and models, utilising data and intelligence in decision-making.
- Undertake prioritised system planning to ensure that comprehensive plans are developed for the most complex systems (referred to here as the Drainage operational Area). The plans will be co-created and will outline over 25 years how we will provide a resilient and sustainable service that protects the environment both now and in the future.
- Focus on reducing the number of EPIs which occur on our wastewater network through increased use of intelligence, including real time monitors and more targeted planned maintenance.

#### 4.3.1.2 Bioresources

The SR27 strategy for Bioresources is summarised below:

- Maximise renewable energy generation from wastewater bioresource, while mitigating outlet risk, and recovering resources from wastewater bioresource, wastewater and water treatment process streams where financially viable to do so.
- Develop and deliver plans to generate energy and maximise value at Daldowie Bioresource Treatment Centre.

#### 4.3.1.3 PFI

The SR27 strategy for PFI Transfers is summarised below:

**For those sites where the PFI contract expired in SR21 to Scottish Water ownership in SR21**

The scale of investment required in SR27 for each of these assets and therefore presented in this plan has been ascertained through the optioneering process described above in Section 4.1.

*For those sites where the PFI contract is due to expire in SR27:*

*PFIs without the option to extend in SR27*

For PFIs without the option to extend in SR27, we have considered implementing new PFI arrangements, alternative outsourcing arrangements as well as transfer of these assets to Scottish Water ownership. As a result of an investment appraisal for each PFI we have concluded that transfer of these assets to Scottish Water ownership is the option that provides customers with best value.

As such, our investments in SR27 for the assets associated with these PFIs focus on transfer costs (where appropriate), AR3 investments and Tier 1 costs to manage these assets in line with Scottish water standards and management approaches to maintain service provided to customers.

The scale of investment required in SR27 for each of these assets and therefore presented in this plan has been ascertained through the optioneering process described above in Section 4.1.

*PFI with the option to extend in SR27*

From our current customer best value assessment, we consider that transfer of these assets to Scottish Water would be the most favourable outcome however we continue to review this position ahead of March 2028. As such we have included PFI exit fees, AR3 investments and Tier 1 costs for the assets under this PFI (from the time of contract expiry) as part of our SR27 investment plan.

#### 4.3.1.4 Water service abstraction and impoundment

The SR27 strategy for water service abstraction and impoundment is summarised below:

- Undertake targeted verification and repair/refurbishment/replacement of monitoring and measurement equipment (AR3) for abstraction and collection of water and maintain environmental flow provision assets to reduce risks of over-abstraction from the water environment and comply with CAR reporting requirements.
- Work towards long- term outcomes of improving compensation and abstraction equipment to ensure licence compliance and make improvements aligned with the River Basin Management Plan where cost beneficial and technically feasible. This involves improving reservoir compensation compliance and investment in fish (eel) passes.
- Continue to work with SEPA on Compliance Improvement Plans for non-compliant sites.
- Continue to work with SEPA on actions/projects to meet RBMP objectives.
- Engage with SEPA on prioritisation of investment.
- Engage with SEPA on licence change requirements for non-compliant sites.
- Involvement in consultation for RMBP4.

### 4.3.2 SR27 Investment plan

We have categorised the SR27 investment plan by the investment hierarchy category as per our investment planning strategy.

*Table 16: SR27 investment plan (including PFIs transferred) by investment hierarchy*

| Investment Type (Primary) | Investment Hierarchy | Investment Drivers | Reference (CPI+4%) (23/24) |
|---|---|---|---|
| **AR3** | Cat 1 | Maintenance | 1,348[3] |
| **Enhancement** | Cat 2 - Commitment | WW Commitment Compliance | 524 |
| **Enhancement** | Cat 2a - Regulatory | WW Compliance | 576 |
| **Enhancement** | Cat 2b- Regulatory | WW Compliance | 72 |
| **Enhancement** | Cat 3 - Regulatory | WW Expectations | 5 |

### 4.3.3 Customer Benefits

#### 4.3.3.1 Performance Outcomes

The outcome measures marked with an asterisk are those that we consider there is scope to align with the measures in England and Wales. We are exploring this further with Scottish Water.

*Table 17: The outcomes we are seeking to achieve in SR27*

| Level of Service | Unit | 2027-28 | 2028-29 | 2029-30 | 2030-31 | 2031-32 | 2032-33 |
|---|---|---|---|---|---|---|---|
| Percentage compliance with SEPA discharge permits | % | 96.37 | 96.37 | 96.37 | 96.37 | 96.37 | 96.37 |
| [Measure(s) to be proposed] UIDS | Number | 850 | 811 | 809 | 806 | 799 | 748 |
| Number of serious pollution incidents* (W & WW) | Number | 8 | 7 | 7 | 6 | 6 | 5 |
| The total number of pollution incidents from a sewerage asset affecting the water environment* (WW only) | Number per 10,000kms length of sewers | 34.8 | 34.8 | 34.8 | 34.8 | 34.8 | 34.8 |
| Percentage unsatisfactory sludge disposal | % | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Zero Emissions | tCO2e | 243,869 | 190,714 | 172,114 | 155,889 | 103,900 | 84,994 |

[3] £284m of this £1,348m is associated with PFI return sites

## 4.4 Risks and Opportunities

Horizon scanning has identified key risks and challenges which do, could or will influence our ability to maintain service to the environment. We have also identified opportunities that may help us overcome challenges we have identified throughout this document.

### *4.4.1 Risks*

**Ageing Infrastructure** – Without sufficient repair, refurbishment and/or replacement (AR3) of our existing water and wastewater assets, the risk of service failures or reduced service performance related to deteriorating asset condition will increase. The service provided by PFI assets returning to Scottish Water ownership will also be a factor of the asset condition upon hand back.

**Climate Change and Extreme Weather Events** – The anticipated increase in climatic variability and subsequent increase in the frequency and magnitude of extreme weather events will increase the risk of service failures or reduced service performance. This has the potential to affect both water and wastewater services.

**Urbanisation and Population Growth** – Population growth and changing spatial distribution of population will increase the demand for housing and associated water and wastewater infrastructure. The increased proportion of paved surfaces will increase surface runoff and loading to the sewer system leading to additional capacity on the wastewater network and at treatment works. There is further reference to managing this risk and the opportunity it presents within the Managing Quantity of Flows Technical Appendix.

**Environmental Regulation –** The emergence of new environmental legislation, or the revision of existing environmental legislation, will change how our water and wastewater service is regulated. This may require investment to meet tighter environmental standards.

**Changes to Compliance Reporting** SEPA are developing a new approach to compliance assessment, the Environmental Performance Assessment Scheme, which will replace the Compliance Assessment Scheme that operated until the Covid-19 pandemic. The way in which compliance is measured and reported will change with the new scheme. This will mean that Scottish Water's compliance position will change. Shadow reporting will be undertaken in SR21 and SR27 to assess the changes.

**River Basin Management Planning (RBMP) –**The current plan, RBMP3, was published in 2021, and the next plan (RBMP4) is currently in development and will be consulted on during 2026 and 2027 prior to publication in December 2027. At present it is not possible to ascertain the actions to be implemented and the subsequent investment required to achieve these improvements. During SR27 we will undertake studies in support of this and to allow for investment priorities to established and planned for in SR33 and beyond.

**Community Engagement and Awareness** – Increased public and political scrutiny of the impact of water and wastewater activities on the environment could result in the need for transformational change to improve our environmental performance. This would be compounded by alignment with the policy adopted by English and Welsh water companies of focusing on reducing the number of spills without consideration of resultant environmental benefit. However, this also provides an opportunity for greater engagement with customers and communities on their role in reducing environmental harm e.g. influencing customer behaviours (e.g. reducing potable water use, preventing disposal of inappropriate items to the sewer).

**Micropollutants** – As emerging contaminants, there is increasing focus on micropollutants in SR27 including new regulatory requirements. There is a risk that as emerging contaminants we do not have the appropriate skills and capabilities to meet this challenge. To overcome this will develop a strategic approach to managing micropollutants, including microplastics, in wastewater and bioresources. This will involve addressing knowledge and capability gaps. We need to understand the available analytical techniques for detecting, measuring, and tracking micropollutants. Collaborating with partners, we will further investigate and co-develop source control measures and explore options for treating contaminants at their source, particularly from trade effluent discharges. Additionally, we must assess the viability and effectiveness of both current and emerging quaternary treatment technologies to meet end-of-pipe standards. This includes evaluating the treatment processes required to implement these technologies.

**Recycling biosolids** – In SR21 we have been utilising historic open cast coal mines as an outlet for our bioresources. By using our bioresource on these sites we have provided land suitable for tree planting and ultimately have been supporting the Scottish Government's Net Zero target. However, during SR27 we will have restored all of these sites and therefore in SR27 biosolid recycling could become a challenge. We have plans to address this risk in SR27 by investing in a bioresource treatment facility in Glasgow that will produce enhanced treated biosolids suitable for agricultural recycling.

**Unit cost increases** – In order to deliver on our ambition of making satisfactory all high priority UIDs by the end of SR27 we will need to deliver 66 high priority needs (those not covered by other strategic schemes). We are forecasting that these 66 needs would need to be delivered for at £111 million; i.e. Each overflow would need to be made satisfactory at an average cost of £1.68 million. However, there is a risk that as the design of these schemes mature the actual unit cost projected is greater than that forecast.

**Delivery timescales** – A number of schemes such as the Edinburgh Strategic Solution is currently still in the optioneering and outline design phase. This strategic scheme is a highly complex project, involving the construction of a new underground tunnelled pipeline, new sewage pumping station and a new deep sea outfall. In line with planned project timelines, full stakeholder engagement has not yet been completed. There is a risk that the result of this engagement could lead to unforeseen challenges (i.e. Legal, logistical or access) which delay the realisation of benefits.

### *4.4.2 Opportunities*

**Digital Transformation** – Greater availability of real time performance data, the application of data analytics and enhanced modelling capability could transform the efficiency and performance of service and enhance environmental performance.

**Innovation of automated infrastructure** – Compensation compliance continues to face challenges due to factors such as raw water infrastructure limitations, the need for manual valve adjustments by staff, remote asset locations, the pace of investment delivery, and operational incidents. To address this, a project is planned to trial automated compensation valves with enhanced capabilities for handling variable flows at selected reservoir sites. The results will guide SR27 investment decisions.

**Artificial intelligence and data analytics** – As more Event Duration Monitors (EDMs) are installed, the availability of sewer performance data increases. To make the most of this, we aim

to enhance the use of data analytics and artificial intelligence to identify trends and take proactive measures to prevent spills. This includes exploring remote cameras on overflows and leveraging machine learning to prioritize maintenance and clean-up efforts. Additionally, utilising near and real-time environmental data—like that collected through the Forth Environmental Resilience Array (Forth-ERA) living laboratory—will help shape long-term strategies for safeguarding and improving the water environment.

Once delivered, we will become nearly 100% reliant on the agricultural outlet for wastewater biosolids. Recycling biosolids to land remains the most sustainable option, but challenges like public perception, microplastics, and PFAS need to be monitored, assessed and managed. We will continue to review emerging research and engage with Water UK, UKWIR and other industry bodies to increase understanding in this area. We will develop different approaches that will allow us to move away from the agricultural outlet if the risk from biosolids is deemed too great.

**Advanced Thermal Conversion (ATC) technologies** - in collaboration with suppliers and UK water companies to gain deeper insights into their operation and the materials produced. This knowledge will help us identify target markets, collaborate with SEPA to create regulatory and commercial pathways, and develop value chains for recovered resources. Additionally, these materials will be used to explore opportunities for phosphorus recovery from char and ash, while informing waste treatment solutions for small-scale rural and island communities.

**Emerging bioresource technologies –** will be trialled to evaluate their benefits. This includes technologies that reuse screening and grit.

**Nature-Based Solutions (NbS)** – During SR27, as we work on removing surface water from the network, we will continue to investigate how NbS can be used to treat surface water and protect the quality of receiving waterbodies. This effort will involve close collaboration with delivery partners and the supply chain to ensure the necessary expertise for designing, building, and maintaining NbS.

**Monitoring** – Further research is needed to understand the connection between wastewater networks and treatment systems. This includes evaluating the impact of widescale surface water removal and improved water efficiency on network performance, influent flow variability to wastewater treatment works (WWTWs), treatment performance, and compliance risks. Expanding trade effluent discharge monitoring and enhancing WWTW inlet quality monitoring could provide early warnings of treatment issues, enabling proactive compliance efforts. Treating trade discharges at their source could also reduce the load on WWTWs, potentially eliminating the need for investments to address asset limitations and reducing the need for micropollutant treatment at WWTWs.

**Proactive solutions to enhance resilience and compliance** – In order to achieve total wastewater treatment works compliance in a changing climate, we need a greater understanding of both the permanent and shorter-term proactive deployment solutions to enhance resilience and manage compliance during adverse weather events. We will seek to address this knowledge gap through undertaking a technology horizon scan, trialling viable technologies and working as an integrated team comprising of planning, operations, engineering and innovation to consider the practicalities of deployment as part of adverse weather response planning. To ensure we fully utilise the capability of our existing asset base, we have identified a knowledge gap on the role of microbiology within the wastewater treatment process in performance optimisation, and the

mechanisms by which we can encourage efficient and effective treatment and breakdown of pollutants.

**Leveraging partnerships** – To enhance the wastewater treatment asset base, we will continue working with academia, other water companies, and delivery partners to identify innovative technologies and practices. Our focus will be on mapping technologies that align with our strategic goals, such as low-energy, low-emission, and low-chemical alternatives to conventional treatment, and exploring viable deployment options.

## 4.5 Investment Programmes

We have set out the following section by asset group level and separated by AR3 and Enhancement investment. Majority of the investment for this technical appendix for water environment is associated with the wastewater with a small proportion of associated to the water.

### *4.5.1 Wastewater Programme*

#### 4.5.1.1Wastewater Treatment

The table below highlights the investment requirements for the wastewater treatment asset group, covering the AR3 asset maintenance totalling to £778m at wastewater treatment sites across the Scottish region, The enhancement costs totalling to £160m associated to compliance improvements to legislation, studies, and managing compliance across Scottish water sites.

*Table 18: SR27 Investment for Wastewater Treatment Sites*

| Spend Type | Management Approach | | Description | Investment Area | Reference Scenario (CPI+4%) (23/24) |
|---|---|---|---|---|---|
| | Reference | Name | | | |
| **AR3** | MA057 | WwTW Ancillaries | Wastewater ancillaries (other) | Maintain Treatment Ancillaries | 97 |
| | MA017 | WwTW Inlet Works | Maintain inlet works including inlet, screening, grit removal and storm tanks. | Maintain Inlet Works Processes | 109 |
| | | WwTW Primary Treatment | Maintain primary treatment including tanks, wet well, pumps, instrumentation, control & monitoring, buildings, screenings, cranes, sampling | Maintain Primary Treatment Processes | 74 |
| | | Screw Pumps - WW | Maintain screw pumps | Maintain Screw Pumps | 25 |
| | MA043 | WwTW Secondary Treatment | Maintain secondary treatment including tanks, septic tanks, | Maintain Secondary | 159 |

| Spend Type | Management Approach | | Description | Investment Area | Reference Scenario (CPI+4%) (23/24) |
|---|---|---|---|---|---|
| | Reference | Name | | | |
| | | | activated sludge assets, wet well, instrumentation, BAF filter, reed bed | Treatment Processes | |
| | MA026 | Enabling Development- Waste water | When development occurs in a catchment, it may be necessary to accelerate to refurbishment or replacement cycles support growth requirements | Enabling acceleration of capacity with provision of Part 4 capacity | 5 |
| | MA021 | Temporary Process Units | Replacement of temporary chemical dosing equipment | Replacement of Temporary Assets | 23 |
| | MA108 | PFI (Private Finance Initiative) | AR3 associated PFI return sites | AR3 associated with PFI return sites | 284 |
| **Enhancement** | MA084 | WwTW Improvements | Improve Bathing Water | Wastewater Studies | 25 |
| | MA084 | WwTW Improvements | Phosphorus, BOD and ammonia impact to be reduced at WwTWs where impact has been confirmed. These form part of draft RBMP3 objectives | WwTW Improvements | 32 |
| | MA084 | WwTW Improvements | Reduce risk of malodour at Seafield WwTW | Reduce the risk of environmental pollution at named sites | 7 |
| | MA084 | WwTW Improvements | Provision of appropriate equipment and analysis to demonstrate pass forward flow (PFF) spill compliance at WWTW and that flow is maintained during the event duration. These form part of draft RBMP3 objectives | WwTW Improvements | 96 |

### 4.5.1.2Wastewater Bioresource Treatment

The table below highlights the investment requirements for the wastewater bioresource treatment asset group, covering the AR3 asset maintenance cost of £107m at wastewater bioresource treatment sites across the Scottish region. The enhancement costs of £515m is to meeting Industrial Emissions Directives at bioresource treatment centres.

In the implementation of the Bioresource Strategy we have developed our approach to the West Central area of Scotland as part of the Scotland-wide bioresource system, comprising a new Bioresource Treatment Centre at Daldowie and associated Bioresource dewatering hubs in the wider area. Replacing the drier technology installed by the PFI contract, as it reaches the end of its 5 year residual life. This will provide a safe, reliable and sustainable service, producing quality product to land, and maximising the value of our bioresource at Daldowie STC. We have also developed plans to maximise generate energy. It is proposed to replace the Daldowie STC sludge dryers with an alternative plant utilising advanced anaerobic digesters as these have a more favourable Net Present Value (NPV) and have a significantly lower carbon footprint. The planning assumption is that this will come on stream until ~2031, and fuel pellet production will continue to be the sludge dryer producing pellets used as waste derived fuel until that time. Throughout the planning process, we will continue to consider all options regarding the future of Daldowie, and engage proactively with WICS and SEPA to ensure their views are fully considered in our analysis.

Scottish Water becoming the only Bioresource operator in Greater Glasgow presents opportunities for rationalisation of assets, efficiency and a strengthened bioresource core capability.

*Table 19: SR27 Investment for Wastewater Sludge Treatment Centres*

| Spend Type | Management Approach | | Description | Investment Area | Reference Scenario (CPI+4%) (23/24) |
|---|---|---|---|---|---|
| | Reference | Name | | | |
| **AR3** | MA024 | Sludge Treatment Centres | Maintain sludge treatment centres to ensure a quality product: sludge reception & cleaning, digestion & stabilisation, sludge storage, return liquor treatment, thermal drying and pelletising | Maintain Sludge Treatment Centres | 107 |
| **Enhancement** | MA077 | We Enhance Scotland's Environment | Industrial Emissions Directive (IED) compliance for existing Sludge Treatment Centres | Industrial Emissions Directives | 40 |

| Spend Type | Management Approach | | Description | Investment Area | Reference Scenario (CPI+4%) (23/24) |
|---|---|---|---|---|---|
| | Reference | Name | | | |
| | | | Creation of IED Compliance Action Plans (Industrial Emissions Directive) | | |
| | MA109 | Bio-Resources | Develop and deliver a system for the West Central area of Scotland as part of a Scotland-wide bioresource system, comprising a new Bioresource Treatment Centre at Daldowie and associated Bioresource dewatering hubs in the wider area. This will provide a safe, reliable and sustainable service, producing quality product to land, and maximizing the value of our bioresource. | - Reduce the risk of environmental pollution at named sites<br>- Highland sludge strategy<br>- Maximise the value from bioresource product | 475 |

#### 4.5.1.3Wastewater Sewer Networks

The table below highlights the investment requirements for the sewer network asset group, covering the AR3 asset maintenance cost of £140m to maintain sewage pumping station sites across the Scottish region. There are significant enhancement costs of £403m associated with the improvement of unsatisfactory intermittent discharges at overflows in the network for aesthetics and water quality and the installation cost of event duration monitors to improve provide intelligence of the sewer network operations.

| Spend Type | Management Approach | Description | Investment Area | Reference Scenario (CPI+4%) (23/24) |
|---|---|---|---|---|
| | Reference | Name | | |
| **AR3** | MA023 | Sewage Pumping Stations | Maintain sewage pumping stations (SPS) - activities to be carried out on Mechanical, Electrical, Instrumentation, Controls, Automation (MEICA) & civil assets | Maintain Sewage Pumping Stations | 140 |
| **Enhancement** | MA005 | UID | Reduce the risk of environmental pollution from CSOs - Develop solutions for 125 priority UIDs (agreed with SEPA) for aesthetics & water quality | Unsatisfactory intermittent discharges | 393 |
| | MA107 | Intelligent Networks | Deploy, ~1,300 Event Duration Monitors (EDM) at locations within 5km of designated waters | Network monitoring | 9 |

*Table 20 SR27 Investment for Wastewater Sewer Networks*

We have ~900 Unsatisfactory Intermittent Discharges across our wastewater networks and have agreed with SEPA a categorisation and prioritisation approach. High priority UIDs are those confirmed as causing a water quality impact or having an unsatisfactory aesthetic impact and a high number of public complaints. Our SR27 investment in UIDs builds on the successes of the SR21 Improving Urban Waters programme and uses the same approach.

Our Plan is to have no 'high priority' UIDs by the end of SR27. The Unsatisfactory intermittent discharges funding of £393m would therefore be allocated as:

- Complete Water Quality projects as part of Improving Urban Waters SR21 programme, that have a deadline of December 2027,
- Deliver strategic approach to resolve 16 aesthetic needs in Edinburgh,
- Deliver solutions to address water quality needs across Daldowie, Swinstie and Shotts,
- Deliver solutions to address the remaining high priority needs,

- 100% coverage of intermittent discharge locations. The planning phase will identify the best locations for these monitors, likely dividing them between overflow monitoring and strategic points within catchments. Using our models as synthetic monitors at difficult to access locations This will significantly enhance our intelligent network capabilities. By improving our understanding of catchment hydraulics and performance, we can increase the accuracy of our hydraulic model predictions, including forecasting and insights into overflow events.

### 4.5.1.4Wastewater Other – Region Wide

Table 20 highlights the investment requirements for region wide asset groups across the wastewater asset base, covering the AR3 asset maintenance cost of £322m across the Scottish region. There are £53 million enhancement costs linked to our net zero and environmental targets through two key investments:

1. Conducting studies to better understand the impact of wastewater discharges on the water environment (£48 million)
2. Understand level of treatment resilience as a result of climate change and other plausible hazards (£5m)

| Spend Type | Management Approach | | Description | Investment Area | Reference Scenario (CPI+4%) (23/24) |
|---|---|---|---|---|---|
| | Reference | Name | | | |
| **AR3** | MA013 | SCADA | Maintain Supervisory Control and Data Acquisition (SCADA) - Wastewater Treatment | Maintain Supervisory Control and Data Acquisition (SCADA) | 49 |
| | MA044 | Telemetry | Maintain Remote Telemetry Unit (RTU), communication, data quality testing and remedial actions & telemetry rationalisation | Maintain Telemetry Systems | 25 |
| | MA049 | WwTW Odour Equipment | Maintain odour equipment | Maintain Odour Equipment | 7 |
| | MA118 | MCC | Maintain Motor Control Centre (MCC) - Wastewater (Network & Treatment) | Maintain Motor Control Centre (MCC) | 76 |
| | MA091 | HV | Maintain High Voltage (HV) - Wastewater (Network & Treatment) | Maintain High Voltage (HV) | 65 |
| | MA120 | Water & Wastewater - Property and Access | Maintain fencing/gates | Maintain Site Property and Access | 60 |
| | MA068 | Statutory & Planned Maintenance | Statutory Maintenance items - Wastewater Treatment assets | Maintain Statutory & Planned legislative compliance | 7 |

| Spend Type | Management Approach | | Description | Investment Area | Reference Scenario (CPI+4%) (23/24) |
|---|---|---|---|---|---|
| | Reference | Name | | | |
| | MA068 | Statutory & Planned Maintenance | Fixed wire electrical systems - Wastewater treatment assets | Maintain Statutory & Planned legislative compliance | 20 |
| | MA068 | Statutory & Planned Maintenance | ATOM wastewater assets | ATOM Wastewater Assets | 13 |
| **Enhancement** | MA076 | Wastewater Studies | Study to understand the impact of wastewater discharges on the water environment Understand level of treatment resilience as a result of climate change and other plausible hazards | Wastewater Studies | 53 |

*Table 21 SR27 Investment for other Wastewater asset groups*

### *4.5.2 Our Investment Programmes – Water*

A key part of the investment programme will continue to be delivered under the Water Resources Environmental Monitoring and Compliance Management Approach (MA063). This constitutes AR3 and Enhancement investment to maintain and improve CAR compliance and SEPA reporting requirements. It is further divided into 3 areas:

- Maintenance of abstraction and compensation controls or monitoring equipment.
- Verification monitoring and measurement equipment & weir calibration.
- Maintenance activities on assets where purpose is solely to deliver environmental flows related CAR licence compliance (compensation valves, fish passes, measuring weirs etc.).

The benefits of the investment programme are that it will maintain/improve CAR compliance, reduces potential for environmental incidents, reduces non-compliance risks and gives assurance to SEPA that asset maintenance programme is in place. It is already an established programme where the contractor works closely with the Scottish Water's Water Resources Team.

#### 4.5.2.1 Water Abstraction - Water Resources Environmental Monitoring and Compliance

*Table 22: Investment for Water Abstraction*

| Spend Type | Management approach | | Description | Investment Area | Reference Scenario (CPI+4%) (23/24) |
|---|---|---|---|---|---|
| | Reference | Name | | | |
| **AR3** | MA063 | Water Enviro Monitor & Comply | Maintain water abstraction and compensation CAR monitoring, measurement and environmental flow equipment to maximise CAR compliance | Install or maintain abstraction and compensation monitoring equipment | 1 |

### 4.5.2.2 Reservoir Compensation Improvements CAR Compliance Enhancement

| Spend Type | Management approach | | Description | Investment Area | Reference Scenario (CPI+4%) (23/24) |
|---|---|---|---|---|---|
| | Reference | Name | | | |
| **Enhancement** | MA063 | Water Enviro Monitor & Comply | Support compliance with changes to CAR Licence conditions to RBMP3 commitments<br><br>(Automated compensation valves / Fish passes) | Water Framework Directive Improvements | 39 |

*Table 23 SR27 Investment for Water Reservoir Compensation*

## *4.5.3 Our Investment Programmes – PFI Transfers*

For the four PFI contracts that will expire during SR27 (AVSE, MSI, Moray and Tay) further detailed studies (including condition assessments) will be required to corroborate modelled assumptions used for the build out of SR27 investments presented within this plan.

*Table 24: SR27 Investment for PFI Transfer Sites*

| Spend Type | Management approach | | | Description | Investment Area | Reference Scenario (CPI+4%) (23/24) |
|---|---|---|---|---|---|---|
| | Reference | Name | | | | |
| **Enhancement** | MA108 | PFI (Private Finance Initiative) | Highland PFI Includes transition to Scottish Water ownership and contractual | PFI other returns | | 7 |

| | | | | | |
|---|---|---|---|---|---|
| | | | obligation of fair market value payment | | |

## 4.6 Future Investment Requirements

### *4.6.1 Our Water Environment Strategy*

Over the next 25 years, we will work towards achieving the outcome of improving the quality of Scotland's rivers and seas through protecting and enhancing our water environment.

To achieve this outcome through our wastewater service, we will plan and deliver targeted investment to deliver sustainable wastewater management solutions that protect public health and enhance environmental quality. Through investment in the maintenance and enhancement of our asset base, we will seek to employ efficient and innovative approaches to ensure resilient infrastructure and reliable service that meets regulatory standards and delivers holistic net environmental benefit. The objectives of the long-term wastewater service strategy which support the proposed outcome for the water environment are described in Section 2.2.2.

To achieve the above objectives, we will continue to improve our knowledge of the condition, performance, operation, capability and resilience of our wastewater assets and service as well as the impact of climate change on the receiving water environment. This will support the deployment of a whole catchment planning approach to prioritise and optimise interventions and solutions, ensuring they deliver the greatest benefit. This approach will be further strengthened through increased performance monitoring and deployment of data analytics to support tactical to strategic decision-making. Whilst we focus on protecting and enhancing the water environment, we will balance decision making with consideration for wider holistic environmental targets such as reducing process emissions and enhancing biodiversity.

We will continuously monitor both risks (e.g. amendments to environmental regulation) and opportunities (e.g. development of innovative technologies) to ensure our long-term water environment strategy is dynamic and adaptable.

This wastewater service strategy aligns with the Water Sector Vision in ensuring that wastewater discharges do not deteriorate the quality of receiving waterbodies and support enhancement wherever appropriate. Additionally, we are seeking to maximise the recovery of water and wastewater resources and build a sustainable circular economy.

**Long Term Strategy: Water Service Abstraction and Sub-outcome**

An objective outlined in the Long-term Strategy for protecting and enhancing the water environment also relevant to wastewater strategy, is as follows:

- Continue to work with stakeholders to ensure our approach to protecting the water environment focusses on improving the overall health of waterbodies in Scotland, to ensure we can deliver best value for customers, communities and the environment. This will include adapting to the changing uses of Scotland's waters and the designation of new or further enhanced bathing waters.

Our long-term strategy specifically for the abstraction and impoundment sub-outcome area is:

- Over the next 25 years, we will improve our compensation and abstraction equipment to ensure compliance with our licences and make improvements aligned with the River Basin Management Plan were cost beneficial and technically feasible.

There is also a separate for water demand reduction objective which is relevant as one of its main aims is to reduce water abstraction from the environment. Reduction in treated water demand over the long-term will reduce water abstraction from the environment, reduce the demand on services, assets, increase drought resilience and support wider economic activity within catchments.

### *4.6.2 Future Trends and Pressures*

Planning for the next 25 years is inherently uncertain. As part of our Long-Term Strategy, we undertook a broad ranging and comprehensive review of the risks and opportunities across the next 25 years. The investment we have identified will secure our essential services by maintaining our existing asset base, allow us to adapt to climate change and meet our legislative requirements. Without major changes to how we currently operate the water and wastewater system and given the projected impact of climate change, we are currently forecasting that the funding needed to deliver sustainable services will need to increase over the next 25 years by almost double. Planning for this period is inherently uncertain and there are both opportunities and risks ahead.

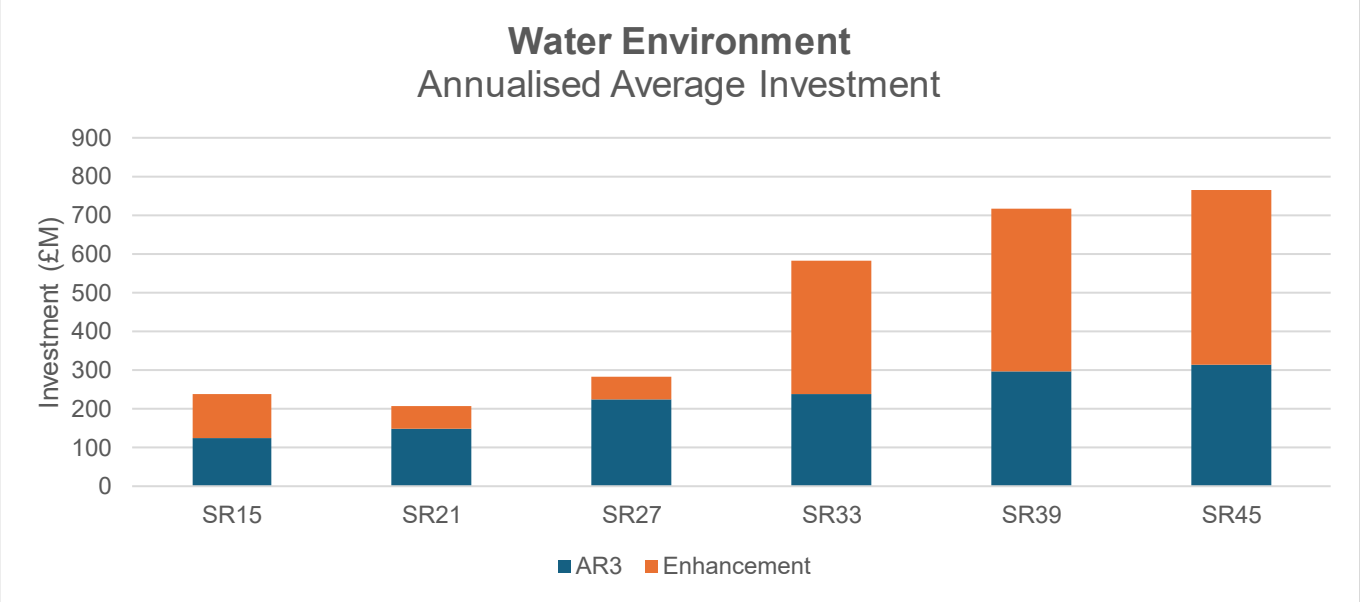


*Figure 9: Historic and projected investment - Water Environment (2015 to 2051)*

For Water Environment, the projection will see expenditure nearly double from £2,524m in SR27 to £4,593m in SR45 (see Figure 9). This is driven by enhancement requirements aligned to a number of key long-term performance requirements:

- Wastewater Networks – address all high, medium and low UIDs by 2051
- Wastewater Treatment – address know compliance and flow to full treatment flows and ensure these are resilient to the impacts of climate change
- Address all known compensation flow compliance issues.

# 5 Innovation

We are committed to employing innovative strategies to enhance water quality and ensure sustainable management of resources. In the upcoming SR27 investment period, the focus will be on pioneering technologies and advanced methodologies to address emerging challenges and optimise treatment processes. By integrating cutting-edge technologies, novel methodologies and research initiatives, we aim to address both current and future challenges within the water treatment processes. Our innovations will be focused on specific issues or risks we have identified in meeting our long-term outcomes (as outlined in 4.4) and will help us to overcome these challenges. Our innovation activities will include:

- Enhanced monitoring to understand how sewer blockages could affect CENTAUR dynamic penstocks
- A trial of automated compensation valves with enhanced capabilities for handling variable flows at selected reservoir sites
- Collaboration on the UKWIR project "National Framework for Water Resources: Environmental Destination Investigation Framework." which focuses on balancing water supply sustainability amid climate change while improving biodiversity and low-flow ecological resilience through partnerships with regulators, stakeholders, and other abstractors.
- Improved data analytics and artificial intelligence to support insight provision from EDMs
- In order to achieve total wastewater treatment works compliance in a changing climate, we need a greater understanding of both the permanent and shorter-term proactive deployment solutions to enhance resilience and manage compliance during adverse weather events. In addition to utilising data from ESNET, we will seek to address this knowledge gap through undertaking a technology horizon scan, trialling viable technologies and working with CSD and TSA to consider the practicalities of deployment as part of adverse weather response planning.
- Continued partnerships with academia, other water companies, and delivery partners to identify innovative technologies and practices more generally. Our focus will be on mapping technologies that align with our strategic goals, such as low-energy, low-emission, and low-chemical alternatives to conventional treatment, and exploring viable deployment options.
- Research into small-scale or decentralized passive treatment solutions for rural and remote communities as alternatives to conventional septic tanks. Additionally, we will further investigate the use cases and advantages of Nature-Based Solutions (NbS) for wastewater treatment.
- Set up of large-scale demonstrators of Advanced Thermal Conversion (ATC) technologies in collaboration with suppliers and UK water companies to gain deeper insights into their operation and the bioresources produced.
- Trial of emerging ATC technologies.

# 6 Interdependencies

This document should be read in conjunction with other Technical Appendices including:

- Managing Quantities of Flows
- Climate Change Adaptation
- Investment Planning
- Supply Chain
- Digital strategy
- Innovation
- The document should also be read in conjunction with Scottish Water's Long-Term Strategy.

# 7 Conclusion

In summary, over the course of SR15 and SR21 our investment in water and wastewater assets has improved our level of service to customers and improved the water environment. More waterbodies are now achieving 'Good' status or higher. Additionally bathing water quality has shown continuous improvement since SR15 and similarly, reduction of pollution incidents categorised as Categories 1, 2, and 3 has also seen positive progress during the same period.

However, we recognise the need to further reduce the impact of our discharges into the water environment. On that basis, we have selected Scenario C for SR27, which aligns with ministerial objectives and our Long-Term Strategy and ambitions, meets customers and stakeholders' expectations, climate change adaptation plan, Scottish Water's Board aspirations for 2033 and risk appetite.

Our Reference Scenario will require **£2,524m** of investment to deliver the following:

- Maintain assets as set out in Management Approaches
- Decreasing the number of Unsatisfactory Intermittent Discharges (UIDs)
- Installing monitors and sensors across our wastewater system to create an increasingly intelligent network
- Reducing the number of serious pollution incidents caused by our operations by nearly 40%
- Maintaining our high SEPA discharge permit compliance 96.37%
- Maintaining our current final effluent and pass forward flow compliance position
- Working with SEPA and other stakeholders to risk assess the potential implications of future legislation
- Delivering all remaining RBMP3 objectives to enhance the water environment
- Maintaining our 100% sludge (bioresource) compliance performance
- Investing in a cutting edge bioresources facility to facilitate the renewable energy generation
- Implementing wider resource recovery from the collection and treatment of water and wastewater
- Integrate PFI assets into Scottish Water asset base
- Maintaining and improving water abstraction and compensation CAR compliance.

# Managing Quantity of Flows
Technical Appendix 004

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# 1 Executive Summary

The Managing Quantities of Flows Technical Appendix covers the SR27 investment required to manage our waste water networks. We must ensure that the waste water networks continue to be maintained, and existing capacity is utilised and optimised and that we address chronic capacity constraints. It is our role to ensure that customer's waste water is collected and returned safely to the environment, without any disruption to customers or communities.

The proposed investment will deliver on regulatory commitments in line with legislation and Scottish Water strategies and policies, including the requirements of Ministerial Objectives to:

- Maintain or improve current levels of service over the long term.
- Identify and pursue opportunities to work with stakeholders, and respond to opportunities proposed by stakeholders, to transform how rainwater and sewerage are managed in new and existing communities.
- In collaboration with other parties as appropriate, must adopt and encourage a catchment management approach to sustainable storm water management wherever practical, to reduce and prevent the impacts of sewer and surface water flooding, reduce pollution from sewer overflows, enable growth, increase resilience and create natural spaces for customers and communities to enjoy.
- Assess and manage climate change risks to infrastructure.

To achieve these objectives, we must continue to overcome a number of key challenges. To identify the optimum blend of interventions to meet our Ministerial Objectives and strategic ambitions, we have undertaken a strategic assessment process to review a number of potential investment scenarios. The investment scenarios were tested against various performance metrics and compliance requirements to validate the scenarios' robustness and ensuring they aligned with stakeholders' expectations, the water sector vision, Scottish Water's Climate Change Adaptation Plan, Net Zero aspirations and risk appetite.

Based on the testing of outcomes, a Reference Scenario (CPI+4%) was recommended.

The Reference Scenario will require £950m (23/24 price base) of investment to deliver the following:

- Maintain assets as set out in our Management Approaches
- Maintain the numerical internal sewer flooding At Risk Register SR21 exit position at the end of SR27, with significant risk associated with unit rate
- Continue to mitigate the impact of internal flooding on customers, where technically feasible, carrying out maintenance on these assets and evaluate their feasibility to be classed as a permanent solution. In SR27 we are planning on installing mitigation measures at 800 properties.
- Initiatives to reduce the number of repeat internal flooding incidents caused by blockages
- Deliver projects to resolve around 135 externally flooded areas on a prioritised basis
- Deliver activities to meet our Flood Risk Management Act duties
- Develop and deliver surface water removal projects, in partnership with others, to reduce overall flood risk
- Support further roll out of customer behaviour campaigns

## Maintaining our Assets

We will take steps to ensure the reliability of our assets and minimise the impact on customers by managing network assets aligned with Management Approaches and operating our assets and responding quickly to resolve issues when they occur, utilising data driven solutions to proactively intervene before flooding occurs. We will seek to optimise our existing assets and networks, and ensure we maximise existing capacity.

1. **Clearing blockages**: Regular maintenance ensures that blockages caused by debris, grease, or tree roots are cleared, allowing waste water to flow freely and preventing backups. This will reduce sewer flooding, and Environmental Pollution Incidents (EPIs) caused by operational issues.
2. **Repairing damages**: Identifying and repairing cracks, leaks, or collapses in sewer pipes can restore their full capacity and prevent infiltration of groundwater, which can reduce the effective capacity of the sewer system.
3. **Optimising flow**: Maintenance activities such as cleaning and desilting improve the hydraulic efficiency of sewers, allowing them to handle higher volumes of waste water.
4. **Preventive measures**: Routine inspections and maintenance can identify potential issues before they become significant problems, ensuring the sewer system operates at its designed capacity.

While regular maintenance of sewers is crucial for preventing blockages and ensuring system functionality, it alone cannot address capacity constraints. To effectively manage increased demand and prevent sewer flooding and unacceptable spills from overflows, infrastructure upgrades are also necessary. Even if every asset and network is maintained at optimum levels, sewer flooding resulting from hydraulic incapacity will still occur. As such we require to continue with interventions to recover and improve the capacity of our networks through enhancement investment.

## Enhancement

Our customers have told us, that internally flooding properties is the biggest impact that Scottish Water can have on our customers. Overall, the underlying likelihood of sewer flooding occurring has increased due to the changing climate, which is reflected in our Internal and External Sewer Flooding At Risk Registers which have been slowly increasing. Our ambition for SR27 is to maintain the internal sewer flooding At Risk Register position so that the exit position from SR27 is the same as the SR27 entry position. We will also continue to focus on the highest priority external sewer flooding.

We will also focus on recovering the capacity of the combined sewer system by removing surface water and increasing our focus on partnership working. This is a new approach for SR27.

We will support customers who have been internally flooded with mitigation solutions where possible, to prevent it happening again. We will also support the enhancement of customer behaviour campaigns, promoting only flushing the 3 Ps (Poo, Pee and toilet Paper), and property level disconnection.

## Enhancing strategic drainage planning

We will work together with others in Scotland to reduce the amount of rainwater in our combined sewer system by setting up two new strategic drainage partnerships and maintaining our three existing partnerships. Strategic Drainage Partnerships help to address multiple challenges of the

climate emergency, ageing infrastructure, increasing population and increasing flood risk by jointly planning with local authorities, above and below ground infrastructure.

This will result in multi-stakeholder partnerships across most of Scotland's densely populated regions. This will include continuing to help others to divert surface water from their buildings and car parks away from the combined sewer system.

This is a key investment area for Scottish Water, as customers have told us through research that flooding properties and community amenities can have a significant impact on their lives. We must maintain flooding performance levels and start to make the long-term shift towards sustainable drainage network which manages rainfall on the surface and reduce internal and external flooding risk.

These key investments are summarised in *Table 1*.

*Table 1: Managing Quantities of Flows Investment Areas*

| Investment Category | Investment Summary | Proposed Investment (£m, 23/24) |
|---|---|---|
| AR3 - Cat 1 | Maintain critical sewers | 49 |
| | Maintain non-critical sewers | 200 |
| | Maintain CSO screens | 12 |
| | Maintain outfalls | 25 |
| | Maintain network model - Upkeep of models with a population equivalent of more than 10,000 | 16 |
| | Maintain Pipebridges | 88 |
| | Maintain rising mains | 139 |
| | Maintain air valves | 1 |
| | Maintain storm tanks | 11 |
| | Maintain Automated Pumped Non-Return Valves (APNRV) and flood mitigation devices | 3 |
| | Maintain syphons | 3 |
| | Maintain Sustainable Urban Drainage Systems | 1 |
| | Other Network assets<br>- Fixed wire electrical systems<br>- Street Iron works<br>- Statutory maintenance items | 44 |
| Flooding - Cat 2a - Regulatory | Provide fit for purpose models required as minimum legislative requirement under Flood Risk Management Act | 4 |
| Flooding - Cat 3 | Develop and deliver surface water removal projects, in collaboration with others, to reduce overall flood risk | 61 |
| | Provide protection to customers from the risk of flooding whilst permanent solutions are being identified and implemented | 12 |
| | To reduce flood risk to customers impacted by high consequence external sewer flooding where not disproportionately expensive | 43 |

| Investment Category | Investment Summary | Proposed Investment (£m, 23/24) |
|---|---|---|
| | To reduce flood risk to customers impacted by high consequence internal sewer flooding where not disproportionately expensive | 213 |
| | Reduce and remove storm water in the sewer network in areas to address high priority risk areas of sewer flooding | 7 |
| | Customer education campaigns | 2 |
| | Reduction in the number of repeat sewer flooding incidents caused by blockages | 16 |

The Investment Planning Technical Appendix provides detailed information on the investment scenarios considered and the optioneering process.

SR27 investment into Managing Quantity of Flows makes up 11% of the total SR27 Investment of £8.3bn, as shown below.

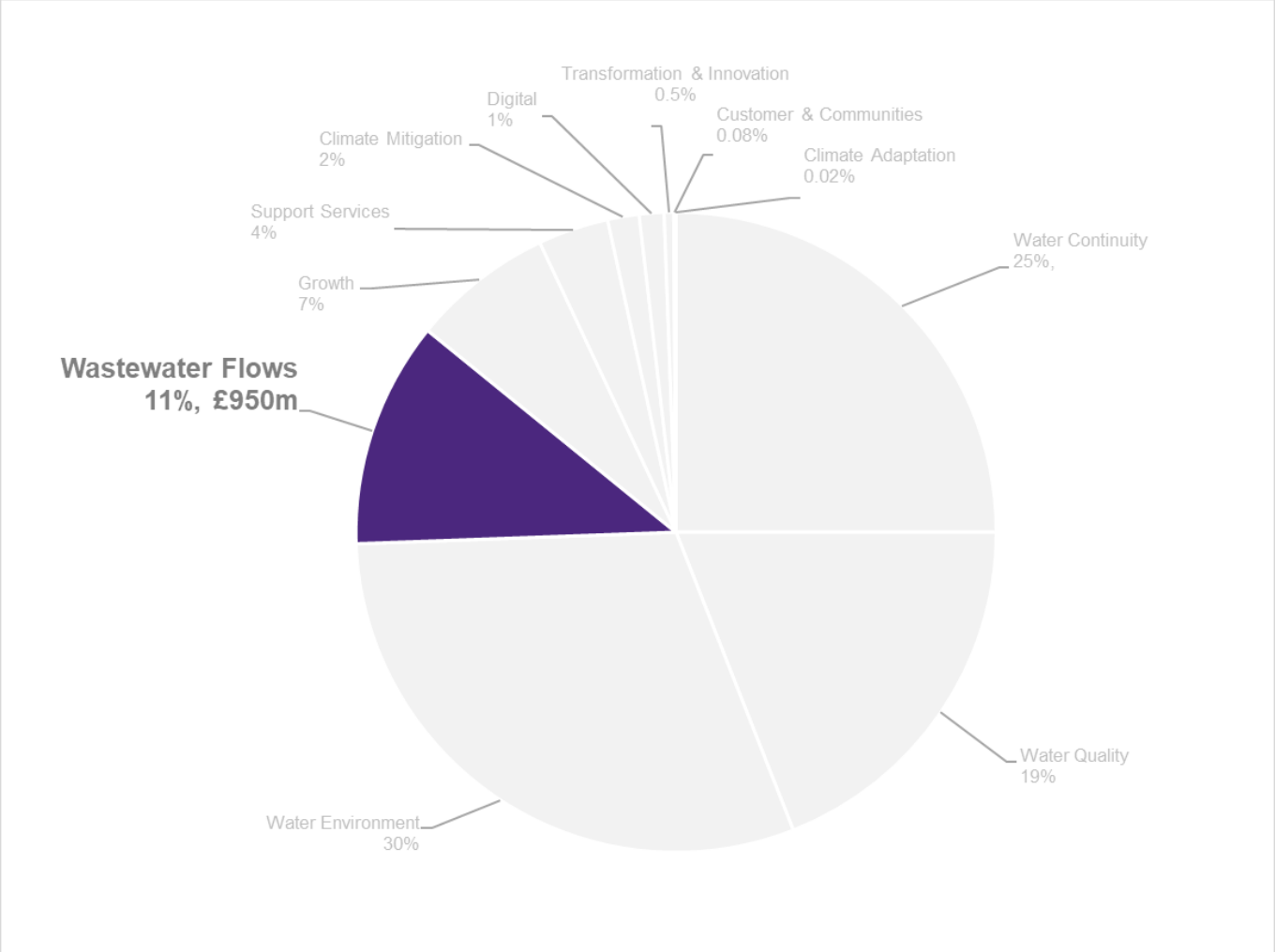


*Figure 1: Managing Quantity of Flows investment as a proportion of the total SR27 investment*

# 2 Background

## 2.1 Scope of Technical Appendix

The Managing Quantities of Flows Technical Appendix covers the investment required to ensure our waste water networks continue to be maintained and existing capacity is utilised and optimised, chronic capacity constraints are addressed, while we start to build resilience against future threats, and we support the collection and safe return of our customer's waste water back to the environment without any disruption to customers and communities. The investment needs for Managing Quantities of Flows have been identified from risks associated with the ability of our assets to deliver this service whilst meeting the requirements of regulatory standards, customer expectations and Scottish Water policies.

The investment needs presented in this Technical Appendix are required to address service performance and risk, whilst mitigating risks to service associated with the key long-term challenges posed by an ageing asset base, increasing requirements from our customers and stakeholders, and environmental changes.

This Technical Appendix details the drivers behind the investments, identifies the needs that will be addressed during SR27 and highlights the importance of this investment for customers, communities and the environment in Scotland.

Figure 2 illustrates in which chapter our specific waste water investments are detailed, with the overall investment split across Water Environment and Managing Quantity of Flows.

| Water Environment | Managing Quantity of Flows |
|---|---|
| • All maintenance associated with Waste Water Treatment Assets<br>• Wastewater Asset Maintenance – Returning PFI contracts<br>• Wastewater Treatment Discharges - Pass Forward Flow Compliance, Instrumentation and RBMP3<br>• Wastewater Treatment Improvements – Bathing Waters<br>• Wastewater Studies<br>• Unsatisfactory Intermittent Discharges<br>• Event Duration Monitors<br>• Bioresource<br>• Water abstraction and compensation CAR monitoring and environmental flow equipment<br>• CAR compliance - fish passes | • All maintenance associated with our wastewater networks (including Combined Sewer Overflows (CSOs) and outfalls)<br>• Sewer flooding<br>• Property level protection (mitigation measures for sewer flooding)<br>• Repeat sewer flooding - initiatives to tackle repeat flooding caused by capacity constraints or blockages on our networks.<br>• Flood Risk Management Act duties<br>• Surface water management and partnership working<br>• Customer behaviour campaigns<br>• Wastewater model maintenance |

*Figure 2: Waste Water Investment Split*

## 2.2 Context

The investment needs presented in this document are required to meet Scottish Water's legislative obligations and align with Scottish Water's Long-Term Strategy and policies to address existing areas of unsatisfactory service performance and risk, whilst mitigating risks to services associated with the key long-term challenges posed by an extensive and complex asset base, changing regulatory requirements and increasing customer expectations.

### 2.2.1 Legislative Requirements

Scottish Water also has statutory duties related to flooding which must be adhered to.

**Sewerage (Scotland) Act 1968**

- To provide and maintain public sewers that can effectively drain surface water from the curtilage of properties under 'usual' rainfall events **Flood Risk Management Act 2009 (FRM Act)**
- The definition of flooding under the act does not include flooding solely from a sewerage system (which falls under Scottish Water duties)
- The FRM act identifies all the parties involved in mapping, understanding, planning and preparing for flood risk.
- Scottish Water has responsibilities for sewers, SEPA has responsibility for flood mapping and flood warning and Local Authorities have powers to reduce flood risk where sustainable.
- Scottish Water must identify where it considers that a flood is likely to originate from a sewerage system and estimate the volume of sewage which is likely to be released in the event of such a flood.
- Exercise flood risk related functions with a view to reducing overall flood risk.

**The Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2021**

- take "all reasonable steps to ensure that discharge [containing sewage] does not result in pollution of the water environment". *This refers to all actions that are practical and feasible for individuals or organisations to take in order to minimise or eliminate pollution risks. This includes implementing best practices, maintaining equipment, monitoring water quality, and responding promptly to any issues*

### 2.2.2 Ministerial Objectives

Our investment plans for Managing Quantities of Flows in SR27 are required to meet the following Ministerial Objectives:

- Maintain or improve current levels of service over the long term.
- Identify and pursue opportunities to work with stakeholders, and respond to opportunities proposed by stakeholders, to transform how rainwater and sewerage are managed in new and existing communities.
- In collaboration with other parties as appropriate, must adopt and encourage a catchment management approach to sustainable storm water management wherever practical, to reduce and prevent the impacts of sewer and surface water flooding, reduce pollution from sewer overflows, enable growth, increase resilience and create natural spaces for customers and communities to enjoy.
- Assess and manage climate change risks to infrastructure.

In addition to the Ministerial Objectives above, the significance of implementing an ambitious flood risk reduction programme is emphasised throughout the Commissioning Letter (*Water Industry Commission for Scotland. (2025). Commissioning Letter for the Strategic Review of Charges 2027-33*[1]). This letter, issued by the Cabinet Secretary for Wellbeing Economy, Net Zero, and

[1] *https://wics.scot/publications/price-setting/strategic-review-charges-2027-33/approach/2027-33-commissioning-letter*

Energy in May 2024, underscores the critical need for proactive measures, specifically highlighting several key areas where such a programme can make a meaningful impact, including:

- Challenges of a changing climate on the industry both in terms of mitigation and adaptation.
- Need to move to nature-based solutions that deliver on response to climate change, the nature crisis, environmental protection and green spaces for the enjoyment of Scotland's population.
- Partnership projects that deliver outcomes in relation to drainage and the reduction of flood risk will require Scottish Water to work closely with Local Authorities, developers, landowners and communities. This requires flexibility so that Scottish Water can deliver to agreed timetables within partnership frameworks.

### *2.2.3 Long-Term Strategy*

SR27 represents the first step on the journey to achieving Scottish Water's ambitions set out in the Long-Term Strategy for the next 25 years. These are:

- Have no customers experiencing repeat sewer flooding in their homes by 2050.
- Support customers who are vulnerable to sewer flooding in their homes, by delivering solutions to quickly prevent it happening again.
- Accelerate our approach to place-based solutions to manage rainwater, using a mixture of engineered and nature-based solutions to increase the resilience of our network and reduce pollution for localised and strategic drainage issues.
- Increase our monitoring capabilities to improve our understanding on how other drainage systems, such as road drains, culverts, roofs and run-off from roads and pavements interact with our sewers.
- All cities and many larger towns will have strategic drainage partnerships which allow collaborative working to more easily and efficiently undertake the necessary work to manage rainwater better.
- Introduce a community fund to support small-scale, localised initiatives like planters and rain gardens in community buildings such as church halls, community halls, libraries and schools.
- Increase our emphasis on partnerships – ensuring we work with public, private and third sector organisations, and involve householders and local communities- to change how we manage rainwater, creating place-based solutions which will help to increase the resilience of our sewer networks and reduce demand on treated water.

## 2.3 Key Challenges

Managing our waste water networks presents several key challenges which contribute to the complexity of maintaining efficient and reliable sewer systems, requiring innovative solutions and proactive management strategies:

- **Climate change** – Extreme weather events are becoming more frequent, resulting in an increased number of property flooding incidents. Forecasts indicate that a growing number of customers will face the risk of both internal and external flooding as rainfall intensity continues to rise.
- **Urban creep** – increased growth of population (particularly in areas already under hydraulic stress) putting further pressure on an already over exerted network.
- **An ageing asset base** - Ageing infrastructure is a significant challenge in managing sewer networks. Many of our sewers were constructed decades ago and as these assets age,

they become more prone to failures, blockages, and leaks, which can lead to sewer flooding and pollution incidents.

- **Changing Legislation:** Scottish Government's policy development work for the water industry is giving consideration to whether future legislation could strengthen Scotland's approach to how rainwater is managed. Potential changes could include:
    - Creation of a Drainage Service as a core function for Scottish Water to sit alongside the Water & Waste Water Services
    - How Scottish Water and Local Authorities could be better enabled to plan, deliver, operate, maintain and protect sustainable rainwater drainage infrastructure to support Climate Adaptation of our urban landscapes.

## 2.4 Past Performance

### *2.4.1 Repair, Refurbish, Replace (AR3)*

To convey over one billion litres of waste water from properties and businesses in Scotland requires an extensive network. Since the mid-1990s, the waste water network has benefited from significant levels of investment in maintenance activities. During operation, our assets encounter significant wear and deterioration which can impact capacity, efficiency and performance.

To help us manage this asset base, in SR21 we created Management Approaches. For each asset type we created a risk based maintenance approach to determine the maintenance tasks and frequency that should be carried out, dependent upon asset condition.

For the majority of our assets, our management approach is to be reactive, when a failure occurs we fix the asset as quickly as possible. We are normally able to keep our assets operating or provide service continuity through measures such as tankering, installation of temporary equipment or additional operator intervention.

### *2.4.2 Sewer Flooding*

Sewer flooding typically occurs due to two main reasons. The first is operational issues, such as blockages, pipe collapses, and other system failures that prevent our assets from functioning properly. The second cause is when the flow of water exceeds the design capacity of our sewer networks, which happens during severe rainfall.

Sewer flooding can impact properties internally, known as internal sewer flooding, or cause external flooding, areas outside the fabric of a property. When this flooding occurs in a rainfall event with a likelihood of occurring 10% in any year, these properties or areas are added to our At Risk Registers. If the rainfall event is above this threshold, the incident is recorded and reported on but is not added to the At Risk Registers. Only flooding which is classified as being caused by sewer overloading is added to the At Risk Register. Due to the key challenges set out above in Section 2.2 the overall underlying risk of sewer flooding is increasing, which is evidenced by our Internal and External Sewer Flooding At Risk Registers.

### *2.4.3 Internal Sewer Flooding*

**The definition of Internal Sewer Flooding**

Internal flooding has been defined as flooding which enters a building or passes below a suspended floor. Buildings are restricted to those normally occupied and used for residential, public, commercial business or industrial purposes. This includes:

• Cellars/basements forming part of the property, regardless of purpose

• Garages linked to the property via internal door and garages with living areas

Buildings excluded from this definition include:

• Buildings primarily used for storage (e.g. outbuildings, sheds).

• Detached garage or garage where there is no direct access from garage to living area

Internal Sewer flooding is classified as either:

- Internal Flooding Overloaded Sewers (IFOS) where the property is flooded due hydraulic incapacity of the network
- Internal Flooding Other Causes (IFOC) where the property is flooded due to other causes such as sewer collapse, blockages etc.

Repeat incidents of flooding can occur in cases where the cause of flooding is attributed to either IFOS or IFOC.

Incidents of flooding due to IFOS and IFOC are recorded and reported upon in Scottish Water's Annual Return reporting process.

**Internal Sewer Flooding At Risk Register**

The Internal Sewer Flooding At Risk Register records internal sewer flooding occurrences caused by overloaded sewers (IFOS), that have happened at a 10% likelihood of occurring in any other year. Figure 3 displays the total number of properties on the Internal Flooding At Risk Register from 2007 onwards.

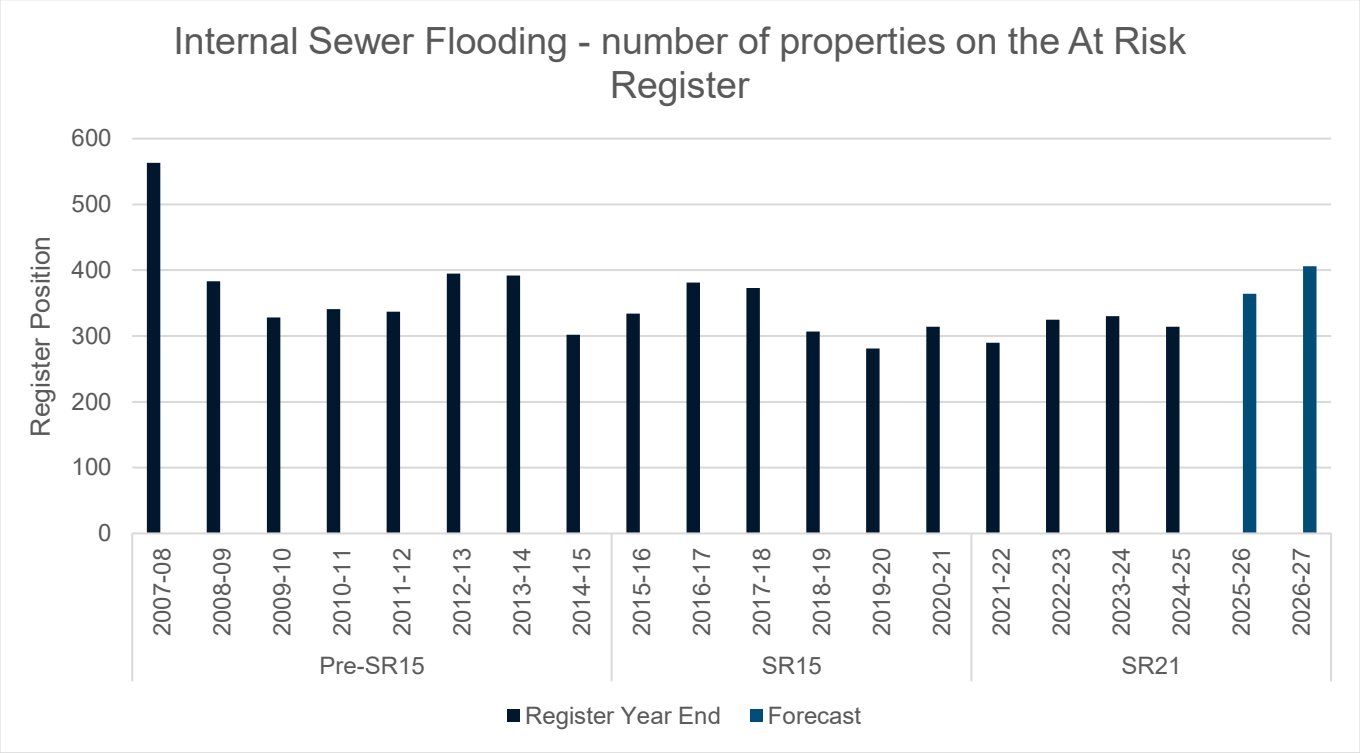


*Figure* 3: Total historic Internal Sewer Flooding At Risk Register properties

## *2.4.4 External Sewer Flooding*

**The definition of External Sewer Flooding**

External flooding is defined as any flooding in an area which is not classed as internal flooding. External flooding is further split into 3 categories:

- Curtilage – any flooding not classed as internal flooding that occurs within the curtilage of a building. This includes the areas excluded from the definition of internal flooding
- Highways – any flooding to highways, including footpaths
- Other – public open spaces, agricultural land or car parks

External Sewer flooding is classified as either:

- External Flooding Overloaded Sewers (EFOS) where the area is flooded due hydraulic incapacity of the network
- External Flooding Other Causes (EFOC) where the area is flooded due to other causes such as sewer collapse, blockages etc.

Repeat incidents of flooding can occur in cases where the cause of flooding is attributed to either EFOS or EFOC.

Incidents of flooding due to EFOS and EFOC are recorded and reported upon in Scottish Water's Annual Return reporting process.

These definitions have been agreed with WICS (Water Industry Commission for Scotland) and are used in all reporting. The definition of external flooding differs from the OFWAT definition[2], which does not include highways and other areas.

Ahead of SR21, we undertook a data quality improvement project, to improve the quality of data that was entered into the At Risk Register. This programme revealed that the number of properties on our external At Risk Register was significantly lower than we had previously thought. This is shown in the drop in the At Risk Register between 19/20 and 20/21 in Figure 4.

In the early years of SR21, several severe rainfall events led to widespread flooding, significantly increasing the need for Flooding Investigations. During this period, suspected internal sewer flooding was prioritised, resulting in fewer investigations into external sewer flooding. Consequently, there were fewer additions to the external At Risk Register, causing a plateau between 2020/21 and 2021/22. After completing the internal sewer flooding investigations, a backlog of external investigations existed. Over the following years, these external sewer flooding investigations were carried out, with some leading to additions to the At Risk Register, and the external At Risk Register position grew again to 2019/20 levels.

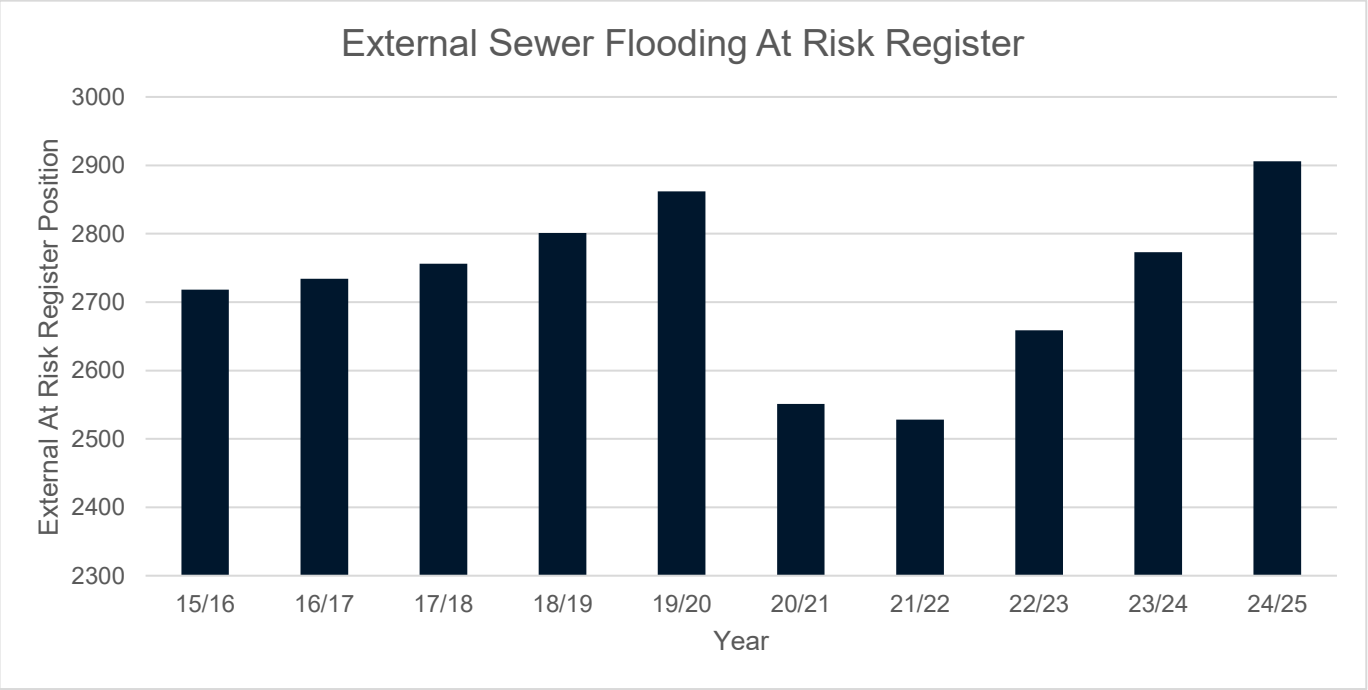


*Figure 4: External At Risk Register Position (From Annual Return)*

[2] https://www.ofwat.gov.uk/wp-content/uploads/2023/05/External-sewer-flooding.pdf

## 2.5 SR21 Delivery

In SR21 we have continued to deliver ambitious, and often complex, programmes of work. We will utilise the learnings and developments we have made in SR21 to guide and inform our SR27 programme. Further details on these learnings are given below.

### SR21 Management Approach

We used Management Approaches (MAs) as a systematic method for determining maintenance activities across all assets. Initially developed in SR21 v1, both maintenance and enhancement MAs aimed to capture investment triggers and ensure consistent decision-making. The updated version 2 (v2) MAs for asset maintenance incorporate cost-benefit analysis, enhanced data and analytics, and resilience requirements for climate change, leading to better-informed decisions and increased confidence in policy choices. For example, the cost-benefit analysis for pumping mains suggests a proactive replacement policy due to their simultaneous installation and rapid deterioration. This approach aims to prevent widespread asset failure, which could disrupt communities and the environment and incur significant repair costs.

MAs associated with enhancement are being transitioned into sub outcome strategies, which have been published in the Long-Term Strategy.

### Enhancement – Internal Flooding Programme

Since 2007, we have maintained our At Risk Register largely between 300 – 400 properties at risk. The average additions to our register over the last ten years have been 50 per year. In SR15 these additions were offset by removing an equivalent number of properties from the At Risk Register through capital interventions. In SR21 however we have not been able to maintain this offset due to two reasons:

1. Increasing cost per intervention
2. Reduced sewer flooding investment funding

#### *1. Increasing cost per intervention*

In SR21 removing properties from the At Risk Register is becoming increasingly more expensive (see Figure 5). This is due to two main reasons.

- Price rises due to inflation. The prices of essential building materials like concrete and steel have surged.
- Solutions are becoming increasingly complex/ properties where the solution is straightforward and low-cost have already been addressed. A portion of new properties added to our At Risk Register can be addressed with lower-cost, less complex solutions. Historically, these types of projects have been successfully implemented. However, larger, more expensive, and complex solutions have sometimes been deferred due to financial constraints or the need for further evaluation. As a result, the number of long-standing properties increases, making up a larger proportion of our register overall. In SR21, we began tackling this backlog of complex projects and successfully delivered more of these challenging schemes, which has led to an increase in the unit rate.

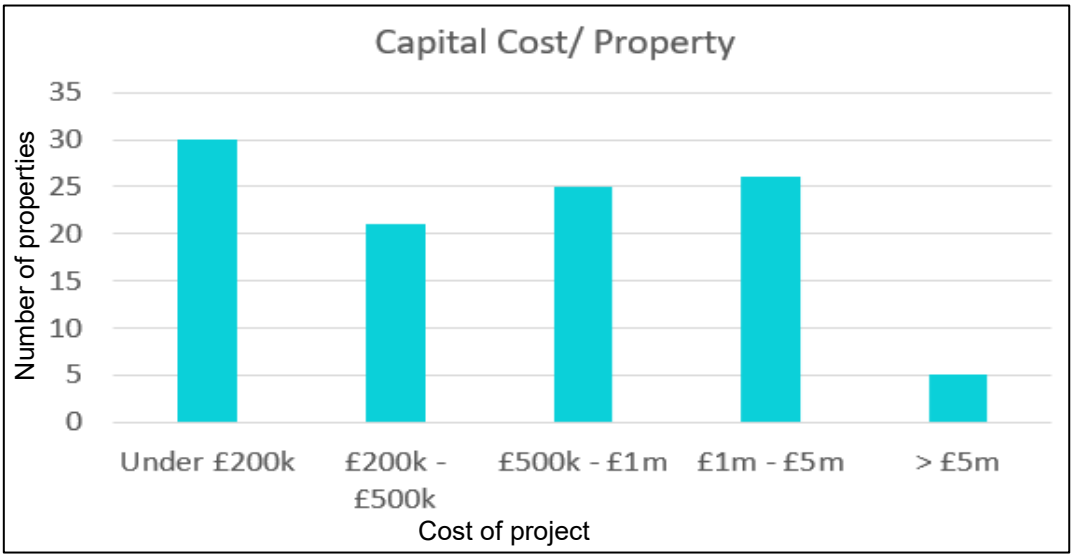


*Figure 5: SR21 Cost per Property on the Internal Sewer Flooding At Risk Register*

Despite increasing our overall investment in Internal Sewer Flooding in recent years, we are forecasting that the At Risk Register numbers will increase throughout SR21.

**Repeat Internal Sewer Flooding**

We want to reduce the consequences of sewer flooding on affected properties as quickly as we can. We use mitigation measures to do this. Mitigation measures are property level flooding protection measures designed to prevent floodwater from entering a building and to minimise damage if flooding occurs. These measures can include installing flood barriers, airbrick covers, non-return valves, and pumps. The goal is to protect the property and its contents, ensuring a quicker recovery and reducing the overall impact of flooding. They provide significant value to our customers by protecting their homes and businesses.

In 2023 we created a dedicated team responsible for delivering an enhanced mitigation programme. The aim of the team is to reduce the impact of repeat sewer flooding on customer properties, widening the envelope of customers who qualify for mitigations. We tested this policy expansion with our Internal Customer Group (ICG) and through customer research and both the ICG and research showed support for the expansion. Our policy (Sewer Flooding Mitigation Policy FRM-001) is as follows:

Mitigation measures will always be considered for:

- Any property on the Internal Sewer Flooding At-Risk Register with a 2 in 10 or 1 in 10 register class
- Any property on the Internal Sewer Flooding At-Risk Register with 1 in 20 register class
- Properties that have flooded internally (or externally) 3 times in 10 years or 2 times in 5 years BUT at least 1 internal incident must have been caused by a rainfall event with a return period less than 1 in 30 years
- Properties, or other external area, added to the External Sewer Flooding At-Risk Register that meet the criteria defined in the External Flooding Overloaded Sewers (EFOS) Mitigation Matrix
- Properties that have experienced repeat flooding as a result of severe weather and meet the criteria defined in the Severe Weather Risk Matrix.

We have installed mitigations at properties that have previously experienced Internal Sewer Flooding to reduce the occurrence of repeat incidents. At March 2025, we have installed mitigation measures, such as flood doors and air brick protection, at 560 properties, with no reported incidents of repeat flooding. Customers are in general supportive of mitigation. Mitigation measures can also protect properties against other types of flooding, such as pluvial and fluvial, which are not the responsibility of Scottish Water, so provide wider benefits to our customers.

On average, it costs £3k to mitigate a property against internal flooding. Scottish Water is also responsible for the maintenance of these measures, which costs an average of £500 per year. This is significantly less than the average cost of implementing a long-term capital scheme, which is approximately £720k per property. We intend to leverage this learning in SR27 and will continue to deploy these value for money solutions in SR27 as described in Section 4.

Mitigating external flooding, presents more challenges as solutions may lie outside the property boundaries and require additional approvals from stakeholders such as local authorities and private landowners.

**External Sewer Flooding**

In SR21 we have made some progress towards implementing external sewer flooding-only solutions. The focus has been on delivering high-priority projects based on flood risk prioritisation.

We have planned schemes for our top 20 clusters of External Flooding Overloaded Sewer (EFOS) areas. The highest priority projects, based on robust prioritisation scoring, will continue through the plan – prepare -deliver process. These projects will likely be on site in SR21, completing in SR27 and will considerably reduce the risk of external flooding at nearly 100 properties.

We are currently projected to invest £41 million across SR21 to remove 42 areas from the external ARR through six projects. Additionally, other areas will be addressed by investing in the removal of properties from the internal ARR, achieved by increasing the waste water network's hydraulic capacity.

**Despite increasing our overall investment in external sewer flooding in recent years, we have seen limited improvements in our External Sewer Flooding At Risk register statistics.**

In SR21 however we have not been able to maintain or decrease the number the number of areas on our External Sewer Flooding At Risk Register because of two key factors:

1. Increasing cost per intervention
2. Reduced IPS allowance

### 1. *Increased cost per intervention*

The average unit rate to remove an area in SR15 was £501,465 which has risen to £631,000 in SR21 as areas remaining on the External Sewer Flooding At Risk register are increasingly complex and therefore solutions for these areas are increasingly high cost.

*2. Reduced IPS allowance*

The external sewer flooding programme experienced the same funding constraints as the internal sewer flooding programme in SR21. The funding constraint meant that we had to reprioritise and reallocate our investments towards the internal sewer flooding programme.

**As a result we are forecasting our SR21 External Sewer Flooding At Risk Register exit position close to 3000 areas.**

Internal sewer flooding is considered a higher priority than external sewer flooding for several reasons. Experiencing flooding within one's home can be traumatic, leading to anxiety, stress, and other mental health issues. The emotional toll can be considerable. This has consistently been a theme coming out of our customer research and our Internal Customer Group. Internal flooding disrupts our customers daily lives, in the most severe cases making homes uninhabitable. This can cause significant inconvenience and stress. However, it is not always 'clear-cut' in terms of priority as external flooding is often very difficult to mitigate and properties in our highest priority clusters can suffer external flooding multiple times a year. External flooding can influence whole communities by flooding access roads and public spaces. For this reason, we have also focused on planning and delivering schemes to resolve external flooding at our highest priority locations.

**Customer Behaviour Campaigns during SR21**

Scottish Water has been tackling the problem of sewer blockages in a new customer behaviour change campaign aimed at protecting the planet. This activity, called 'Nature Calls', is a pan-Scotland campaign involves TV, radio, social, digital and partnership collaborations.

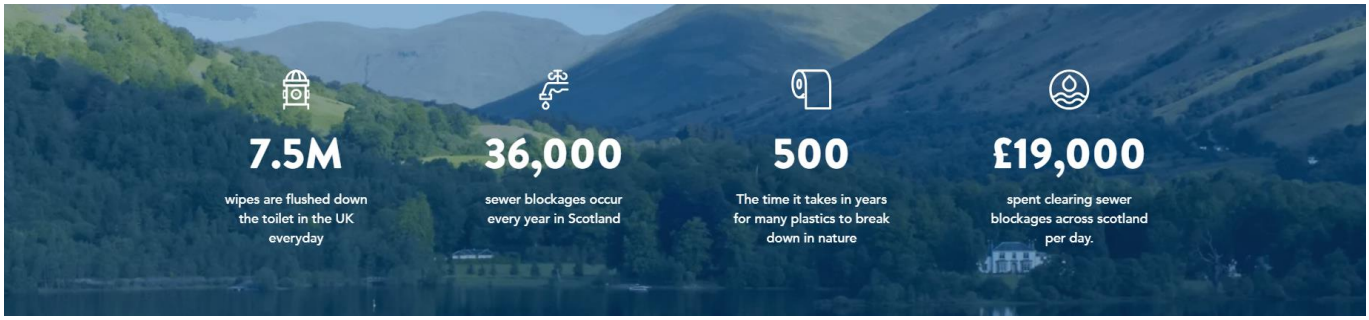


*Figure 6: Nature Calls still from campaign*

Nature Calls has had a marked impact on the business and society more broadly. Not only did major retailers such as Tesco, Boots and Aldi start removing plastic wipes from their shelves, but we also saw governments respond, both north and south of the border. This has led to cross party support for a ban on wipes containing plastic.

And behaviour change with the public has been equally impressive. After the campaign launched, between February 2022 and August 2022, sewer chokes reduced by 14% (vs. 12 months previous) saving the business around £700,000 – a ROMI (Return on Marketing Investment) of 2:1.

As the campaign has evolved, we have taken a more 'localised approach' using blockage data to target hotspot areas, going into communities worse impacted and requiring additional support for change.

YouGov Scottish Omnibus post campaign survey showed significant shifts in attitudinal metrics and claimed behaviours as a result of seeing the campaign:

- 69% of people who are aware of the campaign say they will think more carefully about what they flush down the toilet.
- 74% now agree that wipes are often made with micro plastics.
- 88% would support a call for wipes containing plastic to be banned.
- 73% of those who had seen the ad recalled the main message was 'you shouldn't flush wipes down the toilet'

We are also working at both a national and international level to influence policy and legislation relating to wet wipes.

**Partnership Working**

Alongside Scottish Government (as evidenced in their Ministerial Objectives) we believe partnership working is a key facet of our solution toolkit. As such, in SR21 we have focussed on the focused partnership working arrangements:

- Continuing with the successful Metropolitan Glasgow Strategic Drainage Partnership (of which we are a founding member), which was founded 2002, with five key objectives; supporting economic growth, flood risk reduction, water quality improvement, habitat improvement and integrated investment planning. The formal partnership approach has worked well, it has delivered significant benefits to reducing flood risk in Glasgow, such as the Shieldhall Tunnel and the Smart Canal
- Developing our approach to partnership working. We have developed two additional partnerships; Edinburgh and the Lothians Strategic Drainage Partnership (ELSDP) and Water Resilient Dundee, which is a collaboration with Dundee City Council. Through the ELSDP we have identified priority areas for joint planning, which has resulted in projects to reduce the volume of surface water entering the sewers. Planning is ongoing to identify areas of the city where surface water can be held on the surface, ready for delivery in SR27. In partnership with Dundee City Council we have carried out an opportunity identification exercise across the whole city, prioritising areas for planning and investment. We have already made improvements in Craigie Street and at Douglas Community Park. Our SR27 plans includes increasing capacity of the city's sewer system by preventing or slowing down surface water entry into the sewers.

**Surface Water Management in SR21**

Ahead of the start of SR21, Scottish Water launched its Storm Water Management Strategy. Which moves away from reliance upon the traditional approach of increasing sewerage asset capacity and reliance on CSOs (Combined Sewer Overflows) towards an approach which reduces the amount of (of slows the pace at which) surface water run off enters the system.

The Storm Water Management Strategy can be summarised as:

- Allow no new or substantially re-developed site surface water connections into the existing combined network
- Work with all stakeholders on removing/ reducing storm water from the existing combined network
- Supports sustainable economic growth for all stakeholders
- Supports SUDS which feature place making blue-green city landscapes

In SR21 around 8% of our internal sewer flooding protection projects will have delivered a surface water management element. As a result of focus will have attenuated over 5600$m^3$ of water over the SR21 period – thus reducing the impacts of stormwater on the hydraulic capacity of our sewer

system and therefore significantly reducing the risk of flooding as a result. As described in Section 4 we intend to continue this programme of investment given the significant benefits.

**Climate Change adaptation**

As we plan our flooding solution projects, we plan for a 2°C increase in temperature by 2050 and preparing for a 4°C increase in temperature beyond 2080, which is standardised across Scottish Water.

To determine the flood risk for a property or location, we use a standard method from the UK Water Industry that looks at how often heavy rainfall happens. Previously, we used older data from the Flood Estimation Handbook (FEH)1999, which only included rainfall patterns up to 1999. However, this didn't consider the effects of climate change on rainfall since then. Recently, some parts of Scotland have seen more frequent heavy rain, leading to flooding.

In SR21, we reassessed the flood risk for areas previously investigated, using updated data from the FEH13 (rainfall patterns up until 2013) dataset. This reassessment confirmed that climate change is already affecting rainfall patterns and flood risk. Customers on our database were found to have a higher risk level of flooding (moving from example a 5% risk to a 10% risk of flooding annually) when assessed using the FEH13 dataset confirming that their risk has increased over time as rainfall patterns have altered due to climate change.

**Waste Water Hydraulic Modelling**

Waste water networks are dynamic – property counts, asset data/performance and network data are constantly changing, while hydraulic models are currently static, replicating a point in time. Model Maintenance is required to preserve or improve model confidence in order to maintain their predictive abilities and ensure they are 'Fit for Purpose' for their specific use.

We have approximately 340 models, divided into four categories based on their maintenance schedules: yearly, every two years, once per investment period, and never. The "never" category includes models that are responsive to emerging needs, as they are based on areas with no known catchment needs and small populations. These models can be quickly maintained if necessary.

A key difference between SR15 and SR21 is our approach to managing the model library. We now use network/workgroup models accessible to anyone with InfoWorks ICM viewer licenses. This allows users to view model network representations and predicted results for various design storms.

In addition to our planned model maintenance activities, we update our workgroup models as needed. This includes incorporating survey data from flooding investigations, Capital schemes and updates from localised studies returned by consultants.

Our current policy has reduced from 81% in June to 55%, with expectations to drop further before rising again as model maintenance returns come through. Last year's funding challenge required us to stay within the current budget, aiming for a best score of 65% by the end of SR21. This may decrease further due to recent consultant cost challenges.

So far, we have updated around 100 models through maintenance, with additional improvements from flooding or UID studies. We currently have about 40 ongoing model maintenance studies,

excluding flooding or IUW projects, and initial scoping for another 20 studies to complete by the end of SR21.

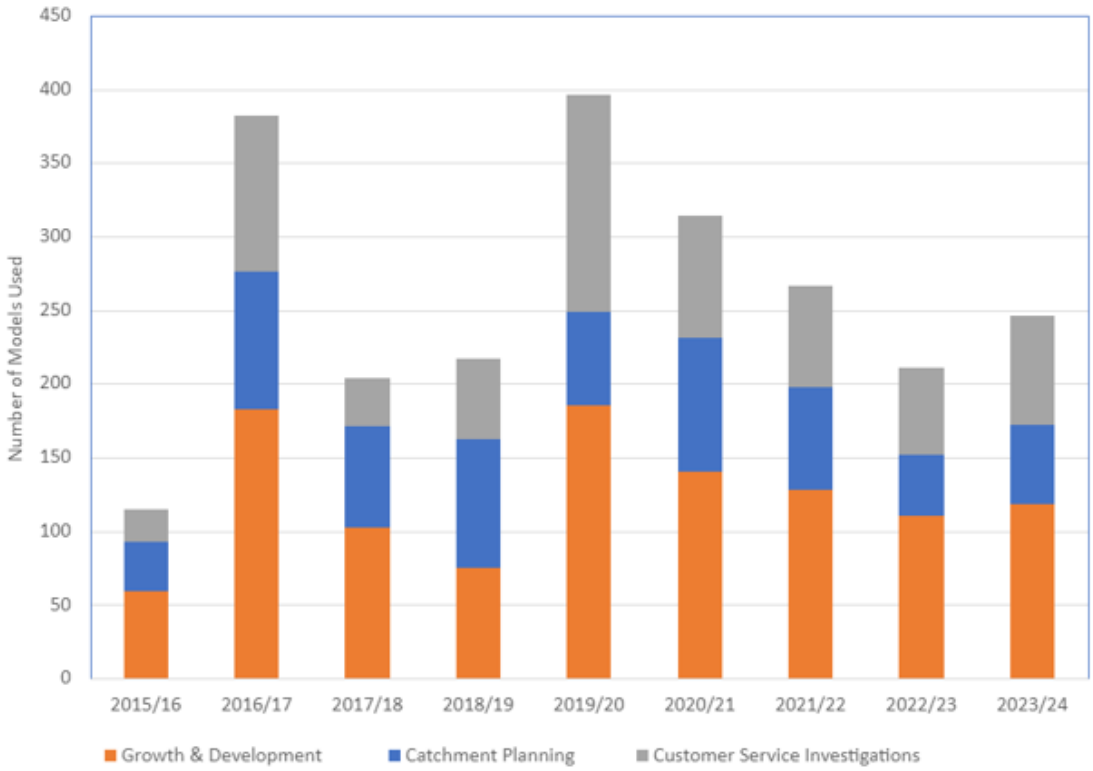


*Figure 7: Waste Water Model Use Across Scottish Water*

**Key SR21 Learnings**

In SR21 we have developed our approach to sewer flooding and rainwater management by piloting and embedding new technologies and tools (embracing software advances and piloting studies) to improve the service offering we provide our customers, to drive value for money in the solutions we develop and deliver and to further our understanding of flood risk on our waste water network.

Some of the new tools/ applications we have trialled, and which will be taken forward into SR27 are:

- **Meniscus** - the Meniscus Rainfall Tool, known as MAP Rain, is a high-performance, cloud-based solution designed for rainfall and flood monitoring analytics. This has led to improvements in understanding our customers' flood risk. We are currently undertaking a year's pilot to understand and quantify the benefits that this tool can offer. We can see how rainfall moves and changes across catchments and can undertake return period analysis in seconds rather than the 15 minutes using the previous software. The Meniscus tool can also look back and find storm events with certain characteristics e.g. such as all rainfall days where depth was greater than 16mm. Meniscus is able to check through historical rainfall records and identify storms that match our query. This was typically very difficult to do using the previous software, and required specific dates to be know and took significant analysis time. This full analysis can now be run in one hour. This analysis gives us a much richer understanding of properties' flood history.
- **Optimatics** - The trial use of Optimatics offers several benefits for Scottish Water. The optimiser software combines the power of Hydraulic Models, the Integrated Catchment Model (ICM) Exchange Tool, and Cloud Computing to quickly identify optimal plans by

considering thousands of potential alternative interventions and solutions. This significantly reduces the time and costs associated with traditional modelling methods, which can be lengthy and costly due to the complexity of networks and the iterative process involved.

- **SCALGO Live** - powerful platform that enables rapid flood risk analysis by providing detailed statistics on surface water flow across catchments. It significantly reduces planning time by allowing quick edits and representations of surface interventions like Sustainable Urban Drainage Systems (SUDS) and Blue-Green Infrastructure (BGI).

**Reassessment of Customer Flood Risk**

To determine the flood risk for a property or location, we use a standard method from the UK Water Industry that looks at how often heavy rainfall happens. Previously, we used older data from the Flood Estimation Handbook (FEH)1999, which only included rainfall patterns up to 1999. However, this didn't consider the effects of climate change on rainfall since then. Recently, some parts of Scotland have seen more frequent heavy rain, leading to flooding.

In early SR21, we reassessed the flood risk for areas previously investigated, using updated data from the FEH13 dataset. This reassessment identified more properties at risk and added them to the At Risk Register, qualifying them for flood mitigation measures.

Since then, in late 2022, the Centre for Ecology and Hydrology (CEH) significantly updated the FEH rainfall statistics, now known as FEH22. To understand the impact of this update, Scottish Water commissioned CEH to produce six technical reports detailing rainfall patterns across Scotland. These reports revealed smaller changes compared to the 1999-2013 update, but new regional variability patterns have emerged.

We are about to receive 25 new FEH22 Design Rainfall series and will soon be able to produce additional series ourselves. These will include a base FEH22 series and climate change projections for 2050 and 2070.

We plan to adopt the FEH22 rainfall dataset for flood risk assessment, with this transition expected to occur between 2025 and 2026.

**Waste Water Intelligent Networks (WWIN)**

In SR21 we embarked on a journey to better understand how our networks and assets were performing across an initial four catchments. Event Duration Monitors (EDMs) & Sewer Level Monitors (SLMs) were installed and an internal WWIN Dashboard developed to visualise the data from the monitors.

In addition the WWIN Dashboard supported by machine learning and artificial intelligence was able to share alerts and alarms to the ICC enabling a proactive Operational Response to potential flooding and environmental events. Across some of the monitored catchments the WWIN Dashboard in now successfully identifying blockages within the network, prior to these causing any issues. Tools and systems are being developed to predict blockages even more time in advance, reducing the risk further of customer or environmental issues.

An additional ~1300 EDMs associated with Improving Urban Waters commitments have also been incorporated into the WWIN dashboard and a public facing Near Real-time overflows map

was launched in December 2024. This new public facing portal provides transparency to our customers and stakeholders regarding how are monitored overflows are performing. Data is refreshed hourly and further information is provided regarding investment down to asset level. There are further improvements we want to make, including incorporating weather, bathing water locations and overall unmonitored assets. Future enhancements be explored through engagement with external parties, such as Surfers Against Sewage.

In the remainder of SR21 we will continue to instal EDMs at prioritised locations and publish data through the overflows map. SLM deployment across a further 12 catchments is underway and being undertaken by the 'in house' EDM team for the first time. This approach is enhancing SWs capability to deploy monitors in the network, but also balance the needs of an increasing number of operational responses.

In the future, data and intelligence gathered from overflows monitors and sewer level monitors will be used to verify the WW Hydraulic Models more dynamically, allowing greater confidence in the model predictions providing further intelligence how our networks are performing and supporting investment choices.

## 2.6 SR27: Drivers of Investment

Continuing investment to resolve internal flooding as quickly as possible is key to our long-term strategy. As we see unit costs continuing to rise, our highest-risk customers facing the fear of potential disruption and associated distress. Furthermore, new additions to the At Risk Registers will increase the backlog of necessary investments required to bring our networks up to an acceptable standard. Without mitigation, properties and communities will continue to face disruption, property damage, health risks, and stress due to repeated flooding incidents.

It is imperative that we begin building strategic partnerships with local authorities now. Establishing such partnerships takes time, and any delays in this process will defer the efficient and collaborative delivery of blue-green infrastructure for many years.

Spending on initiatives like mitigation measures and enhanced clean-up remains critical to delivering service excellence to our customers. These low-cost, high-value interventions are essential for safeguarding our most vulnerable customers and ensuring they receive the support they need.

# 3 Customer and Stakeholders

## 3.1 Our Customers and Stakeholders

Scottish Water operates within a framework of diligent oversight and collaboration, engaging with multiple stakeholders who ensure that customers and communities are not affected by sewer flooding. We engage regularly with the Independent Customer Group (ICG) and carry out wider customer research.

### 3.1.1 Customers

We receive customer contacts from a variety of sources, which can be seen in the graph below. We have seen an increasing trend below. These are typically inquiries around our sewer flooding programmes. Contacts come in a variety of forms, including direct from customers and through their elected representatives. Freedom of Information and MP/MSP requests relating to flooding generally account for 10% of those received by Scottish Water.

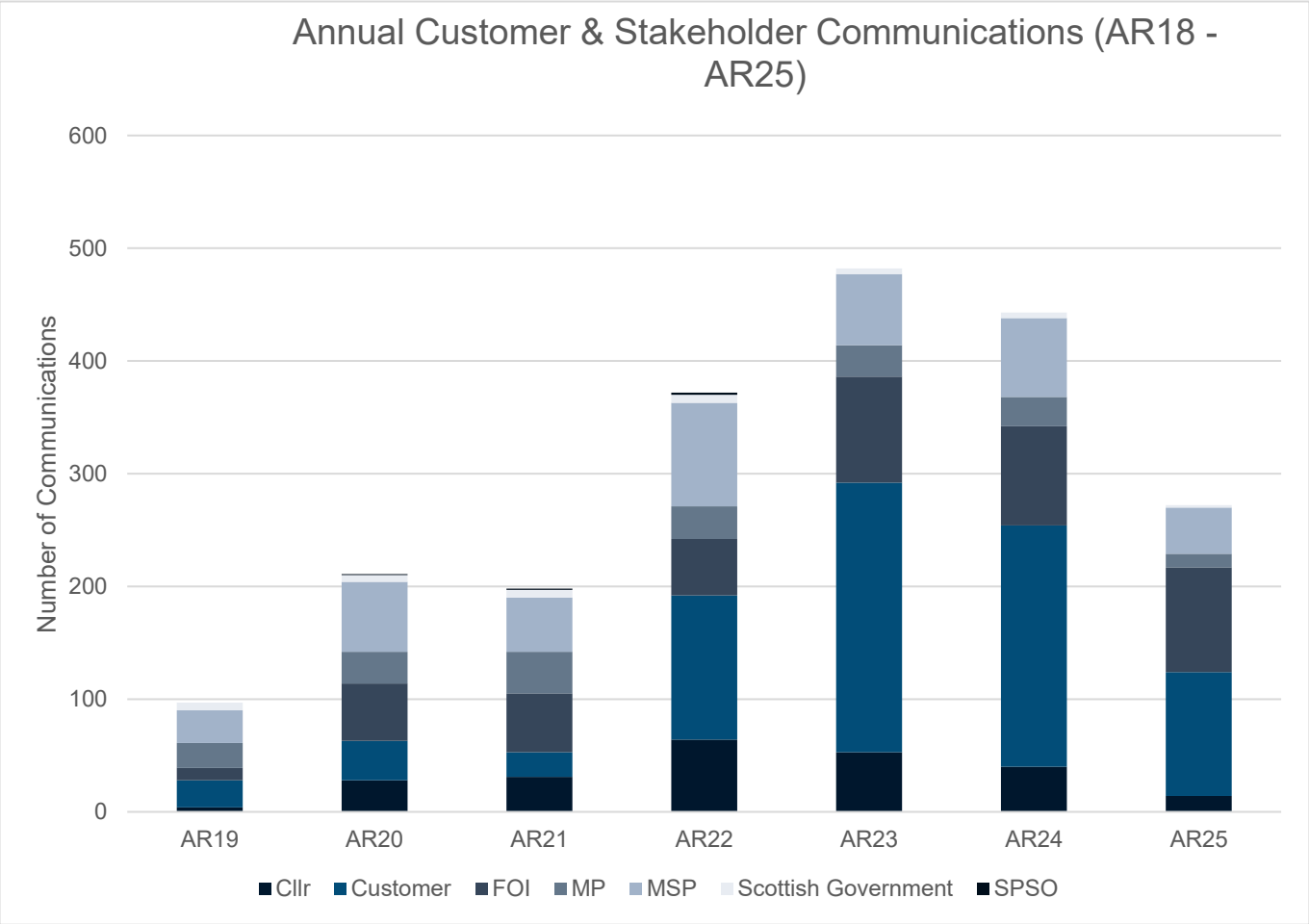


*Figure 8: Annual Customer & Stakeholder contacts 2024*

### 3.1.2 Stakeholders

The **Scottish Government** is a key stakeholder in Scottish Water, setting strategic objectives, overseeing regulatory principles, and monitoring performance. They also collaborate on investment planning to ensure our waste water infrastructure meets current and future needs, maintaining high-quality services and public trust.

**WICS** is responsible for economic regulation, ensuring Scottish Water operates efficiently. They scrutinise financial and operational plans to guarantee that investments deliver value for money while maintaining and improving service quality.

**SEPA** focuses on environmental protection, ensuring compliance with environmental regulations and sustainability goals. Their oversight ensures that water treatment processes minimise environmental impact, safeguarding ecosystems and biodiversity.

**Consumer Scotland** represents the interests of water customers, ensuring that their needs and concerns are prioritised.

**Local Authorities** and Scottish Water collaborate closely to manage and mitigate flooding risks. Scottish Water is responsible for operating public sewers and managing issues related to sewer overflows and blockages. They also handle the drainage of rainwater from roofs and paved areas connected to the public sewer. Local councils, on the other hand, are responsible for managing drainage on local roads and public highways, dealing with tidal and river flooding, and providing flood defences. They also coordinate emergency responses and temporary accommodations during severe flooding events.

Community groups collaborate with Scottish Water by reporting flooding incidents, participating in public consultations, and organising educational campaigns. They also engage in volunteer initiatives and collaborative planning sessions to enhance flood management efforts and ensure local concerns are addressed.

The **Independent Customer Group** works closely with Scottish Water to provide independent insights and perspectives on customers priorities, ensuring customers interests are central to decision making.

In the development of our business plan delivery of our services aligned to our plans we continue to engage with both our customers and stakeholders in a dynamic and transparent manner. Further detail of our work with customers and communities can be found in our Customers and Communities technical appendix.

## 3.2 Customer Engagement

Customer insights are a key part of our investment considerations and as per our Customer Research Technical Appendix, we have engaged with our customers and stakeholders across a breadth of topics both specifically on our SR27 plans and as part of our ongoing engagement programme.

The figures below show the key insights relevant to the Managing Quantity of Flows investment area.

*Table 2: Customer and Stakeholder insights on Internal Sewer Flooding (Customer Insights Synthesis Report)*

| Research Question | Key Insight |
|---|---|
| What is the **perceived impact** of an internal sewer flooding incident? | Customers consistently tell us that an internal sewer flood has the highest personal impact of all service issues. Household customers are concerned by the potential health and safety impact of sewage in their homes, whilst business customers express concerns about damage, potential impact on insurance premiums, and reputational damage. |
| What are customer **expectations** of Scottish Water regarding internal sewer flooding? | Customers generally feel that addressing internal sewer flooding is important, and a priority for Scottish Water, especially when properties are affected by repeated incidents. However, some customers perceive it as an issue that does not affect many customers and may prioritise other areas of investment which affect more people.<br><br>Some customers may expect Scottish Water to work in partnership with other organisations such as Local Authorities and housing developers to manage planning and design issues which can cause flooding issues. They also expect Scottish Water to work with the wider public to address behaviours which can cause internal flooding such as flushing wet wipes. |

*Table 3: Customer and Stakeholder insights on External Sewer Flooding (Customer Insights Synthesis Report)*

| Research Question | Key Insight |
|---|---|
| What are customer **perceptions** of external sewer flooding? | As is the case with many aspects of Scottish Water's waste water service, external sewer flooding is not top of mind for most customers, or a major concern. Customers often group external sewer flooding with other types of flooding e.g. rain on roads. As such, less informed customers can perceive the issue to be part of living in Scotland. However, when it starts to affect homes and businesses customers become concerned. Business customers may be concerned about impact on the accessibility of their premises. When connections are made with sewage, customers are concerned about health and safety. Waste water flooding that impacts culture, tourism or heritage is considered to be damaging to Scotland as a whole. |
| What are customer **expectations** of Scottish Water regarding external sewer flooding? | Customers recognise that external sewer flooding can have significant impact, but do not think that resolving the issue is Scottish Water's sole responsibility. They may expect Scottish Water to work in partnership with others, such as the Scottish Government, Local Authorities and housing developers to manage the issue. They also expect Scottish Water to work with the wider public to address behaviours which can cause external sewer flooding such as flushing wet wipes. |

*Table 4: Customer and Stakeholder insights on Surface Water Management Measures (Customer Insights Synthesis Report)*

| Research Question | Key Insight |
|---|---|
| What are customer **perceptions** of **surface water management measures?** | Customer generally do not have high awareness of surface water management, with low awareness of household rainwater source control measures, and low awareness of larger schemes such as SUDS. Customers may have heard of, or have seen, some approaches, but might not have connected them to managing surface water and flooding. Once explained, customers are supportive of the use of blue-green infrastructure and like the wording and connotations of the phrase 'nature-based solutions'. They are positive about the community and environmental benefits of these approaches.<br><br>There can be some concerns around the practicalities and effectiveness of blue-green approaches. Customers acknowledge that a mix of blue-green and traditional engineering solutions is needed to tackle surface water flooding in Scotland. Customers |

| Research Question | Key Insight |
|---|---|
| | expect Scottish Water to take a proactive approach, with more investment, partnership working and making use of local knowledge. |

*Table 5: Customer and Stakeholder insights on AR3 (Customer Insights Synthesis Report)*

| Research Question | Key Insight |
|---|---|
| What is customer **understanding & acceptance** of aging assets as a challenge? | Customers are generally surprised to hear about the scale of Scottish Water's infrastructure, and to learn its age. Customers understand and acknowledge that ageing assets are a challenge for Scottish Water. They recognise the need for investment in updating and replacing these older assets. |
| What are customer **expectations** of Scottish Water in maintaining assets? | Asset maintenance is a concept that people intuitively understand. It is felt to be highly important, and core to Scottish Water's purpose as an organisation, as it is an area that is clearly Scottish Water's sole responsibility. Customers recognise the need for investment and want to see lasting solutions put in place. Making things last is seen as an important area for Scottish Water's focus, appealing to all customers and older customers in particular. They are keen to reduce the risk of service failures, as well as avoid unnecessary costs.<br><br>Customers expect this to be an ongoing area of investment with a focus on preventing future problems, and generally also expect Scottish Water to maintain or replace infrastructure before it fails to avoid issues with our services. Customers may perceive fixing assets on failure to ultimately cost more money over time. Some customers seek assurance that money is being spent on parts of the system at risk of failing, to demonstrate that investment is not being made unnecessarily. |
| What are customer **expectations** around climate adaptation of assets? | Once hearing about the scale of challenges from climate change, customers believe it is important to protect infrastructure against the impacts of climate change and there is an expectation for long-term solutions to be used. |

## 3.3 Demonstrating Customer and Stakeholder Support

**Internal Flooding**

Our customers have consistently told us that internal flooding of properties is one of the worst ways Scottish Water can impact their daily lives. This view has remained stable over time, with little variation across different areas of the country. Sewer flooding affects household and non-household customers differently. Household customers are primarily concerned about health risks, stress, and damage to their belongings. Non-household customers, on the other hand, worry about business loss and increased insurance premiums. Internal sewer flooding, especially when sewage enters the house through the front door or plumbing, is highly impactful for households. Flooding in basements or garages, while still significant, is less of a concern. Most Scottish Water customers do not experience internal flooding. However, when prompted, there is a strong desire to protect property and health quickly. Customers believe that the responsibility for addressing these issues is shared between Scottish Water, Local Authorities, and other relevant stakeholders. ***In SR27 (as described in Section 4) and aligned with the Ministerial Objectives, our goal is to maintain the number of properties on our Internal Sewer Flooding At Risk Register. We aim to achieve this through both traditional grey solutions and broader alternative approaches, such as mitigation measures and blue-green***

***infrastructure. Our focus is on delivering the best overall value to our customers, considering not only cost but also performance and wider benefits.***

**External Sewer Flooding**

External sewer flooding can be segmented into two categories: flooding in public spaces, such as highways and playparks, and flooding in private areas, such as gardens. Customers prioritise investment in areas that impact tourism or business, and those that repeatedly flood, as these are seen as damaging to Scotland. There is an expectation for a quick resolution to sewer floods, with a focus on protecting human health, and the responsibility is generally considered to be shared among Scottish Water, Local Authorities, and other stakeholders. ***In SR27 (as described in Section 4) we will put greater focus on our external sewer flooding interventions using surface water removal to reduce overall flood risk.***

**Stakeholder Roles and Engagement**

Both household and non-household customers view Scottish Water, Local Authorities, and other stakeholders as having shared responsibility for addressing sewer flooding. Among the service issues that impact a community and the environment, sewer flooding on roads is considered one of the most impactful issues for both household and non-household customers. Effective engagement and collaboration among these stakeholders are crucial to ensure timely and efficient responses to sewer flooding incidents, protecting both property and health. ***In SR27 (as described in Section 4 and as aligned to the Ministerial objectives our ambition is to expand and enhance our partnership working arrangements and increasing the benefits that they bring, including delivering more joint projects***

**Surface Water Management**

Our customers generally have less awareness around surface water management and what this may entail. Whilst they may have seen or heard of some of these approaches, they are unlikely to have connected them to managing surface water and flooding. However, when explained, customers are generally supportive of these measures – including blue-green infrastructure and nature based solutions. They also expect us to take a proactive approach with more investment, partnership working, and using local knowledge. ***In SR27 (as described in Section 4) we will develop and deliver surface water removal projects, in partnership with others, to reduce overall flood risk***

**Asset Maintenance (AR3)**

There is some surprise when our customers learn about the age of our assets and the overall scale of our infrastructure - but customers understand the challenges this brings, and the need for investment. Customers believe asset maintenance is important - and want to see lasting solutions in place. Our customers also expect us to protect infrastructure against the impacts of climate change. ***In SR27 (as described in Section 4) we will maintain our assets as set out in our Management Approaches.***

By understanding the different concerns and priorities of our customers and communities, and recognising the roles of various stakeholders, we can better address the challenges posed by sewer flooding and work towards more effective solutions.

As described above and in detail in our Technical Appendix, we continue to carry out ongoing customer research to ascertain priorities and areas of focus or concern for our customers and stakeholders. When we collate the results of this extensive engagement, we call this our Research Synthesis. This Research Synthesis currently uses more than 50 pieces of customer research, mostly qualitative, spanning the last decade.

We have also robustly and extensively tested our SR27 investment choices with our customers and stakeholders, namely our suite of scenarios as described in Section 4.1.2 and within our Investment Planning Technical Appendix.

As per our Customer Research Technical Appendix we are continuing to undertake and analyse customer engagement activities and results as per our engagement plan and therefore we look to review and revise the position described above as necessary as we develop our final business plan.

# 4 Our Investments

## 4.1 Approach

Our long-term goal, as set out in our Long-Term Strategy is to progressively reduce the number of customers at risk of internal and external sewer flooding, aiming for near-zero repeat internal flooding by 2050 and ensuring no long-standing customers remain on the at-risk register. In the near term, we will continue to deliver Ministerial Objectives to maintain current service levels, and to counter the impacts of climate change and urban creep, at acceptable levels of risk.

To achieve this, we need to tackle critical hydraulic capacity issues on our network, whilst removing surface rainwater from our system. Our approach also provides resilience against climate change, and the impact of further urbanisation. We will continue to collaborate with local authorities and others to build resilience against these challenges. By maintaining a consistent approach to flooding issues, we will ensure fair and equitable service for all customers and communities, both now and for future generations.

During SR27 for managing quantities of flows, we will deliver:

- Maintain assets as set out in Management Approaches
- Maintain the numerical internal sewer flooding At Risk Register SR21 exit position throughout SR27, with significant risk associated with unit rate
- Continue to mitigate the impact of internal flooding on customers, where technically feasible, carrying out maintenance on these assets and evaluate their feasibility to be classed as a permanent solution
- Initiatives to reduce the number of repeat internal flooding incidents caused by blockages
- Deliver a small number of external flooding projects on a prioritised basis
- Deliver our commitments to meet Flood Risk Management Act duties
- Develop and deliver surface water removal projects, in partnership with others, to reduce overall flood risk
- Support further roll out of customer behaviour campaigns

This will be achieved through a combination of Capital Maintenance (Asset Repair, Refurbishment and Replacement (AR3)) and Enhancement expenditure.

### 4.1.1 Strategic Outcomes and Performance Requirements

Our investment plans for Managing Quantities of Flows in SR27 are required to meet the following Ministerial Objectives:

- Maintain or improve current levels of service over the long term.
- Identify and pursue opportunities to work with stakeholders, and respond to opportunities proposed by stakeholders, to transform how rainwater and sewerage are managed in new and existing communities.
- In collaboration with other parties as appropriate, must adopt and encourage a catchment management approach to sustainable storm water management wherever practical, to reduce and prevent the impacts of sewer and surface water flooding, reduce pollution from sewer overflows, enable growth, increase resilience and create natural spaces for customers and communities to enjoy.

The delivery of the Long-Term Strategy outcomes relating to managing quantity of flows will be based on the following principles**:**

- Have no customers experiencing repeat sewer flooding in their homes by 2050.
- Support customers who are vulnerable to sewer flooding in their homes, by delivering solutions to quickly prevent it happening again.
- Accelerate our approach to place-based solutions to manage rainwater, using a mixture of engineered and nature-based solutions to increase the resilience of our network and reduce pollution for localised and strategic drainage issues.
- Increase our monitoring capabilities to improve our understanding on how other drainage systems, such as road drains, culverts, roofs and run-off from roads and pavements interact with our sewers.
- All cities and many larger towns will have strategic drainage partnerships which allow collaborative working to more easily and efficiently undertake the necessary work to manage rainwater better.
- Introduce a community fund to support small-scale, localised initiatives like planters and rain gardens in community buildings such as church halls, community halls, libraries and schools.
- Increase our emphasis on partnerships – ensuring we work with public, private and third sector organisations, and involve householders and local communities- to change how we manage rainwater, creating place-based solutions which will help to increase the resilience of our sewer networks and reduce demand on treated water.

*Table 6: How we will measure delivery against our outcomes*

| Outcome | AR3 / Enhancement | Description | Performance measure / Target |
|---|---|---|---|
| **Asset Maintenance** | AR3 | Our management approaches cover various asset groupings and have been economically appraised to determine the most effective approach to maintain our assets, including an assessment of costs, benefits, risks, and carbon. | - Number of External Sewer Flooding Incidents<br>- Number of properties on our External Sewer Flooding At Risk Register<br>- Number of Internal Sewer Flooding Incidents<br>- Number of properties on our Internal Sewer Flooding At Risk Register<br>- Number of properties experiencing repeat sewer flooding |

| Outcome | AR3 / Enhancement | Description | Performance measure / Target |
|---|---|---|---|
| **External Sewer Flooding** | Enhancement | Increase in the number of properties on our External Sewer Flooding At Risk register and ensuring that we reduce the number of customers experiencing repeat external sewer flooding. | - Number of External Sewer Flooding Incidents<br>- Number of properties on our External Sewer Flooding At Risk Register |
| **Internal Sewer Flooding** | Enhancement | Maintaining the number of properties on our Internal Sewer Flooding At Risk register and ensuring that we reduce the number of customers experiencing repeat sewer flooding. | - Number of Internal Sewer Flooding Incidents<br>- Number of properties on our Internal Sewer Flooding At Risk Register<br>- Number of properties experiencing repeat sewer flooding |

### *4.1.2 Building our approach for AR3*

In SR21 Scottish Water introduced Management Approaches (MAs) for each asset type which set out policy of how and when we will intervene to manage assets. Our approach is directed by our ambitions, long-term outcomes, our ministerial objectives, current legislative requirements, and Board risk appetite statements which set the performance levels for critical and non-critical assets.

Management Approaches for each asset type have been maturing since 2023 to become economic appraisals. Impacts of climate change have also been considered, considering a range of climate hazards as identified through the Scottish Water Climate Change Risk Assessment.

Our general approach to management approaches includes two primary considerations:

- **When to intervene** – this considers the point in an asset's life when an intervention should occur. This includes whether to intervene after failure (responsively) or on a planned basis before failure, and if planned, at what stage to intervene to maximise the useful life of the asset while minimising the chance of failure.
- **How to intervene** – this considers what intervention is used to restore asset condition / performance. This includes options for investigations and repairs, decisions on whether to refurbish or replace. Decisions on whether to enhance or improve the resilience of an asset when it is being refurbished or replaced are considered as part of a sub-outcome approach and made on a case-by-case basis as part of systems planning.

*Table 7: Scottish Water definitions for intervention approaches*

| Intervention Approach | Definition |
|---|---|
| **Responsive** | The intervention is responsive when an asset has failed and is impacting service provision and/or we identify that an immediate, no-choice intervention is required. |
| **Planned** | The intervention is planned when an asset has a historic service failure, or we identify that an intervention is required, at our choice, to reduce the risk of asset failure. |

*Table 8: Scottish Water definitions for intervention types*

| Intervention Type | Description |
|---|---|
| **Investigation** | Activities focused on gathering asset information which is required in the decision-making process prior to one of the other asset intervention types. This includes inspection programmes to identify the condition of our assets. |
| **Operational and Maintenance Activities** | Processes and practices that support an asset to continue to operate and achieve its expected operational life that do not modify the asset itself. These can be responsive or planned. |
| **Repair** | Fixing an asset to ensure it can continue to operate and achieve its expected operational asset life (this includes replacement of component parts). |
| **Refurbish** | Renovation / overhaul of older or damaged equipment or replacement of parts of the asset to bring the asset back to a workable condition to extend the expected life of the asset. |
| **Replace** | Replacement of an asset (equipment, unit, or process) when it is at the end of its serviceable life, or the asset has failed and cannot be repaired or refurbished (or it is not economic to do so), or when a change in performance or capacity is required. |

Key Management Approaches informing the asset maintenance requirements for Managing Quantities of Flows include maintain sewer network assets namely, Pipebridges, Waste Water Pumping Mains, Waste Water Outfalls, CSOs, Sewer Structures, Gravity Sewers and finally Waste water Network Model Maintenance.

The investment needs for asset maintenance have been developed primarily from a combination of two different approaches:

- Analytical models[3] (used to predict the overall level of investment required for a particular asset type); and
- Management Approaches (used to identify the site / asset specific needs in line with policy criteria).

In addition, some investment requirements are associated with routine inspection and maintenance programmes, with others developed from historical run-rates of ongoing activities.

[3] Further details of our analytical models are described in our Investment Planning Technical Appendix

A key change from our last AR3 process for the 2021 regulatory period, is adopting a standardised approach to the repair, refurbishment, and replacement of our assets through the production and implementation of our Management Approaches (MA). MAs for each asset type set out policy of how and when we will intervene to manage assets. Impacts of climate change have also been considered, considering a range of climate hazards as identified through the Scottish Water Climate Change Risk Assessment.

A key component of the MAs is the systematic inspection and categorisation of asset condition. Our MA's include inspection programmes to help us monitor and understand how our assets are deteriorating with age and the environment within which they operate, which in turn informs our long-term replacement needs and AR3 programme prioritisation to maintain service levels.

### Waste Water Model Maintenance

Hydraulic waste water models are essential for several reasons:

1. **Confirm Capacity Constraints**: Hydraulic models simulate the flow of waste water through sewer systems under various conditions, including heavy rainfall and peak usage times. This helps identify areas where the system may become overwhelmed and cause flooding
2. **Optimising Infrastructure Design**: These models accurately predict water flow, helping design efficient systems that use resources wisely and avoid unnecessary construction
3. **Supporting Climate Resilience**: With climate change causing more extreme weather events, these models test system performance under various scenarios, ensuring long-term resilience
4. **Capacity Planning**: Hydraulic models help understand capacity limitations within the system, aiding in better planning for capital and operational improvements

Overall, hydraulic waste water models are crucial for designing, managing, and maintaining sustainable and resilient waste water systems. Maintaining hydraulic models is crucial for ensuring their accuracy and reliability. Regular updates and maintenance keep the models current, reflecting any changes in the sewer system and preventing data inaccuracies. Well-maintained models support informed decision-making for infrastructure investments, emergency responses, and long-term planning. By preventing costly errors and inefficiencies, regular maintenance saves money in the long run and ensures the system remains effective and resilient.

We propose to revise our model maintenance strategy for SR27. Instead of relying on a standard time-based approach, we will implement a model confidence trigger to determine when updates are necessary. The changes will involve:

1. Modification of Maintenance Frequency:
    - Adjust the frequency of Model Maintenance (MM) for the Operational and Essential categories to better align with the current capabilities and speed of conducting studies.
2. Enhanced Decision-Making Process:
    - Introduce a more intelligence-driven and evidence-based approach to determine the necessity of proceeding with MM studies. This adaptation addresses cost and funding challenges by implementing thorough model reviews prior to scoping MM. These reviews will assess the need for action at the current stage.
    - Amend the Model Assessment (MA) policy to date stamp the completion of the review, initiating the timeline policy from this date rather than the date of the last model update, as per the existing policy.

3. Integration of WWIN Data:
    - Incorporate WWIN data into the decision-making process to enhance the accuracy and relevance of model assessments.
    - Integrate any smart technologies where we can

### 4.1.3 Building our approach for Enhancement

An investment demand for the SR27 Managing Quantity of Flows portfolio was developed using historical trends, average unit rates and climate change projections.

The demand covers:

- Internal Sewer Flooding
- Mitigation programme
- External Sewer Flooding- focusing on surface water removal
- Repeat Sewer Flooding due to other causes
- Delivering Flood Risk Management Act duties
- Partnership working to reduce overall flood risk using surface water removal solutions
- Continued roll out of customer behaviour campaigns

The following sections describe the intervention options considered when building our plan. It is varying combinations of these intervention options that comprise the scenarios we have considered.

#### *4.1.4 Internal Sewer Flooding approach*

To maintain our Internal Sewer Flooding At Risk Register position we need to deliver interventions to remove 300 properties during SR27. This is based on ~50 annual additions to the Internal Sewer Flooding At Risk Register per year.

Table 5 outlines the different scenarios, based on choices within the internal sewer flooding programme. Should we choose to continue to deliver SR21 projects and the deferrals there will be a very challenging unit rate cap for all remaining projects.

The funding constraints may drive a need for a wholesale change in approach to how we tackle internal flooding, and around the level of service we provide and the phasing of interventions. This is likely to include research into whether mitigations could in some instances be considered a permanent solution and allow properties to be removed from the At Risk Register.

Currently mitigation measures alone are not sufficient to remove our customers from the Internal Sewer Flooding At Risk Register. However, to date, mitigation measures have performed well, with no repeat internal flooding reported. Mitigation measures often provide an increased level of service when compared to hydraulic solutions, which provide 1 in 10 to 1 in 30 year protection. This is an area that we need to explore internally before engaging with WICS and other stakeholders. Including our customers. We will carry out in house analysis first to understand how we could demonstrate a satisfactory reduction in flood risk. This approach could also facilitate a more phased approach to improving catchment hydraulics with a higher focus on surface water management.

*Table 9: Choices of approach in Internal Sewer Flooding Programme*

| Scenario | 1 | 2 | 3 |
|---|---|---|---|
| **Included** | Low cost projects only where property can be removed from the register for unit rate (£647k/ property removed from the register) or less | SR21 projects currently in flight with spend forecast in SR27 | Continue to deliver SR21 projects in flight and deferrals |
| **Excluded** | • SR21 projects with spend in SR27<br>• Deferrals | • Deferrals | |
| **Programme breakdown** | 300 properties removed from the register. Only progress with projects with average unit rate of £710k/ property or less | 120 properties removed from the register for £115m<br>180 additional properties to be removed to maintain register position<br>Unit rate of 180 additional removals would need to be limited to £544k/ property in order to maintain the register position | 120 properties removed from the register for £115m<br>30 properties removed from the register for £60m<br>150 additional properties to be removed to maintain register position<br>Unit rate of 150 additional removals would need to be limited to £254k/ property in order to maintain the register position |

There are several intervention types available to address hydraulic capacity constraints in the network. However, the technical viability of any option is dependent on the specific location of the need. Resolving known hydraulic capacity issues will require a mix of interventions.

- Considerable work is undertaken during our 'Plan' phase to develop a range of potential options and to identify the best overall solution to address a particular need. The preferred option is selected based on a value management approach taking into consideration whole life cost, the benefits delivered including indirect benefits, residual risk, phasing and environmental and community impact.

Grey infrastructure is generally considered to be the most technically viable in terms of providing guaranteed delivery of the required service level at a specific location. Particularly when targeting level of service of 1 in 30 years. Grey infrastructure typically allows more control over flows and storage. Modelling allows us to design grey infrastructure to meet specific capacity requirements ensuring schemes perform effectively under extreme conditions. In densely populated urban areas, grey infrastructure can be integrated into existing built environments without requiring significant changes to land use. This makes it a practical solution for cities where space is limited. At present, grey infrastructure is generally less expensive than the alternative surface water management option.

Surface water management can involve either attenuating rainwater before it is slowly released to the combined sewer, or full disconnection where rainwater is removed from the sewer network and discharged elsewhere e.g. to a watercourse.

Surface water management will not be a viable option at every location suffering from chronic capacity constraints. It also should be recognised that on the whole surface water management is most beneficial where it can be implemented on an opportunity basis, in partnership with others.

Where it can be implemented successfully, surface water management plays a significant role in mitigating the impacts of climate change. There are several ways in which is supports adapting to climate change:

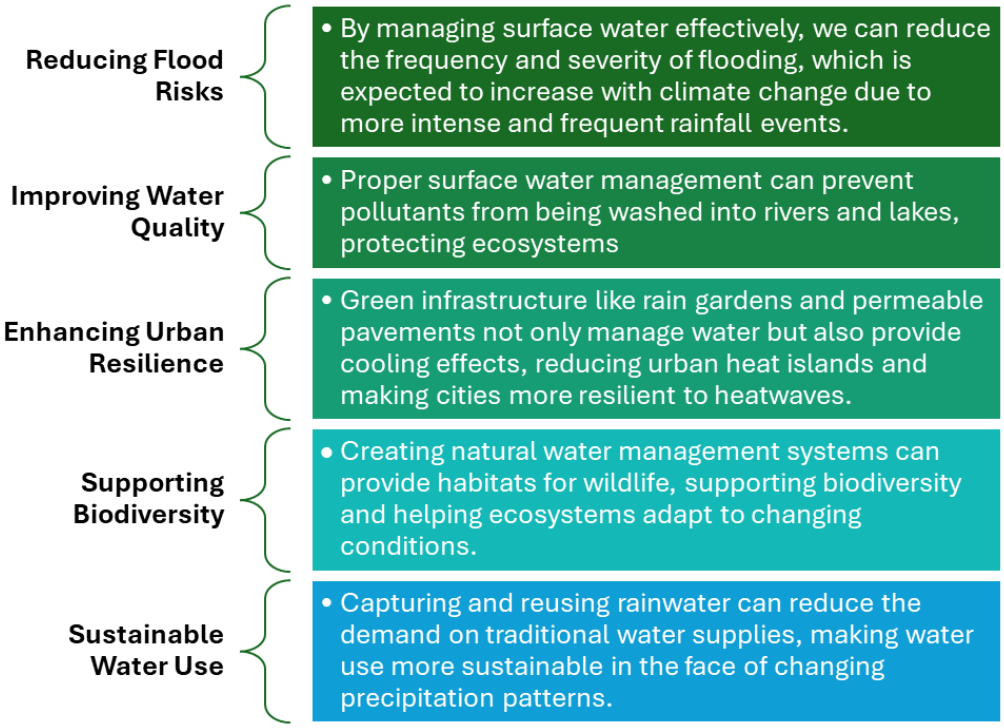


*Figure 9: How a surface water management and nature-based approach supports tackling the impact of climate change*

We currently do not put a unit rate cap per property for an internal flooding project. This means that there is not a set maximum amount of money spent per property. Each flooding location and the outline design are considered on a case-by-case basis, and a holistic view is taken of the impact of flooding on the customer and the wider benefits of the scheme as well as the cost. It is rare that a scheme will not be delivered and in general any schemes that cannot be funded within the internal flooding funding constraints of the current investment period would be deferred to the next investment period.

As shown in Figure 10, intervention cost per property ranges from £10,000 to £10,000,000.

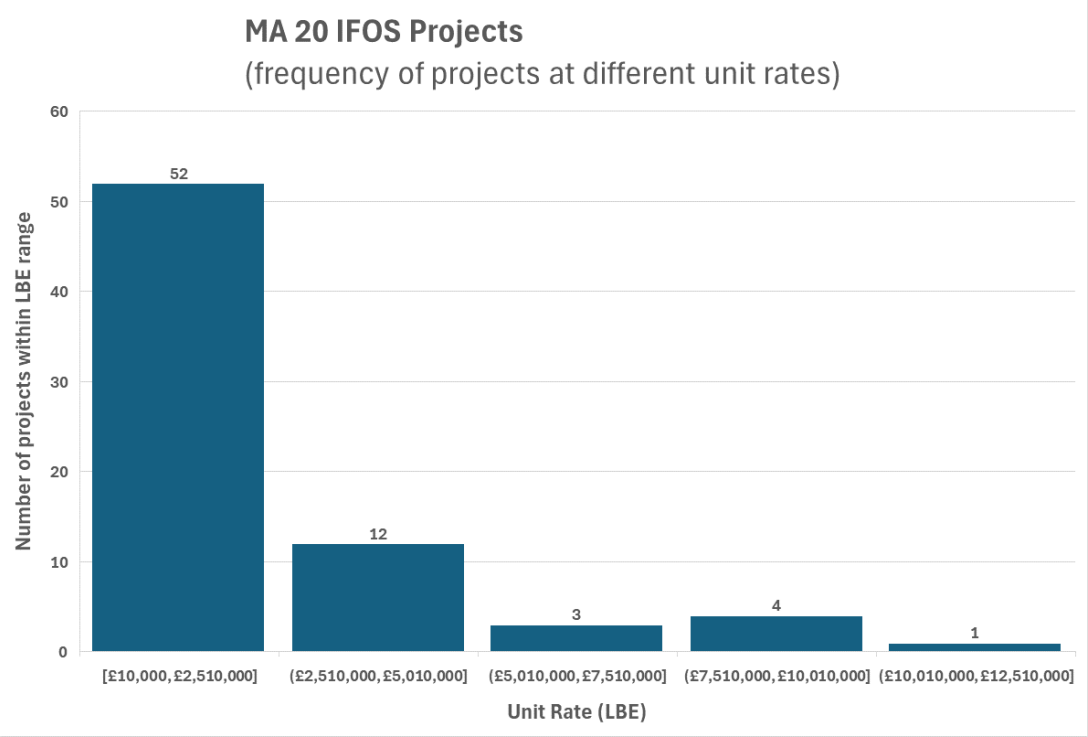


*Figure 10: SR21 internal flooding programme- frequency of projects at different unit rates*

Internal Sewer Flooding projects in general deliver far more than just reducing the risk of flooding at the internally flooded property. They provide additional network capacity and draw down the hydraulic gradient, often across a much larger area. This reduces the risk of flooding to neighbouring properties, often reducing associated frequently occurring external and highway flooding.

These interventions enhance community resilience by protecting homes and businesses from the disruptive and damaging effects of flooding. Additionally, in some cases these projects contribute to environmental sustainability by reducing spills from overflows. Furthermore, effective flood management can lead to economic benefits by reducing property damage and associated repair costs, and by maintaining the functionality of critical infrastructure.

### *4.1.5 Mitigation programme*

In SR27 we plan to continue to follow the Mitigation Policy developed in SR21. Properties that have experienced repeat internal sewer flooding during severe rainfall and those most frequently impacted by external sewer flooding will receive mitigations measures if technically feasible.

These interventions do not improve/restore hydraulic capacity or alter the likelihood of flooding occurring. However, they do prevent customers from experiencing the impacts of flooding. These are vital low-cost high value interventions that can prevent internal flooding at properties again, whilst they are waiting for a long-term hydraulic scheme, or that do not qualify for a long-term scheme. Examples of mitigation measures are:

- Smart air bricks
- Flood doors
- Non return valves

*Figure 11: Example of mitigation measures we have provided*

### 4.1.6 External Flooding Approach

External flooding can be resolved using the same solutions as described in Internal Sewer Flooding Approach. In SR27 we want to focus on using surface water removal solution options. Surface water management can involve either attenuating rainwater before it is slowly released to the combined sewer, or full disconnection where rainwater is removed from the sewer network and discharged elsewhere e.g. to a watercourse.

Surface water management will not be a viable option at every location suffering from chronic capacity constraints. It also should be recognised that on the whole surface water management is most beneficial where it can be implemented on an opportunity basis, in partnership with others.

### 4.1.7 Flood Risk Management Act

Under Section 16 of the Flood Risk Management (Scotland) Act 2009, Scottish Water is responsible for assessing flood risks originating from sewerage systems in potentially vulnerable areas identified by SEPA (Scottish Environment Protection Agency). This is a Statutory requirement which must be carried out.

We will ensure that sewer infrastructure is managed effectively to minimise flood risks and protect communities. The process for this is as follows:

- Assessment Preparation: Scottish Water prepares an assessment for each identified area, detailing where floods are likely to originate from sewerage systems, estimating the volume of sewage likely to be released, and including other specified information.
- Consultation: SEPA consults with Scottish Water and other responsible authorities before identifying areas for assessment.
- Integration: The assessment integrates with flood risk information held by SEPA and other responsible authorities.
- Review and Update: Scottish Water reviews and updates the assessments periodically, at least every six years.

- Collaboration: Scottish Water collaborates with SEPA and other authorities to ensure the assessments are comprehensive and up-to-date.
- This process helps manage and mitigate flood risks from sewerage systems, contributing to overall flood risk management efforts in Scotland

### *4.1.8 Partnership Working*

Working in collaboration with others has been recognised as an essential tool to help Scotland prepare for the climate challenges of the future. The ongoing Scottish Government policy development work aims to increase collaborative working between public bodies.

Scottish Water has a vital role; bringing technical expertise and funding to partnerships. We currently are involved in three well established partnerships.

- Metropolitan Glasgow Strategic Drainage Partnership
- Edinburgh and Lothians Strategic Drainage Partnership
- Water Resilient Dundee Strategic Drainage Partnership

All three groups share a common objective, to deal with water on the surface, to prevent it reaching the sewers and have historically delivered a number of co-funded projects, including Orchard Park Swale in Edinburgh.

In SR27 we will continue to work with our partners, to identify areas where surface water removal can be removed from the waste water network.

We also use the partnership way of working to help to smooth development and redevelopment projects.

As these opportunities are co-funded, we are relying on others to provide funding. We are in the process of setting up an internal Scottish Water governance board to ensure that projects are consistently funded.

### *4.1.9 Customer Behaviour Campaigns*

Research has shown the customer behaviour campaigns must be run regularly to remind the public of their responsibilities with regard to treating the sewer network with respect. The Nature Calls campaign, run throughout SR21 has been successful, we have seen a 5% reduction in the number of chokes. The ‘localised approach’ will be utilised as a solution option in SR27, alongside an evolving message of encouraging customers to disconnect their property roof drainage from the waste water network.

It is important to run campaigns on an ongoing basis, as part of our toolkit to prevent sewer flooding and pollution incidents, for the following reasons:

1. **Awareness and Education**: Regular campaigns help keep customers informed about the causes of sewer blockages and how to prevent them. This is crucial as new residents move in and others may forget previous advice.
2. **Behaviour Change**: Changing habits takes time and reinforcement. Repeated messages can help solidify the importance of proper disposal practices, like not flushing wipes or pouring grease down the drain.

3. **Seasonal Factors**: Different times of the year can bring different challenges. For example, heavy rains can increase the risk of blockages, so timely reminders can be particularly effective.
4. **Ongoing Issues**: Sewer systems can face recurring issues, and ongoing communication ensures that customers remain vigilant and proactive in preventing blockages.
5. **Community Engagement**: Regular campaigns foster a sense of community responsibility and engagement, encouraging everyone to contribute to maintaining a healthy sewer system.

#### *4.1.10 Response to repeat flooding*

The number of IFOC and EFOC incidents recorded have remained relatively consistent throughout SR21. In SR27 we want to reduce the number of recorded incidents. We will use a combination of knowledge from our intelligent networks and proactive response on the group to drive down the number of recorded incidents. We are working to develop an approach to tackle this issue, which will be ready by the final Business Plan.

## 4.2 Optioneering

### *4.2.1 Optioneering Process*

The investment scenario options are built based on three key principles:

- Support new connections: providing adequate standards of service to our new customers.
- Deliver for our existing customers: this includes carrying out essential works to maintain existing asset performance, customer experience, and health and safety, meeting legislative, regulatory and community standards and progress towards Net Zero by 2024. It also involves investing in asset enhancement to improve resilience, reliability and sustainability of service.
- Consider future customers: replacing ageing assets now to ensure resilience of supply to future customers, preventing unsustainable costs being passed on to them in future.

We use our investment hierarchy approach to develop a balanced investment portfolio across all investment areas, including Managing Quantities of Flows, to prioritise projects and programmes based on our objectives, customer expectations, stakeholder needs and available funding. This approach is outlined in the table below, which links the principles with three investment need categories.

- Category 1 covers ‘must do’ investments, which are required as a minimum to meet customers’ expectations on level of service. This category accounts for the majority of the investment.
- Category 2, which accounts for the next biggest share, includes ‘should do’ investments aimed at delivering regulatory compliance and meet the expectations of legislation and regulation.
- Category 3 covers investment choices to improve service for existing customers, enabling growth, replacing ageing assets to protect service levels for future customers.

The approach is outlined in the table below, which links the principles with investment allocation.

*Table 10: Investment hierarchy approach*

| | Customer & performance centric investment needs | Description | Investment allocation approach | Mapping to FD | |
|---|---|---|---|---|---|
| Deliver for existing customers | 1 Maintain core service performance for existing customers | Essential works to maintain existing asset performance, customer experience and health & safety | Minimum needed to maintain service. Already prioritised significantly so budget reduced as a last resort, after all other non-discretionary expenditure reduced to minimum levels | AR3 – asset category 1,2&3 | Core expenditure |
| | 2 Meet current regulatory & community commitments | Meet legislative (RBMP3), regulatory (water quality), (IUW) community (e.g., Seafield odour) and progress Net Zero by 2040 | SR15 and matched funding<br>Then allocated portion of Enhancement funding | Enhancement (incl. matched funding )<br>SR15 | |
| | 3A Improve service for existing customers | Investing in asset enhancement to strengthen resilience, reliability and sustainability of service | No ring-fenced allowance. Absorbed within Enhancement<br>Allocated portion of Enhancement to support internal flooding and low pressure | Enhancement<br>Incl. ring-fenced allowance | Remaining allocation prioritised within these areas |
| Support new connections | 3B Provide a service for new customers | New development and connections, including temporary works | Currently £100m committed and known sites like Bertha Park are advancing | Enhancement | |
| Consider future customers | 3C Replace long-life assets for future customers | Proactively replacing aging assets to tackle back log and underlying issues; water mains (Asbestos cement pipes), civil infrastructure with lifetime of 40-60 years). Aim to prevent unsustainable costs being passed on to future customers | Consequential allocation as there is high demand from existing assets that impact current service. FD & investment scenarios do specify investing in long-life asset replacement. Future customer needs re-prioritised | AR3 – category 2 Civils and water mains, pressurised sewers | |

### 4.2.2 Unconstrained Options

The development of investment planning scenarios is a crucial step in ensuring that strategic and financial objectives are aligned with the water sector Vision and our long-term strategy. The initial step involved generating a comprehensive suite of options to encapsulate potential outcomes and investment needs. The unconstrained options include all the necessary investment demands to meet the current draft SR27 Ministerial Objectives, covering legislative requirements, commitments to stakeholders, and customer priorities.

The unconstrained options incorporate all potential investment options, with a focus primarily on maintaining all assets involved in managing quantities of flows. The total number of investment options considered was 84.

Table 11 below provides details of the number of investment options considered for SR27 detailed by investment category.

*Table 11: Managing Quantities of Flows - The volume of our unconstrained options*

| Investment Hierarchy | Number of Options |
|---|---|
| **Category 1 - AR3** | 44 |
| **Cat 2a & 2b - Regulatory** | 27 |
| **Category 3 - Enhancements** | 13 |
| **Total** | **84** |

To identify the best suite of interventions from the above options we have undertaken an extensive optioneering process, applying testing across various performance metrics and compliance requirements to form a series of constrained options, the investment scenarios.

### 4.2.3 Constrained Options

The constrained investment scenarios were generated from the unconstrained investment options by eliminating, reducing or removing some of the investments. The three constrained investment scenarios presented in this section are:

- **High Scenario**: The investment reduces risk with a CPI + 6.5% per annum, maintaining the service levels achieved at the exit of SR21
- **Working Reference Scenario**: It is the "reference" scenario, with a CPI + 4% per annum, the investment allows maintenance of the service levels achieved at the exit of SR21, meeting Ministerial Objectives albeit accepting more compliance risk
- **Flat Charges Scenario** the reduction in investment under this "flat charge" scenario, with a CPI + 0% per annum, triggers reduced service levels compared to exit of SR21, with notable overall service impacts as measured by OPA and CEM.

The Table below compares the investment across the three constrained investment scenarios, summarised by Investment Programme:

*Table 12: Summary of investment in Managing Quantities of Flows under constrained scenarios*

| High<br>(CPI + 6.5%) | Working Reference<br>(CPI + 4%) | Flat Charges<br>(CPI + 0%) |
|---|---|---|
| Internal At Risk Register position significantly improved returning to SR15 exit position<br><br>Significant progress in enhancing and establishing new partnerships<br><br>Step change- ramping up of surface water management interventions and external sewer flooding projects | Internal At Risk Register position held stable at SR21 forecast exit level<br><br>Existing partnerships maintained with some progress in developing new partnerships.<br><br>Limited progress on surface water management and external sewer flooding<br><br>Maintain AR3 approach | Internal At Risk Register position deteriorates.<br><br>No additional progress on external flooding other than completion of SR21 projects with spend in SR27. |
| **£1,276m** | **£966m** | **£755m** |

*Table 13: AR3 investment programme across the three constrained investment scenarios*

| Investment Hierarchy | Investment Area | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|
| **AR3 Cat 1** | Maintain critical sewers | 52 | 52 | 52 |
| | Maintain non-critical sewers | 209 | 209 | 190 |
| | Maintain CSO screens | 18 | 18 | 18 |
| | Maintain outfalls | 26 | 26 | 26 |

| Investment Hierarchy | Investment Area | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|
| | Maintain network model - Upkeep of models with a population equivalent of more than 10,000 | 12 | 12 | 12 |
| | Maintain Pipebridges | 96 | 96 | 96 |
| | Maintain rising mains | 149 | 149 | 130 |
| | Maintain air valves | 6 | 6 | 6 |
| | Maintain storm tanks | 15 | 15 | 15 |
| | Maintain Automated Pumped Non-Return Valves (APNRV) and flood mitigation devices | 2 | 2 | 2 |
| | Maintain syphons | 1 | 1 | 1 |
| | Maintain Sustainable Urban Drainage Systems | 1 | 1 | 1 |

*Table 14: Enhancement investment programme across the three constrained investment scenarios*

| Enhancement Investment Area | Investment Hierarchy | Description | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|---|
| **Flood Risk Management Act Duties** | Flooding - Cat 2a - Regulatory | Provide fit for purpose models required as minimum legislative requirement under Flood Risk Management Act | 4 | 4 | 4 |
| **Surface Water Removal** | Flooding - Cat 3 | Develop and deliver surface water removal projects, in collaboration with others, to reduce overall flood risk | 102 | 70 | 38 |
| **Mitigation Measures** | Flooding - Cat 3 | Provide protection to customers from the risk of flooding whilst permanent solutions are being identified and implemented | 13 | 13 | 13 |
| **External Sewer Flooding** | Flooding - Cat 3 | To reduce flood risk to customers impacted by repeat high consequence external sewer flooding where not disproportionately expensive | 97 | 39 | 19 |

| Enhancement Investment Area | Investment Hierarchy | Description | High (CPI+6.5%) (£m, 23/34) | Working Reference (CPI+4%) (£m, 23/34) | Flat Charges (CPI+0%) (£m, 23/34) |
|---|---|---|---|---|---|
| **Internal Sewer Flooding** | Flooding - Cat 3 | To reduce flood risk to customers impacted by repeat high consequence internal sewer flooding where not disproportionately expensive | 388 | 233 | 129 |
| **Surface Water Removal** | Flooding - Cat 3 | Reduce and remove storm water in the sewer network in areas to address high priority risk areas of sewer flooding | 65 | 0 | 0 |
| **Customer Response to Flooding** | Flooding - Cat 3 | Reduction in the number of sewer flooding incidents caused by blockages | 17 | 17 | 0 |
| **Customer Behaviour campaign** | Flooding - Cat 3 | Minimise sewer blockages (flooding and environmental pollution incidents) through engagement with customers | 0 | 0 | 0 |
| **Customer Behaviour campaign** | Flooding - Cat 3 | Education campaigns targeted at customers in sewer choke hot spot areas | 3 | 3 | 3 |

### *4.2.4 Chosen Option*

The investment scenarios were tested against various performance metrics and compliance requirements to validate the scenarios' robustness and ensuring they aligned with ministerial objectives, customers and stakeholders' expectations, Long-Term Strategy for the water sector, climate change adaptation plan, SW Board aspirations for 2033 and risk appetite. Based on the testing outcomes, we progressed with the Working Reference scenario (CPI+4%) as the basis for our final recommendation.

**Our final chosen option is the Reference Scenario, a matured and refined version of the Working Reference.**

We did this across all investment areas by:

- Refining the available budget associated with a CPI+4% pa customer charge profile, re-running the Financial Model using the latest modelling assumptions and the application of the most up to date top-down global efficiency factors to be applied.
- We incorporated feedback from sector stakeholders, clarification of Regulator requirements, customer research feedback and further considering the requirements of the draft Ministerial Objectives. Decisions were required to navigate these limitations while ensuring a balanced investment plan.

- Several strategic options were considered to manage budgetary constraints and investment reallocation. These included potential further removal of demand in the asset repair, refurbishment, and replacement (AR3) programme areas or reduce outcomes where there is service choice. As a result, there were upwards adjustments in some areas, and downwards adjustments in others.

This scenario balances investment needs with acceptable customer charge increases, providing a clear path forward for the draft Business Plan submission.

## 4.3 Overall Strategic Option Chosen for SR27

### *4.3.1 SR27 Investment plan*

The strategy for SR27 aligns with the framework set out in the Long-Term Strategy and follows the overall theme of a multi-directional approach. As such, the key parts of the SR27 Managing Quantity of Flows portfolio are:

- Internal Sewer Flooding – We will maintain the Internal Sewer Flooding At Risk Register position so that the exit position from SR27 is the same as the SR27 entry position – currently forecast to be 406.
- Mitigation measures programme – We will deliver mitigation measures at 800 properties, for properties and external areas that have experienced flooding due to overload sewers. In SR27 we will be considering whether to adopt mitigation measures as permanent solutions, thereby removing properties with mitigations from the At Risk Registers.
- External Sewer Flooding – We will remove 104 areas from external flooding At Risk Register
- Flood risk management - We will carry out our duties as specified in the Flood Risk Management Act
- Partnership working – We will work in partnership with others (including local authorities and local communities) to plan and deliver surface management on a prioritised basis. This will allow us to seize opportunities as they arise to remove rainwater from our networks and recover capacity and resilience. We plan to also establish a further 2-3 drainage partnerships. These partnerships and projects, jointly funded with others, will deliver the benefits for climate resilience, improved recreational and aesthetic benefits and biodiversity, to these local areas. We are working with our existing partners to jointly plan and prioritise projects in their respective cities. When identified and agreed, information about these projects will be published.
- Customer behaviour campaigns – We will continue to use customer behaviour campaigns in areas where flooding incidents due to blockages remain high.
- Response to repeat flooding – We will reduce the number of recorded incidents of repeat internal sewer flooding caused blockages by 75% and maintain zero repeat internal sewer flooding caused by overloaded sewers.
- Smart sewer networks – We will continue to increase real-time visibility of our sewers' operation to make the transition to smart sewer networks. The data gained will provide visibility to prevent and reduce the risk of customer flooding or pollution incidents. We will build on the successes and learning from SR21 and expand our coverage of waste water intelligent networks.
- We will continue to maintain our network assets according to the guidance set out in our management approaches.
- We will continue to maintain our hydraulic waste water models on a planned risk basis.

*Table 15: Summary of investment for Managing Quantities of Flows for SR27*

| Investment Area | Investment Category | Reference Scenario (CPI+4%) £m |
|---|---|---|
| **AR3** | AR3 | 592 |
| **Enhancement** | 2a – Regulatory | 4 |
| **Enhancement** | 3 | 355 |
| **Total** | | **950** |

### *4.3.2* Customer and stakeholder benefits

The investment proposed in this Technical Appendix will provide the following benefits to customers and stakeholders.

**Internal, External Sewer Flooding and Mitigations**

Stakeholders – Primary: Customers

Secondary: Local Authorities, wider community, SEPA

- Protecting Property: Prevents damage to homes and businesses, reducing repair costs and preserving property value.
- Health and Safety: Minimizes exposure to harmful pathogens and contaminants found in sewage, protecting public health. Improves mental health of customers directly impacted by internal sewer flooding.
- Environmental Protection: Interventions often reduce the risk of sewage spills that can harm local ecosystems and water quality.
- Improved Quality of Life: Enhances living conditions by preventing unpleasant odours and unsanitary conditions.
- Economic Savings: Lowers the financial burden on both property owners and local authorities by reducing the need for emergency responses and repairs.
- Community Resilience: Strengthens community resilience against flooding events, fostering a sense of security and well-being

**Partnership working**

Stakeholders – Primary: Local Authorities

Secondary: Customers, Scottish Government, Community Action Groups, SEPA

- Enhanced Collaboration: Brings together diverse expertise and resources from various sectors, leading to more innovative and effective solutions.
- Shared Funding: Access to a broader range of funding sources, reducing financial burdens on individual stakeholders.
- Improved Outcomes: Combines efforts to achieve better environmental, social, and economic outcomes, such as reduced flood risk, enhanced biodiversity, and improved public health1.
- Community Engagement: Involves local communities in planning and decision-making, fostering a sense of ownership and pride in the projects2.
- Knowledge Sharing: Facilitates the exchange of information and best practices, leading to continuous improvement and innovation2.
- Long-term Sustainability: Promotes sustainable development by integrating green infrastructure into urban planning, ensuring long-term benefits for the environment and society.

**Customer Campaigns**

- Reduced Flooding: By preventing blockages, these campaigns help minimize the risk of sewer flooding, protecting homes and businesses from water damage.
- Improved Public Health: Reducing blockages decreases the likelihood of sewage overflows, which can spread harmful pathogens and contaminants.
- Environmental Protection: Preventing blockages helps protect local waterways and ecosystems from pollution caused by sewage spills.
- Cost Savings: Fewer blockages mean lower maintenance and repair costs for both homeowners and Scottish Water. Scottish Water can then channel this cost saving to other areas.
- Enhanced System Efficiency: Clear sewers operate more efficiently, ensuring reliable waste water management and reducing the need for emergency interventions.

Community Awareness: These campaigns educate the public about proper disposal practices, fostering a sense of responsibility and community engagement

## Performance Outcomes

The outcome measures marked with an asterisk are those that we consider there is scope to align with the measures in England and Wales.

*Table 16: The outcomes we are seeking to achieve in SR27*

| Measure of Level of Service | Level of Service | Unit | 2027-28 | 2028-29 | 2029-30 | 2030-31 | 2031-32 | 2032-33 |
|---|---|---|---|---|---|---|---|---|
| **Internal Sewer Flooding** | Number of internal sewer flooding incidents* | Number normalised by number of sewer connections | 1.53 | 1.52 | 1.51 | 1.50 | 1.49 | 1.48 |
| **Internal Sewer Flooding** | Number of properties at | Number normalised by number | 1.65 | 1.69 | 1.61 | 1.61 | 1.59 | 1.51 |

| Measure of Level of Service | Level of Service | Unit | 2027-28 | 2028-29 | 2029-30 | 2030-31 | 2031-32 | 2032-33 |
|---|---|---|---|---|---|---|---|---|
| | risk of internal flooding | of sewer connections | | | | | | |
| **External Sewer Flooding** | Number of external sewer flooding | Number normalised by number of sewer connections | 10.62 | 10.75 | 10.87 | 10.99 | 11.11 | 11.24 |
| **External Sewer Flooding** | Number of properties at risk of external flooding | Number normalised by number of sewer connections | 11.44 | 11.52 | 11.61 | 11.70 | 11.79 | 11.88 |

### *4.3.3 Risk and Opportunities*

Throughout the development of our SR27 plan we have identified a number of challenges and opportunities that we are working to overcome to enable us to deliver successfully upon our investments:

**Technical Knowledge**: Addressing the complexity of hydraulic capacity erosion requires further advancements in modelling and predictive capabilities. We will work with our supply chain partners and upskill our staff to mitigate this risk

**Resource Constraints**: Limitations in skilled workforce availability may impact the timely delivery of SR27 objectives.

**Adaptation to Climate Impacts**: The growing intensity and frequency of extreme weather events require adaptive strategies, which present ongoing challenges in terms of planning and execution. We will continue to address this risk by using the most up to date information on the appropriate climate change updates more specifically, there is a risk that the assumption of 50 per year annual additions to our Internal Sewer Flooding At Risk Register could increase due to climate change. This would mean more than 300 properties would need to be removed from the register in order to maintain the SR27 entry position, meaning that a lower cap would be needed on the unit rate. Climate Change Risk assessment work is currently in progress to understand the likely impact of climate change over the coming investment periods.

**Legislative and Policy Changes**: Keeping pace with evolving regulatory and ministerial requirements adds further complexity to project prioritisation and implementation.

**Unit cost increases**: To deliver our Internal Sewer Flooding At Risk Register ambition, we will carefully monitor the unit rate for flooding projects, delivering those that are not disproportionately expensive to do so. However there are significant risks associated with this, namely:

- There are currently a large number of projects ongoing in SR21 which we expect to incur spend into SR27. We would like to continue to deliver these, however, these have a higher than average unit rate (cost per property) with 120 properties removed from the internal sewer flooding At Risk Register for £115m (23/24 prices). However, stopping these projects would likely cause reputational damage, as customers have received communications that these projects are in the Plan stage so likely anticipate progress. It would also lead to inefficient delivery.
- There is a bank of deferred projects from previous investment periods. These are highly complex and costly projects – delivering 30 properties removed from the internal sewer

flooding At Risk Register, at an estimated capital cost of £60m (23/24 prices). Again, should we choose to deliver these it would be very challenging to maintain the register position, as the remaining programme would have to made up of very low cost projects (low cost per property removed). However, these high cost projects, would provide significant improvement to customers who will benefit from a long-term scheme and also benefit all properties in the zone of influence of any improved network hydraulics.

Although we acknowledge there are several challenges to the delivery of our SR27 plan, we do also see several opportunities that we are looking to leverage:

- **Benefit capture** – we know that our flooding schemes, and surface water management interventions, can often have a much wider hydraulic impact on the local area in terms of improving network capacity and resilience. We are progressing towards a better quantification and tracking of this to allow us to understand the full benefits delivered by the programme.
- **Delivery of blue-green infrastructure** - Our strategic partners and alliance delivery partners are typically set up to deliver grey infrastructure schemes. As such this procurement route is not necessarily the most efficient or cost-effective means of delivering blue-green infrastructure, particular at pace. Work is ongoing to explore procurement routes and opportunities and leverage this opportunity to push the innovation of our supply chain – see our Supply Chain Technical Appendix for further detail.
- **Develop and adopt enhanced survey techniques**, such as use of drones or other remote information gathering equipment to improve our efficiency and output. For example, we have worked closely with our Delivery Partners to develop a drone to survey difficult critical sewers where normal Crawler type CCTV units are unable to function and we will continue to utilise this going forwards.
- In SR27 we will continue to work with our **Delivery Partners to develop and innovate new asset inspection techniques** and we also hope to share data on asset degradation over time within the wider water industry. Obtaining more site-specific information will also enable the development of detailed system plans and these plans will facilitate economic repair or replacement of assets with equivalent or modern alternatives.
- **Innovation in Drainage Solutions**: Exploring advanced technologies for flood risk management and surface water retention can enhance long-term resilience.
- **Collaborative Partnerships**: Partnerships such as the ELSDP and Water Resilient Dundee provide opportunities for integrated investment planning and joint initiatives to address surface water challenges.
- **Future-Proofing Infrastructure**: Investments in SR27 offer the chance to address longstanding capacity issues, increase network resilience, and prepare for climate change impacts.
- **Customer-Centric Enhancements**: Expanding mitigation measures and improving clean-up responses strengthen customer trust and satisfaction.
- **Waste water Intelligent Networks** – as we roll out more ‘smart’ networks we will obtain a much better understanding of how our networks operate, and where there may be opportunities for dynamic control.

## 4.4 Investment Programmes

The following sections provide greater detail on our SR27 investment programme broken down by AR3 and enhancement investment.

### *4.4.1 AR3 Option Chosen for SR27*

*Table 17: Proposed AR3 investment*

| Investment area | Investment Category | Description | Reference Scenario CPI+4% (£m, 23/24) |
|---|---|---|---|
| **Maintaining Pipe bridges** | Cat 1 | Maintenance existing pipe bridges | 88 |
| **WW Pumping Mains** | Cat 1 | Maintain rising mains and air values | 141 |
| **WW Outfalls** | Cat 1 | Maintain existing waste water outfalls | 25 |
| **Maintaining CSOs** | Cat 1 | Maintain existing CSO screens | 12 |
| **Sewer Structures** | Cat 1 | Maintain Automated Pumped Non-Return Valves (APNRV) and flood mitigation devices<br>Maintain syphons<br>Maintain storm tanks<br>Maintain Sustainable Urban Drainage Systems | 17 |
| **Gravity Sewers** | Cat 1 | Maintain non-critical sewers<br>Maintain critical sewers | 249 |
| **Waste water Model Maintenance** | Cat 1 | Maintain network model - Upkeep of models with a population equivalent of more than 10,000 | 16 |
| **Other Network assets** | Cat 1 | Fixed wire electrical systems<br>Street Iron works<br>Statutory maintenance items | 44 |
| | | **TOTAL** | 592 |

### 4.4.2 Enhancement Option Chosen for SR27

*Table 18 Proposed enhancement investments*

| Reference Scenario - CPI+4% | Reference Scenario- CPI+4% (£m, 23/24) | Benefits |
|---|---|---|
| **Internal Sewer Flooding** | £213m | ~300 properties removed from the Internal At Risk Register |
| **Mitigation Measures - Repeat flooding programme** | £12m | 800 properties protected from internal flooding |
| **External Sewer Flooding** | £43m | 130 - 140 areas removed from the External At Risk Register |
| **Flood Risk Management Act Duties** | £4m | Meeting statutory duty |
| **Customer Behaviour campaign** | £2m | Reduced blockages leading to reduced internal and external flooding incidents |
| **Surface Water Removal- Partnership Working** | £68m | Collaboration and efficient delivery of blue-green infrastructure |
| **Customer Response to Flooding** | £16m | Reduction in the number of sewer flooding incidents caused by blockages |
| **Total** | **£359m** | |

### 4.4.3 Internal Sewer Flooding

**Our ambition for SR27 is to maintain the internal sewer flooding At Risk Register position.** Under the reference scenario we will continue to seek to address our longest standing and highest risk internal sewer flooding. The table below shows how the funding will likely be distributed. We will face difficult choices as unit rates increase. There are SR21 projects in flight with spend profiled into SR27 and these are listed in the table.

*Table 19: Internal sewer flooding projects*

| Group | SR21 project | Comments |
|---|---|---|
| **Internal sewer flooding project Glasgow** | ✓ | Project not named due to customer confidentiality (code 5362090000). Delivering 2 removals |
| **Internal sewer flooding project Bothwell** | ✓ | Project not named due to customer confidentiality (code 5461550000). Delivering 1 removals. |

| Group | SR21 project | Comments |
|---|---|---|
| **Internal – SR21 Named Flooding Projects -** | ✓ | 51 Flooding Projects current beyond GW30 but not yet at GW90 with spend forecast beyond March 2027.Project LBEs all <£6m. Will deliver 117 removals from the ARR. |
| **IFOS Emerging SR21 & SR27 Non-named Projects** | x | Projects to be delivered on a prioritised approach. |

### *4.4.4 Mitigation Measures*

Funding for mitigations will be retained at £12m. Mitigation measures are lower cost interventions that provide significant value and protection to our customers. They are quick and generally easy to deploy, and in many cases offer protection against flooding even in severe weather. We will continue to track and internally report on the number of mitigation measures installed.

In addition to continuing with the internal mitigation measures to alleviate repeat internal sewer flooding, we will also look to start to reduce internal flooding caused by blockages.

### *4.4.5 External Sewer Flooding*

The external At Risk Register is expected to continue growing throughout SR27, as it has consistently done during SR21, leading to more customers being affected by external flooding. We will focus on addressing the highest priority external sewer flooding clusters within the SR27 funding constraints. As outlined earlier in this document, we completed planning activities for our top 20 clusters in SR21.

In SR27, we will aim to implement the projects that offer the highest value and benefits for our customers. The table below shows the split of funding between SR21 projects already in flight and with delivery due to span SR21 – SR27 and the funding available for the next highest priority clusters.

*Table 20: External sewer flooding investments*

| Group | SR21 project | Comments |
|---|---|---|
| **External SR21 Named Flooding Projects -** | 835 | 5 Flooding Projects current beyond GW30 but not yet at GW90 with spend forecast beyond March 2027.<br>Delivers 95 areas removed from the external sewer flooding At Risk Register |
| **EFOS Emerging Priority Areas** | 835 | Based on £30m allocation to external flooding minus the SR21 overhang in line above |

| Group | SR21 project | Comments |
|---|---|---|
| | | Forecast additional 26 removals at a unit cost of £500k/ area removed from the external sewer flooding At Risk Register |

In total we anticipate that this funding will ensure around 120 properties will be removed from our External Sewer Flooding At Risk Register.

### *4.4.6 Flood Risk Management Act*

Under Section 16 of the Flood Risk Management (Scotland) Act 2009, Scottish Water is responsible for assessing flood risks originating from sewerage systems in potentially vulnerable areas identified by SEPA (Scottish Environment Protection Agency). This statutory duty will be undertaken as part of our plan.

### *4.4.7 Partnerships and surface water management*

We will continue to expand and enhance our existing three drainage partnerships. Within the funding constraints we plan to also establish a further 2-3 drainage partnerships. By concentrating on 2-3 new partnerships, we can both invest in establishing these collaborations and contribute financially to joint rainwater management projects in these local authority regions. These partnerships and projects, jointly funded with others, will deliver the benefits for climate resilience, improved recreational and aesthetic benefits and biodiversity, to these local areas. We have consistently set out that we need a dual approach to improving our networks - addressing chronic capacity issues while also improving resilience through rainwater management. Working fully in partnership moves us beyond individual organisations dealing with “their part of the problem”, to a framework where multiple issues can be identified and addressed in a planned and co-ordinated manner to provide multiple benefits to partner organisations and communities.

Through partnership collaboration, Scottish Water will benefit from efficiencies of time and cost through co-ordinated planning and delivery, access to new avenues of joint funding, and new delivery mechanisms. This will enable us to deliver greener, place-based solutions which will increase the resilience of the sewer network to future climates, whilst improving the level of service to a much wider range of customers than those who are targeted through individual projects aimed at resolving specific chronic issues (under the flooding and UID programmes). The interventions and projects delivered under these partnerships will start to build network resilience and offset the impact of climate change.

We are working with our existing partners to jointly plan and prioritise projects in their respective cities. When identified and agreed, information about these projects will be published.

As these opportunities are co-funded, we are relying on others to provide funding. We are in the process of setting up an internal Scottish Water governance board to ensure that projects are consistently funded.

### 4.4.8 Customer Behaviour Campaigns

We will use £2m to help support the Nature Calls campaigns, focusing on reducing blockages and start to focus on encouraging customers to disconnect their property roof drainage from the waste water network.

### 4.4.9 Response to repeat flooding incidents due to blockages and chokes

We will develop an approach to drive down the number of repeat flooding incidents due to blockages and chokes.

This will use a combination of knowledge from our intelligent networks and proactive response on the group. This is an area we can utilise new technologies to identify the households responsible for repeated chokes in the waste water network.

### 4.4.10 Additional investment options which are excluded from plan

In developing our SR27 investment plan, we have considered a wide range of options for investment but had to make decisions based on risk and affordability for customers. For areas in our plan where we have reduced or curtailed investments, we have made provision in our Risk and Opportunity Management Plan.

Within Managing Quantities of Flows, items we have NOT included in our investment plan are:

- Recover the SR15 internal At Risk Register exit position – ARR position of 314
- Deliver Higher level of surface water management funding to allow high priority external sewer flooding schemes to be delivered with a blend of grey and blue-green infrastructure and additional blue-green infrastructure scope at 5-10 UID projects.

## 4.5 Future Investment Requirements

### 4.5.1 Future pressures on our waste water network

Planning for the next 25 years is inherently uncertain. As part of our Long-Term Strategy, we undertook a broad ranging and comprehensive review of the risks and opportunities across the next 25 years. The investment we have identified will secure our essential services by maintaining our existing asset base, allowing us to adapt to climate change and meet our legislative requirements. Without major changes to how we currently operate the water and waste water system and given the projected impact of climate change and urban creep, we are currently forecasting that the funding needed to deliver sustainable services will need to increase over the next 25 years significantly. Planning for this period is inherently uncertain and there are both opportunities and risks ahead.

For Managing Quantities of Flows, the projection will see an increase in total expenditure of over four-fold between SR27 and SR45 from £950m to £4,506m (Figure 14).

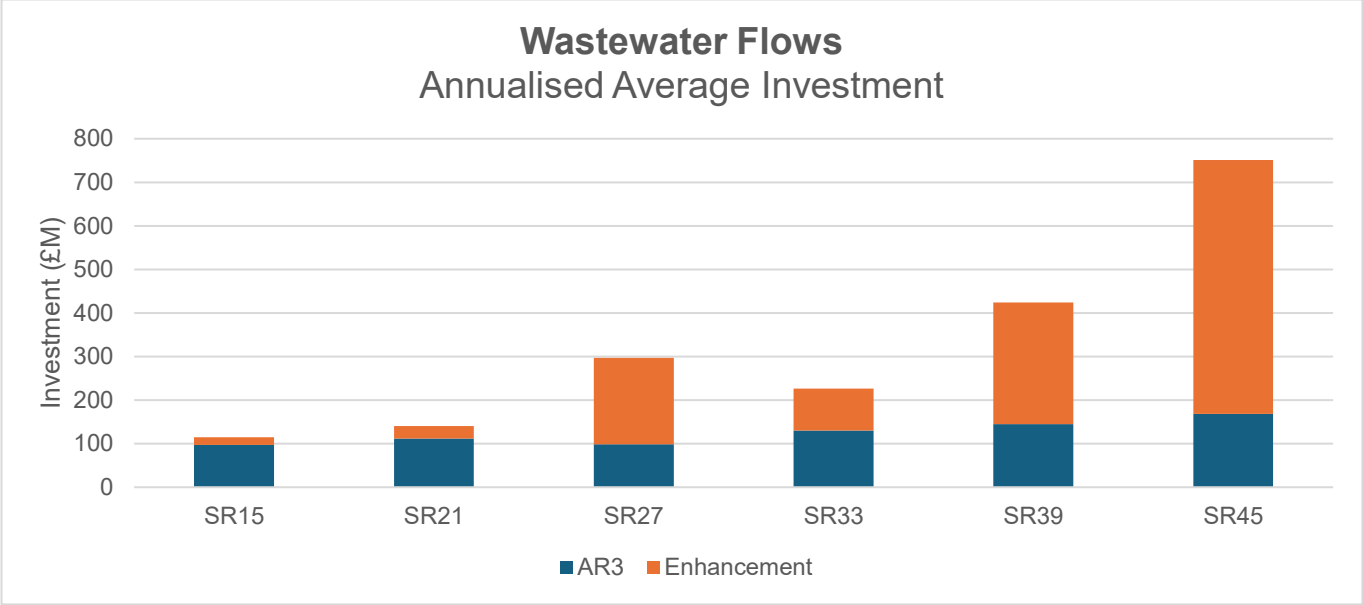


*Figure 12: Historic and projected investment - Managing Quantities of Flows (2015 to 2051)*

This driven by increased enhancement expenditure due to:

- An increase in properties that come onto the At Risk due to the effects of climate change
- Significant investment in surface water management – where we will be increasing the work we do with partner organisations to reduce the amount of surface water entering our sewers and therefore having a negative impact on our network and ultimately significantly reducing the risk of flooding to customers in the long term.

A detailed breakdown is shown in Figure 13 below. The Chronic Issues on the Waste Network our Long-Term Investment Strategy sub-outcome that covers all reported sewer flooding (both internal and external) occurring with an annual risk of reoccurring of 3% or higher.

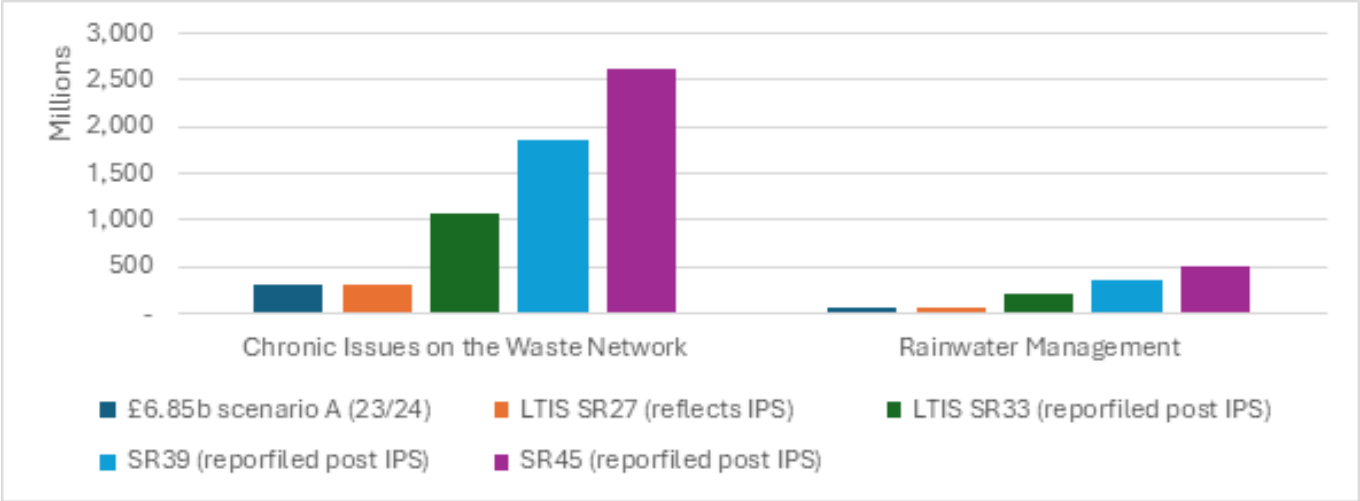


*Figure 13: Long Term Enhancement Expenditure Projection for Managing Quantities of Flows (2027 - 2051)*

We are forecasting a lesser increase in AR3 investment required annually over the longer term (from ~£100m per year in SR27 to ~£170m per year in SR45). We have planned to invest heavily in the renewal of our rising mains, pipe bridges and other associated sewer infrastructure in SR27 thus lowering the increases in our overall AR3 spend out to SR45.

# 5 Interdependencies

This document should be read in conjunction with other Technical Appendices including:

- Water Environment
- Enabling Growth
- Climate Change Adaptation
- Investment Planning
- Supply Chain
- Digital strategy

The document should also be read in conjunction with Scottish Water's Long-Term Strategy.

# 6 Conclusion

In summary, over the course of SR15 and SR21, our performance across internal and external flooding incidents has been broadly stable, this is due a combination of investment in long-term hydraulic schemes and new programmes such as mitigations, which target repeat flooding. On that basis, we have selected the Working Reference Scenario for SR27, which aligns with ministerial objectives and our long-term strategy and ambitions, meets customers and stakeholders' expectations, climate change adaptation plan, Scottish Water's Board aspirations for 2033 and risk appetite.

Our Working Reference Scenario will deliver require £950m of investment to deliver the following:

- **Maintain existing sewer network asset during SR27:** Maintaining our existing sewer asset base is critical to deterioration of sewer to our customers and stakeholders. We intend to spend £592m during SR27, which will also support flooding issues.
- **Maintain number of properties on the Internal Flooding At Risk Register (ARR):** Our key focus of SR27 will be to continue to tackle and resolve internal flooding for our most at risk customers, ensuring that exit numbers of properties at risk of internal flood at the end of SR27 will not exceed SR21 exit number which is likely to concluded at [406]. This will require to address properties on the register from projects already identified in SR21, Emerging Properties, Emerging SR21 Non-named Projects and Emerging Properties and Impact of Climate Change – Properties not on Register from the start of SR27, arriving at [406] properties at risk as the exit position of SR27
- **Mitigate the impact of internal and external sewer flooding** where technically feasible to do so.
- **Tackle a number of our highest priority clusters currently on the External Flooding At Risk Register (ARR**): The strategy seeks to tackle our highest priority external flooding, which we know can have a significant impact on both individuals and communities This will address external flood by commencing external named flooding projects deferred or overhanging from SR21 and new and Emerging Priority Areas during SR27.
- **Maintain the total number of internal and external flooding incidents**: Our strategy to maintain the total number of internal and external flooding incidents is to replicate SR21 scale and expenditure of mitigation measures programme. Building on our success in SR21, our SR27 Mitigation measures strategy remains a key component in our solution as a low-cost high value means of protecting customers against the worst impacts of flooding and preventing repeat flooding event. We will also look to target repeat internal flooding that are not caused by hydraulic overloading. This coupled with the Customer Behaviour Campaign, will help reduce the number of incidents.

# Enabling Growth
## Technical Appendix 005

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# 1 Executive summary

The Enabling Growth investment area covers the investment required to meet the relevant Ministerial Objectives (MOs), by providing the strategic capacity for all new domestic properties connecting to our water and waste water systems as well as the domestic demand associated with commercial properties. These Ministerial Objectives are:

- Scottish Water must identify and provide new strategic capacity that will meet the demand of all new housing development and the domestic requirements of commercial and industrial development for the 2027-33 period.
- Scottish Water must:
    - work with the industrial sector to facilitate the provision of capacity that will meet the non-domestic needs of new and expanding industry,
    - work with stakeholders to influence strategic development in areas where there is already capacity, and to consider all possible measures to release capacity in existing assets before requiring enhancement of water and waste water infrastructure,
    - work with the Scottish Government to support the Scottish Government's objective of ensuring reliable and sustainable rural waste and water services.
- Scottish Water must ensure that such strategic capacity is delivered in support of committed investment to minimise the likelihood of redundant capacity.

We recognise, in our Long-Term Strategy (LTS), that the population of Scotland is growing and changing, and that this is one of the three key challenges that we are facing (along with more extreme weather and ageing assets). As the populations grows, so does the demand on our networks and treatment works.

Where strategic capacity (headroom) at our water and waste water treatment works is limited, and population growth is increasing demand, then investment may be required to restore headroom (e.g. through upgrades and extensions to the network). We must meet this demand while enabling all new household connections, providing any required new capacity "just ahead of need".

To identify the best suite of interventions to meet the challenge, we have undertaken an optioneering process, combined top-down and bottom-up investment scenario planning to identify and scope out our recommended Enabling Growth investments for SR27.

The investment scenarios were tested against various performance metrics and compliance requirements to validate robustness whilst ensuring they meet: Ministerial Objectives; customers' and stakeholders' expectations; our LTS and contribution to the water sector vision; and Climate Change Adaptation Plan, while meeting Scottish Water's Board expectations and risk appetite.

The Investment Planning Technical Appendix provides detailed information on the investment scenarios considered and the optioneering process.

The Reference Scenario will deliver £593m (23/24 price base, post-efficiency) of investment to meet the relevant Ministerial Objectives, maintaining overall compliance, and ensuring we will

continue to identify and provide the new strategic capacity to meet the demand of all new housing development, and the domestic requirements of commercial and industrial development.

We will deliver the outcomes above by investing in Waste Water Growth, Water Growth, Infrastructure Investment, and Service Relocation, including in SR21 Waste Water Treatment Works (WWTW), 3 Water Treatment Works (WTW) (Tiree, Kenmore & Balmichael), and the Seafield WWTW development.

*Table 1* below summarises our key investments, alongside the costs and benefits to customers.

*Table 1: Enabling Growth SR27 Investment Summary (23/24 price base, post-efficiency)*

| Investment Category | Investment Hierarchy | Programme | Investment value (£m, 23/24) |
|---|---|---|---|
| **Waste Water Growth MA026** | Category 2 – Meet current regulatory & community commitments.<br>Category 3 - Provide a service for new customers | Provision of Part 4 capacity to meet strategic & local growth requirements | £391m |
| **Water Growth MA087** | Category 3 – Provide a service for new customers | Provision of Part 4 capacity to meet strategic & local growth requirements | £45m |
| **Infrastructure Investment MA032** | Category 2 – Meet current regulatory & community commitments | Provision of strategic capacity in our networks to meet new demand | £120m |
| **Service Relocations MA065** | Category 2 – Meet current regulatory & community commitments | Comply with legislative requirements – Water & Waste Water | £37m |
| **Total Enabling Growth Investment** | | | **£593m** |

SR27 investment in Enabling Growth makes up 7% of the total SR27 Investment of £8.3bn, as shown below.

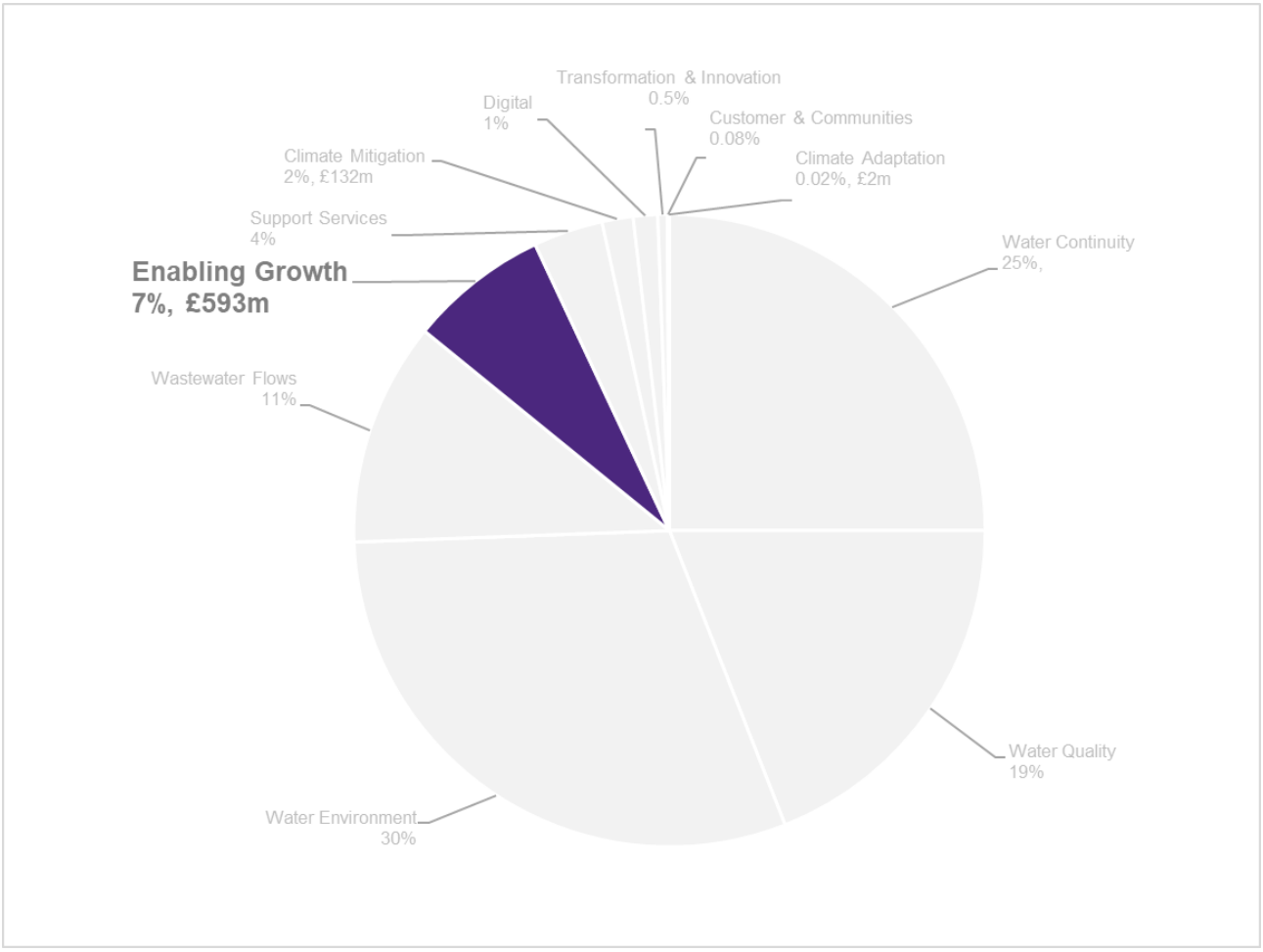


*Figure 1: Enabling Growth investment as a proportion of the total SR27 investment*

# 2 Background

## 2.1 Scope of this Technical Appendix

This technical appendix covers the investment required to ensure there is the necessary strategic water and waste water capacity to facilitate new housing connections and new domestic demand associated with commercial properties, thereby supporting sustainable economic growth in Scotland.

## 2.2 Ministerial Objectives

The Ministerial Objectives for Supporting Sustainable Economic Growth are described below:

- Scottish Water must identify and provide new strategic capacity that will meet the demand of all new housing development and the domestic requirements of commercial and industrial development for the 2027-33 period.
- Scottish Water must:
    - work with the industrial sector to facilitate the provision of capacity that will meet the non-domestic needs of new and expanding industry,
    - work with stakeholders to influence strategic development in areas where there is already capacity, and to consider all possible measures to release capacity in existing assets before requiring enhancement of water and wastewater infrastructure,
    - work with the Scottish Government to support the Scottish Government's objective of ensuring reliable and sustainable rural waste and water services.
- Scottish Water must ensure that such strategic capacity is delivered in support of committed investment to minimise the likelihood of redundant capacity.

Our Long-Term Strategy[1] (LTS) has incorporated these requirements into the wider long-term outcome of enabling Scotland's sustainable economic and housing growth. This aligns with the Water Sector Vision[2] of ***We will enable the economy to prosper****,* by ensuring that we do not cause unnecessary delay to development.

Supporting customer research highlighted that our customers believe Scottish Water infrastructure should support economic growth, although not at the expense of the environment.

## 2.3 Legislation and Regulations

[1] Our-Sustainable-Future-Together_Scottish-Water-Long-Term-Strategy.pdf
[2] Scottish Water's Water Sector Vision

The key legislation and regulations relating to Enabling Growth are set out in *Table 2*.

*Table 2: Legislation and regulations directly applicable to this the Enabling Growth investments*

| Statutory Duty / Regulatory Obligation | Summary |
|---|---|
| **The Scottish Water (Objectives: 2021 to 2027) Directions 2020:** | Under the Water Industry (Scotland) Act 2002, Ministerial Directions were given to Scottish Water by Scottish Ministers for 2021 to 2027 for supporting sustainable and economic growth. |
| **The Water (Scotland) Act 1980:** | Part 2 Section 6 – 'It shall be the duty of Scottish Water to provide a supply of wholesome water to every part of [its] limits of supply where a supply of water is required for domestic purposes and can be provided at a reasonable cost'. |
| **The Sewerage (Scotland) Act 1968:** | Requires Scottish Water to effectively drain its area of domestic sewage, surface water runoff from roofs and paved areas within the curtilage of premises, and trade effluent. Note: Scottish Water is not obliged to do any of the above which is not practicable at reasonable cost. |
| **The Provision of Water and Sewerage Services (Reasonable Cost) (Scotland) Regulations 2015:** | Determines what Scottish Water's reasonable cost contribution should be, by specifying what will, and will not, be taken into account in calculating the reasonable cost contribution and also by specifying the method for calculating the maximum amount. |
| **The Principles of Charging for Water and Sewage Services 2021-27:** | Confirms cost arrangements for new household, commercial and industrial development. |
| **The Urban Wastewater Treatment Directive (UWWTD):** | Sets out the impact of development on receiving waters whereby secondary treatment is a requirement when the threshold of a town grows bigger than 10,000 in population numbers. For example, this the case for the town of North Berwick. |

We will continue to invest to meet the challenge of providing the capacity necessary to enable growth. Failure to do so, would otherwise mean that we could compromise compliance with current environmental licences, we may not meet the expected security and resilience of Scottish Waters' services, and resulting in constraints on future developments.

## 2.4 Understanding strategic capacity

The strategic water and waste water capacity, also known as **Part 4**[3], is set out in the figure below. Further details of the component parts of new connections and capacity is provided in the annex.

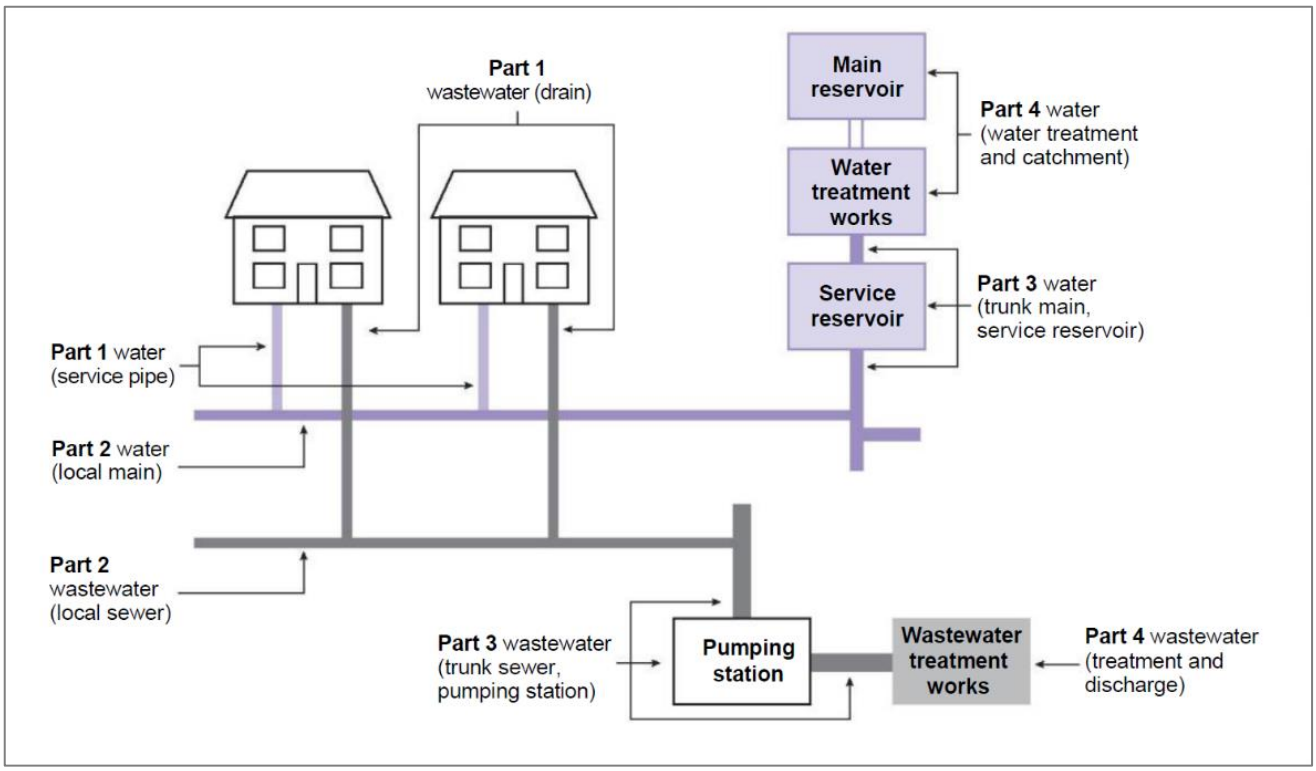


*Figure 2: An illustration of the four component parts of new connections and capacity*

Under the Ministerial Objectives, Scottish Ministers direct Scottish Water to meet the Part 4 strategic capacity requirements of all new housing developments and the domestic requirements of commercial and industrial customers. We will continue to deliver against this requirement.

## 2.5 Our Strategy

We recognise, in our LTS, the changing population of Scotland is one of the three key challenges that we are facing. As such, one of our Long-Term Outcomes is to continue to play a key role in enabling Scotland's sustainable economic and housing growth. We commit to enabling growth in support of a flourishing Scotland by ensuring on-time, as-needed effective connections for all new housing developments (and domestic water usage in non-household settings) to our water and waste water networks. It also states a need to work collaboratively with developers, planning authorities and other agencies to understand the timing and scale of their new developments.

We will encourage development where there is already capacity by influencing decisions makers, develop schemes for new strategic capacity where it is highly likely that capacity expansion will be required, and take the lead in providing strategic water and waste water infrastructure where it is most cost effective to do so and there is high confidence that the associated development will progress. Specifically, we will:

- Engage with the Scottish Government, local authorities, and developers to encourage and support development in areas where we have existing capacity at our water sources and treatment works.

[3] See Table 11 for definitions

- Encourage the development of water efficient homes and businesses and provide developers with standard, low-carbon infrastructure, to make connecting to our assets easy and efficient for everyone involved.
- Continue to encourage the development of homes and businesses which capture rainwater for reuse and keep rainwater on the surface through sustainable drainage systems (SuDS) and blue-green rainwater management systems, and the use of permeable materials for driveways and car parks.

### *2.5.1 Key drivers*

We are responsible for providing water and waste water services that are essential to everyday life for households and businesses across Scotland: making a critical contribution to the country's health, wellbeing, economic prosperity, and natural environment. Customers expect us to provide an affordable, sustainable, low carbon services – and the changing climate will increasingly threaten our ability to deliver these services.

Our Enabling Growth strategy is to provide strategic capacity "just ahead of need". We will do this by identifying where new strategic capacity is required at our assets and initiate investigations as development is confirmed, while still in the planning stage and before actual construction begins. This allows us to connect new developments as they are required. The key criteria that we consider are local authority development plans, land ownership status, planning permission status, and developer timescales and build out rates. Consideration of these factors gives us the necessary confidence that the development is going ahead, and we can therefore be certain that we are investing in the right places at the right time, ensuring we are delivering value for money, meeting the expectations of new customers, while avoiding negative impacts to existing customers.

Population growth is the driver of this investment area. The population of Scotland has been growing for the last 25 years and is projected to continue to grow. However, the growth is not evenly distributed across Scotland, with larger cities experiencing higher rates of growth.

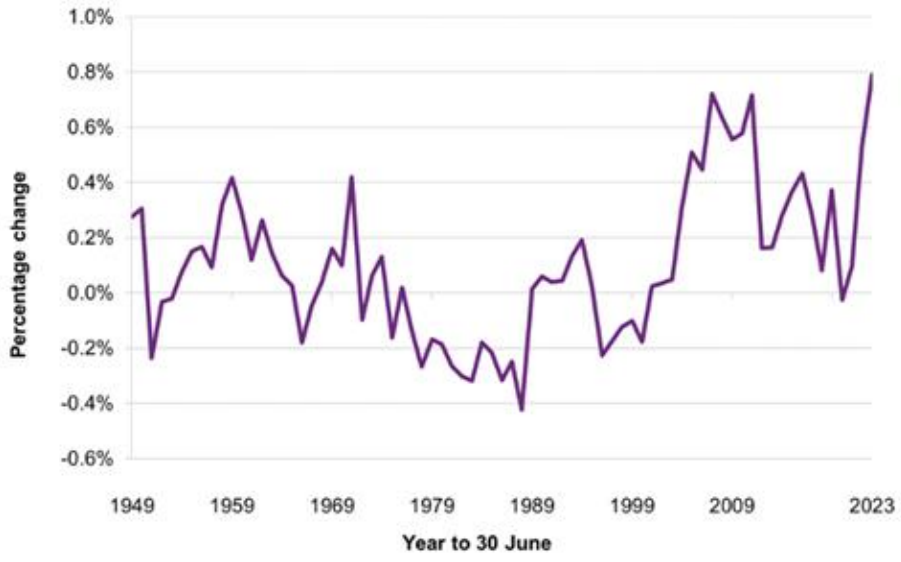

*Figure 3: The population increase between 2022 and 2023 was the largest in at least 76 years (Annual population change (%), Scotland, 1949 to 2023)*[4]

This increase in population means that we will need to provide more water if our customers keep using water at the same rate we do today. The increase in housing and new businesses, will also put more pressure on our waste water network and result in a need for new assets to treat the additional volume of waste water.

## 2.6 What we have done so far

During SR21, we have continued to successfully[5] work alongside the development community to:

- Meet the Ministerial Objective of Supporting Sustainable Economic Growth for the current investment period. The outputs measure associated with this investment area are Population Equivalent (PE) which is indicative of the increase in capacity delivered. The strategic capacity outputs delivered so far are.
    - Waste water growth 39,349 PE
    - Water growth 8,217 PE
- 75,554 newly connected properties in the first 4 years of SR21.
- Meet our statutory requirement to provide domestic supply at reasonable cost within our supply area,
- Support a flourishing Scotland, by enabling development,
- Minimise impact to existing customers, through engagement and forward planning with developers and Local Authorities.

## 2.7 What has changed since SR21 submission

During SR21, we undertook a series of waste water growth investigations, in locations where confirmed development was progressing, to understand the available remaining capacity and the capability of our waste water treatment works assets. These investigations monitored actual flows and established the hydraulic and biological loading baseline and determined the impact that future growth may have at a given asset.

We are required to evaluate the possible impact of population growth driven changes in effluent discharge flow on the quality of riverine and coastal receiving waters. This is necessary to ensure that, where required, treatment works processes are adapted or upgraded to mitigate any risks to the environment that might arise. The requirements for evaluating possible impacts differ by waterbody type, which entail different modelling and data management activities. The outputs of these modelling assessments inform provisional license standards to be defined and endorsed by SEPA at a much earlier stage in each growth project lifecycle, saving both time and money.

The benefit to Scottish Water carrying out this work, is that it will provide confidence in understanding the contribution of discharges from its assets in the catchments in relation to

[4] Reference: National Records of Scotland website

[5] Our successful work alongside the development community is evidenced by the increase in our Development Customer Experience Measure (dCEM) performance scores over the last 2 years, as shown in Figure 4.

impacts on water bodies, and that any required investment will deliver the desired environmental and compliance outcomes.

### *2.7.1 What we have learned*

The outcome from these investigations confirms the need and the case for change for an increase in treatment capacity to ensure that environmental standards continue to be met. In some cases, the investigation confirms that sufficient headroom exists at our waste water assets which enables development to proceed without detriment to existing customers or the environment. To date, 23 growth investigations have been completed during SR21 where 4 confirmed that capacity was available. We have an estimate of 46 planned for completion during SR27.

In SR27, a similar approach will be adopted to ensure we are only investing in areas which have a genuine need, to meet the requirements set out in the Ministerial Objectives.

## 2.8 Key risks, challenges and opportunities

### *2.8.1 Risk*

Through correct and timely investment to provide strategic capacity, we can minimise the risk of impacts to existing customers, such as experiencing interruptions to supply, low pressure water supply, and internal or external sewer flooding. In addition, we can enable future developments, without unnecessary delays.

We also mitigate environmental compliance risks that may otherwise materialise. This is because an increase in population in a catchment increases the biological loadings to our waste water treatment works and in turn tighter discharge standards may apply dependent upon the dilution in the current watercourses. The challenge of this may increase in the future as climate change impacts the volumes of water associated with our rivers and burns due to prolonged dry spells.

We are committed to ensuring that both new and existing customers receive the services and benefits that they expect, and that we have committed to deliver. Section 3 describes how we will overcome this risk through our approach to identifying specific investments needs and the projects enabled by the resulting recommended investments.

### *2.8.2 Connections*

Based on a review of the actual numbers connected over the last five years, we expect to connect ~20,000 domestic properties (households) per year over SR27. Continued housebuilding to support; a growing population, population movement, and changes in typical household occupancy, increases the demand to connect into our network.

It is difficult to precisely predict the number of connections per year. There is variation in annual connections of ~2,000 connections, or ~10% year to year. This estimate is supported by the housing completion certificates issued across Scotland which demonstrate similar ranges.

Based on the actual connections over the last three years, we estimate that we will have connected ~ 3,500 non-domestic or commercial premises over the SR21 period and plan for a similar number in SR27.

### *2.8.3 Planning*

Given the challenges set out above, investment planning for future growth is by nature uncertain due to the size and timing of new development demand. Along with this uncertainty we are faced with multiple challenges including ageing assets and climate change. Our strategy to enable development "just ahead of need" ensures that investment is prioritised at assets where the risk posed through connection of new development is minimised to maintain current service levels. This is the risk that growth (new connections) exceeds the available headroom at a water or waste water treatment works ahead of the investment being delivered, and the asset is then at risk of breaching licence conditions.

## Rural communities and areas with smaller water courses

Variable population increase can have specific and additional impacts in those areas that have smaller water courses, and in rural communities. In small water resource zones or catchments, a small change in population can have a significant impact on available treatment capacity[6].

Firstly, standards are tighter for smaller water courses, therefore the appropriate waste water treatment technologies may be different; these could either be unavailable or higher cost than standard solutions.

Secondly, population changes typically have a bigger relative impact on rural communities, and meeting their needs can increase the costs and required investments by a relatively greater amount. These factors might have particular impacts on our understanding of the available headroom at a water or waste water treatment works and is therefore a growth consideration.

[6] See also the following Technical Appendices, where these issues and how they relate to existing capacity and customers are covered: Water Continuity, Water Environment, and Managing Quantity of Flows.

# 3 Customer and Communities

## 3.1 Customers / Stakeholder engagement and support

Our customers are the development community who require connections to our network for water and waste water services. We have historically always strived to connect our customers *just ahead of need* to enable their developments. This approach is clearly favoured by customers and as such receives positive feedback; the Development Customer Experience Measure (dCEM) is currently tracking above target, indicating that we are providing a high level of service.

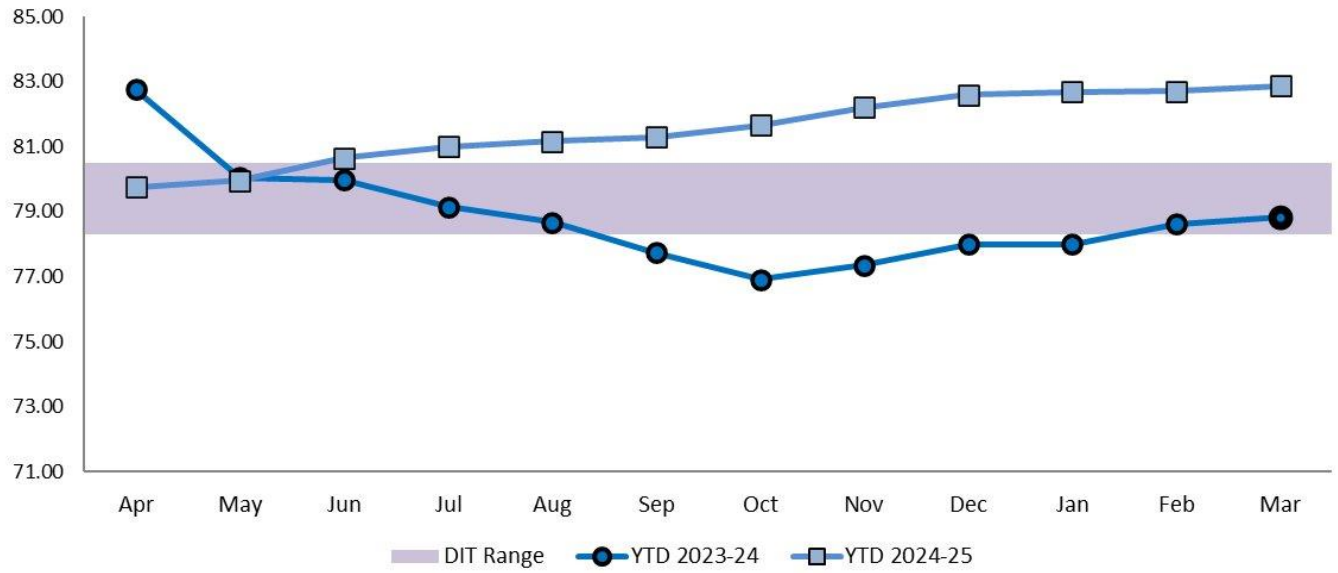


*Figure 4: Our dCEM performance scores over the last 2 years (score out of 100. DIT (Delivery Improvement Target) represents the target range for the dCEM score.)*

Whether it is a single house or a larger housing developer, the purpose of the dCEM is to inform and drive improvements in all developers' service experience, both with regards to the service they receive and how Scottish Water resolves any issues with services. dCEM includes both Household and non-Household measures with qualitative and quantitative elements. The figure below shows the year-to-date dCEM performance for the current and previous year.

Our Development Services team organises an annual Development Forum event to build relationships and understand how we can further support the development community. The feedback from the Forum in 2025 was extremely positive.

We have a good relationship with Homes for Scotland (HFS) who represent 200 member organisations across the development community. We recently collaborated with HFS by sponsoring a Small Medium Enterprise SME report[7]. The report was largely positive but indicated some areas of improvement which we are taking forward.

Furthermore, last year we requested that Trinity McQueen complete a pilot survey with our managed Developer Customers. The objective of the survey was to provide a measurement from our managed Developer Customers on how easy we are to work with and overall satisfaction with

[7] Scotland's SME Home Builders 2024: Data Review and Industry Insights

the Development Manager/Development Management team. The survey also gathered deeper insights into areas of service excellence as well as areas for development or focus. The results from the survey provided positive indicators that our Development Managers are meeting our Managed Development Customers' expectations, with positive themes around knowledge, responsiveness, collaboration and enablement reported.

## 3.2 Partnership Working

We continue to build on existing partnerships with local authorities and Developers to ensure these relationships stay strong even with changes of personnel. Also, we have been attending meetings with Water UK to maintain our relationship and to get a better understanding of what is happening in Development Planning in England and Wales.

We have been involved in the Edinburgh and Lothians, Metropolitan Glasgow, and Dundee Strategic Drainage Partnerships.

The National Planning Framework (NPF) is a long-term plan for Scotland. NPF sets out where national developments and infrastructure is needed to support sustainable and inclusive growth. The current version is National Planning Framework 4 (NPF4). We are heavily involved in the NPF4 in supporting the local authorities in the preparation of the documentation required for this process.

There is also opportunity for future collaborations with local authorities and Transport Scotland (and potentially other bodies) for strategic working partnerships particularly where there are City Deals.

# 4 Our Investments

## 4.1 Investment context and approach

The connection of new households requires the provision of strategic capacity. Where sufficient strategic capacity is already available then no additional investment is required. However, the available remaining capacity is decreased where new houses have been connected.

Where there is insufficient strategic capacity to support new connections, then investment to provide additional capacity is required.

### *4.1.1 Investment priorities*

Where available capacity in our network or at our treatment works is limited, and there is future development in the local development plan, investment into the restoration of the headroom will be prioritised based on several factors, including the scale, timing and confidence that development progresses as well as the service risk to existing customers.

Water assets investment priorities are where there is a risk to water quality or the supply of water to existing customers caused by the new growth. Waste water assets investment priorities are where the risk of new connections to the network lead to increased flows and loads at the treatment works present a risk to service or the environment.

Where we are unable to deliver a solution in the necessary timescale, we will manage the risk through operational interventions or deliver smaller temporary solutions for to ensure connections are enabled.

### *4.1.2 Just ahead of need*

The timescale of when investment into strategic capacity is required is dependent upon the development build out rates, i.e. the rate that new properties are completed and connected to the Scottish Water network. We strive to provide this strategic capacity “just ahead of need”.

### *4.1.3 Approach to identifying specific investment needs*

The current approach to growth investment planning begins with growth forecasting, using local authority plans and national population projections to develop forecasts. These forecasts are used to identify growth needs at water and waste water treatment works. Once a development is confirmed, we will initiate investigations to establish the actual remaining asset capacity, the headroom.

This includes flow and load studies, and process assessments to understand the operational baseline of the asset, any constraints, and potential requirements for investment.

Once the needs are identified, the process moves to options appraisal and investment prioritisation.

The proposed investments are set out across the four categories detailed below: Waste Water Growth, Water Growth, Infrastructure Investment, and Service Relocations.

## 4.2 Our existing policies

We introduced Management Approaches (MAs) for SR21, to set out the policies of how and where we will intervene to manage particular assets. There are four key management approaches (see the *Investment Planning Technical Appendix* for further details) that directly inform our efforts to Enable Growth. These are:

- **Enabling Development – Wastewater Growth Management Approach (MA026)** sets out the provision of waste water treatment capacity to meet local, strategic and commercial growth requirements where the risk of additional connections to the network and the subsequent increased flows and loads at the treatment works would present a risk to service or the environment due to the future development demand.
- **Water Resilience and Growth Management Approach (MA087)** - sets out how resilient our water supply systems are, assessed against a defined list of hazards, and how we prioritise the appraisal of options to improve resilience. The growth element is part of the Water Resources assessment, and the risks are assessed through the Supply Demand Balance model (SDB) using growth model data. The Tankering Strategy (Use of Tankers to Provide Continuity of Water Supplies) is included within this policy and sets out where potable water tankering is considered as an alternative to investment in WTW upgrades. (Enhancement elements of this Management Approach are set out within the Water Continuity Technical Appendix.)
- **Enable Economic Growth - Infrastructure Investment Management Approach (MA032)** sets out the investment approach to new infrastructure and outlines the funding responsibility between developers, customers, and Scottish Water. This is based on the Principles of Charging for Water and Sewage Services 2021-27.
- **Comply with Legislative Requirements – Service Relocations Management Approach (MA065)** sets out the statutory requirement to contribute towards the relocation and integration of assets, such as water pipes and sewers, associated with large infrastructure schemes.

## 4.3 Outcomes

The outcomes for Enabling Growth are:

- **Level of Service Water Growth** - Part 4 capacity, for all new domestic properties connecting to our water system, and the domestic element of commercial properties connecting to our water system, shall be provided.
- **Level of Service Waste Water Growth** - Part 4 capacity, for all new domestic properties and the domestic element of commercial properties connecting to our waste water system, shall be provided.
- **Level of Service Customer** - We strive to connect our customers “just ahead of need” to enable their developments.
- **Investment Areas** – Waste Water Growth, Water Growth, Infrastructure Investment, and Service Relocations

### *4.3.1 Customer benefits*

We aim to meet the expectations of new customers while minimising the risk of impact to existing customers. The main benefit to our customers, in this case the developer community, is that they can connect all new housing developments to water and waste water services on time and *just ahead of need*. To enable this, we will ensure that there is the sufficient capacity and capability of strategic and local water and waste water assets for the new developments when they need it.

### *4.3.2 Performance*

We will measure how well we are serving our customers in this area through the Developer CEM (dCEM), which focusses on those customers requiring a water and/or waste water connection.

Through targeted measures and analysis of the data behind them, we are better able to understand customers, where points are being lost and where there is a need to drive to resolve and reduce points lost to provide a better experience. The dCEM score is calculated monthly out of a score starting from 100, with deductions made from several elements (e.g. formal complaints, service issue contacts, upheld regulatory complaints). Points cannot be regained, but proactive approaches and timely repairs can prevent future losses. The forecast for this measure is below.

| WICS ref | Short title | Base year | Unit | Description of base | End of SR27 | End of SR33 | End of SR39 | End of SR45 |
|---|---|---|---|---|---|---|---|---|
| **1.01** | dCEM | 81.8 | Score (1 to 100) | 3-year average to 2026/27 | 83.04 | 84.06 | 85.01 | 85.91 |

*Table 3: dCEM projections through till the end of SR45*

## 4.4 Optioneering

### *4.4.1 Scottish Water's investment options*

When considering the level of investment that we require for development work in SR27, we have worked through several investment planning scenario options. These are essential for aligning strategic, financial, and ministerial objectives with our vision for the water sector and our LTS.

Recognising the potential demands on our customers and the overall ambition of the Scottish Government, we developed a series of top-down investment scenarios to impose constraints on the bottom-up first-pass demand needs. The effect of these constraints was to require certain investments to be reduced or eliminated.

The three constrained investment scenarios discussed in this section are as follows:

- **High Scenario:** our initial estimates of what would be required to meet Ministerial Objectives and make good progress against our Long-Term Strategy.

  This investment, with a CPI +6.5% per annum, maintains the service levels achieved at the exit of SR21, meets with a reduced risk of non-compliance.
- **Working Reference Scenario:** a mid-range scenario above the previous SR21 Final Determination but lower than the High Scenario.

  At CPI +4% per annum, this investment allows maintenance of the service levels achieved at the exit of SR21.
- **Flat Charges Scenario:** that considered available investment and progress if customer charges were limited to inflationary-only increases on an annual basis.

  The reduction in investment under this "flat charge" scenario, with a CPI +0% per annum, would trigger reduced service levels compared to exit of SR21, with notable overall service impacts as measured by OPA and CEM.

### *4.4.2 Enabling Growth Investment Options*

The above investment scenarios are broken down into levels of investment in the specific demand areas. Within the Enabling Growth area, High Scenario includes the investment required to provide the capacity for all new domestic property connections, a range of WWTW and WTW enhancements and development, and investment allocated to anticipated emerging demand.

The outcome of this Investment Area is to deliver strategic capacity, and an initial assessment of these scenarios is set out below.

*Table 4: Testing the scenarios against ministerial objectives*

| **Ministerial Objective / Investment** | **High Scenario CPI + 6.5% (£9.5bn)** | **Working Reference Scenario CPI + 4% (£8.5bn)** | **Flat Charges Scenario CPI + 0% (£7.0bn)** |
|---|---|---|---|
| **Supporting Sustainable Economic Growth** | Provide strategic capacity to enable all new domestic property connections, at reduced risk (risk that growth exceeds the available headroom at water or waste water treatment works so that assets are then at risk of breaching licence conditions.)<br><br>- 100% WWTW confirmed need from SR21, for delivery in SR27,<br>- 3 WTW (Tiree, Kenmore & Balmichael),<br>- Seafield WWTW development, and<br>- Emerging, but as yet unconfirmed, demand, as indicated by our long-term modelling. | Provide strategic capacity to enable all new domestic property connections, with increased risk (that growth exceeds available headroom)<br><br>- 100% WWTW confirmed need from SR21, for delivery in SR27,<br>- 3 WTW (Tiree, Kenmore & Balmichael),<br>- Seafield WWTW development, and<br>- Higher compliance risk at 14 WWTW. | Reduced ability to provide strategic capacity to enable all new domestic property connections.<br><br>- 50% of WWTW confirmed need from SR21, for delivery in SR27, being delivered,<br>- 2 WTW (Tiree & Kenmore),<br>- No investment in Seafield WWTW development,<br>- High compliance risk at 34 WWTW. |
| **Scenario Investment for Enabling Growth** | **£650m** | **£611m** | **£475m** |

## 4.5 Proposed investment

The investment scenarios were tested against various performance metrics and compliance requirements to validate the scenarios' robustness to understand how they align with Ministerial Objectives, customers' and stakeholders' expectations, long-term strategy for the water sector, climate change adaptation plan, SW Board aspirations for 2033 and risk appetite. Based on the testing outcomes, we progressed with the Working Reference Scenario as the basis for our final recommendation.

**Our final chosen option is the Reference Scenario, a matured and refined version of the Working Reference.**

We did this across all investment areas by:

- Refining the available budget associated with a CPI+4% pa customer charge profile, re-running the Financial Model using the latest modelling assumptions and the application of the most up to date top-down global efficiency factors to be applied.
- We incorporated feedback from sector stakeholders, clarification of Regulator requirements, customer research feedback and further considering the requirements of the draft Ministerial Objectives. Decisions were required to navigate these limitations while ensuring a balanced investment plan.
- Several strategic options were considered to manage budgetary constraints and investment reallocation. These included potential further removal of demand in the asset repair, refurbishment, and replacement (AR3) programme areas or reduce outcomes where there is service choice. As a result, there were upwards adjustments in some areas, and downwards adjustments in others.

The **Reference Scenario** allows us to continue to meet the needs of our Customers and Developers, by providing the required strategic capacity just ahead of need, enabling all new connections. However, overall investment into our network will be reduced so there will be a likely impact on overall resilience and an increased risk of non-compliance in certain areas.

Details of the Enabling Growth breakdown for this investment scenario are set out below.

*Table 5: Overview of recommended investment (23/24 price base, post-efficiency)*

| Investment Category | Investment Hierarchy | Programme | Investment value (£m, 23/24) |
|---|---|---|---|
| **Wastewater Growth MA026** | Category 2 / Category 3 – Meet current regulatory & community commitments, and provide a service for new customers | Provision of Part 4 capacity to meet strategic & local growth requirements | £391m |
| **Water Growth MA087** | Category 3 – Provide a service for new customers | Provide capacity to meet new demand | £45m |

| | | | |
|---|---|---|---|
| **Infrastructure Investment MA032** | Category 2 – Meet current regulatory & community commitments | Provision of strategic capacity in our networks to meet new demand | £120m |
| **Service Relocations MA065** | Category 2 – Meet current regulatory & community commitments | Comply with legislative requirements – Water & Waste Water | £37m |
| **Total Enabling Growth Investment** | | | **£593m** |

The Water and Waste Water Growth programmes are rolling programmes where delivery of confirmed need spans the investment periods SR21, SR27 and beyond. These investment programmes are dynamic by nature where the projects are prioritised on an ongoing basis. This is due to the uncertainty associated with future development plans, as well as delivery and investment constraints. Continuous prioritisation of the current programme is also required as the timing and size of a development has a variable impact on a particular waste water treatment works dependent upon the current operational capability and headroom availability.

This Technical Appendix covers Water and Waste Water Growth only and therefore asset maintenance is not included. However, there will always be economic benefit to deliver multiple drivers together and this will be pursued wherever possible along with appropriate allocation of cost. The operational baseline[8] will be established during the Growth Investigation stage to understand the impact of the future growth.

[8] Operational baseline – the actual capacity and capability of an asset in normal operation, i.e. flow volumes, biological loadings etc

### *4.5.1 Waste Water Growth*

## Introduction

Growth is one of the principal drivers of investment when assessing future needs of waste water treatment works. Through our waste water growth investment planning process, we identify where forecast growth exceeds the available headroom at a waste water treatment works and the asset is at risk of breaching current license conditions (flow and final effluent quality).

Within scope here are investments in the waste water treatment asset base (WWTW), (currently capable assets), that become incapable due to future growth.

Out of scope are existing service issues, quality enhancements, or climate change, these are covered in as AR3 and Enhancement investments in the *Water Environment*, *Managing Quantity of Flows*, and *Climate Change Adaptation* technical appendices.

## SR27 Waste Water Growth Investment

In the current investment programme, there are 55 of our 1,852 waste water treatment works (WWTW) where the need has been confirmed for the provision of additional strategic capacity. These confirmed needs will be delivered during the SR27 investment programme. At these sites, it was determined that further connections to the network and the subsequent increased flows and loads at the treatment works could present a risk to service or the environment due to confirmed development demand. In addition, we expect there to be a further 50 WWTWs at risk due to projected future development demand which we will investigate to understand how any expected population growth will impact existing waste water treatment works.

This equates to the potential SR27 investment demand for the waste water strategic capacity of £391m which will deliver 180,000 population equivalent (PE) outputs[9]. The breakdown of this investment is detailed in the table below:

*Table 6: Waste Water Growth SR27 Investment details (23/24 price base, post-efficiency)*

| Investment Category | Investment Hierarchy | Programme | Description | Investment value (£m, 23/24) |
|---|---|---|---|---|
| **Waste Water Growth** | Category 2 – Meet current regulatory & community commitments | Provision of Part 4 capacity to meet strategic growth requirements | North Berwick, and Bertha Park (Perth), East Stirlingshire | £135m |
| **MA026** | Category 3 – Provide a service for new customers | Provision of Part 4 capacity to meet local growth requirements | Confirmed development in catchments which require investment | £256m |
| **Total Waste Water Growth Investment** | | | | **£391m** |

[9] This is the number of the outputs in PE (population equivalent) associated with the growth projects which achieve Gate 100 during SR27. This is different from the connections enabled.

When development occurs in a catchment, it may be necessary to accelerate refurbishment or replacement cycles to support growth requirements, we expect this investment to be ~£30m.[10]

Alternative lower investment was considered, but that would have rendered us unable to invest in the waste water assets where compliance risk was compromised due to limited remaining strategic capacity. This would also impact our customer expectations around the timing of the provision of new strategic capacity, resulting in customer complaints. Furthermore, it would also increase the risk of service failures, with the associated increase in expensive reactive operational activity.

### *4.5.2 Water Growth*

## Introduction

This area of investment covers the improvement and expansion of strategic water treatment and catchment capacity, and capability deemed necessary through the growth of communities.

Within this same Management Approach, there is investment allocated as Enhancement, to improve resilience of water supply systems to enable them to provide continuous water supplies. This is not due to new demand, so is not considered part of Enabling Growth and is further covered as part of the broader *Water Continuity Technical Appendix*.

In total, out of scope are existing service issues, quality enhancements, or climate change, these are covered in as AR3 and Enhancement investments in the *Water Continuity and Climate Adaptation* technical appendices.

## SR27 Water Growth Investment

The Water Growth programme for SR27 is set out in the table below. Planned investment in SR27 is reflective of identified constrained assets where there is sufficient confidence in the forecast growth in water demand. Sustainability of demand-side intervention solutions at these assets would be inadequate and not investing in a supply-side solution would result in continued interruptions to supply (ITS) events. Details our SR27 investments are set out below.

*Table 7: Water Growth SR27 Investment details*

| Investment Category | Investment Hierarchy | Programme | Description | Investment value (£m, 23/24) |
|---|---|---|---|---|
| **Water Growth MA087** | Category 3 – Provide a service for new customers | Provide capacity to meet new demand | Increase the availability of water to meet strategic growth requirements - Water | £45m |
| **Total Water Growth Investment** | | | | **£45m** |

The following projects are included within this investment category and phased delivery of these schemes will ensure that funding is sufficient.

[10] This investment (~£30m) into accelerated capital maintenance is driven by Waste water Growth, and is included in MA026, but is categorised as AR3 investment and it will be covered in the Waste water Technical Appendices.

*Table 8: Specific project details within Water Growth*

| Project Name | Scope Description |
|---|---|
| **Taymouth Growth** | Supply new demand though infrastructure connection and WTW/Water Resource upgrades to Kenmore WTWs. |
| **Balmichael Resilience** | The resilience of Balmichael WTW is currently determined by its lack of yield, restrictions within the treatment process, and lack of storage available – all of these could result in an ITS event. The scope of work is to provide a resilient water supply to the 3,989 customers on Arran and provide capacity for future growth. |
| **Tiree Resilience** | The resilience of Tiree WTW is currently determined by its lack of yield and no strategic connectivity due to its location. There are also constraints at the WTW, which could result in supply issues. The scope of work is to provide a resilient water supply to the 870 customers on Tiree. |

### *4.5.3 Infrastructure Investment*

## Introduction

The investment within this programme area is associated with increasing the capacity of existing network assets for water and waste water network infrastructure, directly associated with new development where it is not readily attributable to a (single) particular developer.

New water and waste water connections are subject to an 'infrastructure charge' and Scottish Water reallocate revenues from these charges to pay for enhancements to our existing network assets. These are limited to "Enhancing Existing Network Assets" and are financed by all developers through infrastructure charges with the enhancements delivered by Scottish Water or by developers.

Excluded from this investment is the resolution of existing service issues; repair or refurbishment activities associated with existing water and waste water infrastructure and flooding however, opportunities will be sought for efficient delivery of multiple drivers.

## SR27 Infrastructure Investment

The estimated SR27 Infrastructure Charge income for a forecast of 120,000 connections would generate funding of ~£120m for reinvestment in the provision of Part 3 capacity associated with new development. This income is directly affected by the number of connection charges paid and would therefore reduce should the number of connections be less than forecast.

During SR27 Scottish Water will continue to produce strategic network impact assessments to understand where impacts due to new development connecting to our water and waste water networks. Work will continue to create new, and update existing, strategic network impact assessments as new local development plans are released by the 32 local authorities in Scotland. The outputs from these assessments are used to inform our investment plans for upsizing existing infrastructure where confirmed new development will create an impact e.g. waste water flooding

or low pressure on the water network. This investment programme is prioritised on the future development build out rates. Details our SR27 investments are set out below.

*Table 9: Infrastructure Investment SR27 Investment details (23/24 price base, post-efficiency, values have been rounded so do not sum up to the total)*

| Investment Category | Investment Hierarchy | Programme | Description | Investment value (£m, 23/24) |
|---|---|---|---|---|
| **Infrastructure Investment**<br><br>**MA032** | Category 2 – Meet current regulatory & community commitments | Provision of strategic capacity in our networks to meet new demand | Reinvestment of the receipts from the Infrastructure Charge to create or restore capacity in the general network | £67m |
| | | Enable economic growth - Water | | £54m |
| **Total Infrastructure Investment** | | | | **£120m** |

## *4.5.4 Service Relocations*

### Introduction

We have legal obligations to provide investment contributions for New Road and Street Works Act (NRSWA) diversions as required by the NRSWA Diversions Code of Practice. The SR27 investment will ensure that we can facilitate, and support transportation schemes promoted by Transport Scotland, Bear Scotland, 32 Local Councils and Network Rail where our assets conflict with the scheme proposals.

The boundary of this investment is limited to resolving asset conflicts by diversion or asset protection measures. Out of scope is the funding of increasing capacity or resolving existing asset issues. We have based our required SR27 investment on previous investment run-rates and investment profiles, and by providing estimates for the future investment period.

### SR27 Service Relocations Investment

The investment forecast for Service Relocations is higher than Scottish Waters' liability as 82% of the cost is recoverable from the clients under the Highway Authorities and Utilities Committee (HAUC (UK) 7) Code of Practice. This figure is based upon a run rate from previous investment periods albeit this figure has reduced as there is evidence that the run rate is decreasing. Details our SR27 investments are set out below.

*Table 10: Service Relocations SR27 Investment details (23/24 price base, post-efficiency)*

| Investment Category | Investment Hierarchy | Programme | Description | Investment value (£m, 23/24) |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| **Service Relocations**<br><br>**MA065** | Category 2 – Meet current regulatory & community commitments | Comply with legislative requirements - Waste | Scottish Water's statutory contribution towards the relocation and integration of Scottish Water assets associated with large infrastructure schemes | £13m |
| | | Comply with legislative requirements - Water | | £24m |
| **Total Service Relocations Investment** | | | | **£37m** |

## 4.6 Investment that spans SR21 and SR27

The funding for this investment area comes from existing customers. It is a regulatory requirement set out in the Ministerial Directions to deliver Strategic Capacity - Part 4 capacity, for all new domestic properties and the domestic element of commercial properties connecting to our waste water system, shall be provided.

For Waste Water Growth, the 2021-27 investment allowances are £248.1m (IPS 24.2) and we are recommending that £391m will be required to provide strategic capacity during the 2027-33 period.

This scale of investment is anticipated due to the continued increase in the migration of people into Scotland, continued housing development in areas where there is no available headroom at the waste water treatment works as well as ageing assets.

## 4.7 SR27 knowledge and capability gaps

We recently commissioned and completed a review of our processes for development of growth forecasts, identification of investment, and prioritisation of the programme. Included in the review was a comparison of our growth forecasting processes against the existing frameworks used across the water sector, including the approaches taken by a range of companies in England and Wales. Through this exercise we have been able to identify specific examples of good practice.

We were able to identify several challenges and subsequently have identified the required improvements to our processes. The improvement areas identified were around our growth forecasting, prioritisation of projects, cost allocations, and more realistic costs estimating.

A range of improvements across the process were identified, which could support Scottish Water in its decision-making process, better manage the uncertainty inherent in development forecasts and streamline the process going forward. Implementation of these improvements has started and will continue through SR27.

## 4.8 Future investment requirements

The following two projects are included within MA087, but are currently not in scope for our SR27 Working Reference Scenario, as they are only in early development;

- **Dundee Resilience and Growth**
  - Latest Best Estimate (LBE) of £19.7m
  - To increase capacity at the Lintrathen WTW and/or the wider Dundee area investigating interconnectivity potential.
- **Edinburgh Lothians Castle Moffat Hopes Resilience and Growth**
  - LBE of £99.8m
  - Providing for long-term growth and water resource climate change adaptation.

For both projects, early development work will continue with future delivery planned thereafter.

# 5 Interdependencies

This document should be read in conjunction with our Long-Term Strategy, overall Draft Business Plan, Data Tables and Commentary, and the following Technical Appendices:

- Key investment areas
    - Water Continuity
    - Managing Quantity of Flows

- Confidence in investment decisions
    - Investment Planning

- Confidence in the plan
    - Supply Chain
    - Customer Research
    - Risk
    - Monitoring

# 6 Conclusion

Our Reference Scenario has been selected, and the specific investments within it, to ensure that we can meet our ministerial objectives, customers, and stakeholders' expectations, our LTS, climate change adaptation plan, and Scottish Water Board aspirations for 2033 and risk appetite.

The Reference Scenario will require £593m (23/24 price base, post-efficiency) of investment across our water and waste water assets to enable growth, by ensuring the provision of the necessary strategic capacity to allow all connections by ensuring on-time, as-needed effective connections for all new housing developments (and domestic water usage in non-household settings).

For the population of the Data Tables and for the Business Plan submission, we will present our Reference Scenario (CPI+4%), along with Alternative Scenarios at CPI+5% and CPI+3%.

# Annex: supplementary information

### Component parts of new connections and capacity

The four components of the network, Parts 1-4, provide the new connections and capacity. Responsibility and payment for these is split between us and the relevant developer, as described below:

*Table 11: Description of the component parts of new connections and capacity*

| Component | Description | Cost / Delivery Responsibility |
|---|---|---|
| **Part 1** | The connection from individual premises to a water main or sewer | Developer responsible for costs |
| **Part 2** | The water mains and sewers that connect developments (for example, a street of houses) to trunk mains and trunk sewers and some sustainable urban drainage systems (SUDS) | Any required extensions or upgrades to Part 2 or 3 elements are funded by the developer, with a contribution towards the cost of the works from Scottish Water to take account of the future income that will be received from the new connection |
| **Part 3** | The local bulk infrastructure, such as trunk mains and trunk sewers, water service reservoirs, wastewater pumping systems and some SUDS | |
| **Part 4** | the strategic assets such as raw water intakes, water impounding reservoirs, water pumping stations and aqueducts, and water and wastewater treatment works. | The cost and programming of any work associated with upgrading the Part 4 elements of the network are the responsibility of Scottish Water |

# Climate Change Adaptation
## Technical Appendix 006

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# 1 Executive summary

Scottish Water has statutory duties under the Climate Change (Scotland) Act 2009 to support the government's climate change plan to deliver net zero, and Scotland's National Adaptation Plan, reflected in SR7 and SR27 Ministerial Objectives. This Technical Appendix focuses on adapting our assets and services to address the impacts of climate change.

Climate change is an existential threat to the wellbeing of nature, society and our future prosperity. The climate emergency[1] is exacerbating the nature crisis[2] and will significantly impact the ability of the water environment to provide the resources we rely on. Changes in weather patterns and the increased risks of extreme rainfall or drought events will impact all core services by:

- Disrupting the ability of our natural environment to provide sufficient good quality water for us to treat and supply to customers;
- Exceeding the capacity of urban and rural landscapes, the environment and our drainage systems, to deal with excess rainfall without flooding customers or assets;
- Impacting the ability of waste water systems and treatment processes to cope with increasingly frequent and extreme weather, driven by climate change, and still protect the environment; and
- Challenging our people and supply chains to sustain or recover services and infrastructure, disrupted by more frequent and extreme events.

Our proposed climate change investment in the SR27 period allows us to meet relevant statutory obligations and the Ministerial Objectives (*Table 1*).

*Table 1: Ministerial Objectives relevant to Climate Change*

| **Climate Change Related Ministerial Objectives** | |
|---|---|
| **Climate Change Adaptation** | Identify the expected impacts of climate change on its assets and assess the risk and likelihood; |
| | Continue to implement and evolve plans for adaption measures necessary to protect its services; |
| | Work with customers and the wider industry to support and measures that reduce water use in homes and businesses and help ensure that only appropriate items are flushed down the toilet or put down the sink |
| **Climate Change Mitigation** | Make substantive progress in the 2027-33 period towards climate change targets, and ensure it is on an appropriate trajectory to meet or exceed those targets. |

Our approach, set in our Climate Change Adaptation Plan[3] is to plan for 2 degrees of warming by 2050 and prepare for 4 degrees by the 2080s, reflecting guidance from the UK Climate Change Committee[4].

[1] https://netzeronation.scot/about/campaigns/climate-emergency
[2] Tackling the nature emergency - gov.scot
[3] Climate Change Adaptation - Scottish Water
[4] Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf

We have done this by:

- Assessing 2 and 4 degree climate change pathways to the 2080s using the UK Met Office Climate Projections (UKCP18)[5].
- Applying these pathways to undertake a Climate Change Risk Assessment (CCRA) across our assets and services focused on two types of risk:
    - Increasingly frequent and extreme weather, such as storm events with acute service impacts that directly disrupt service; and
    - Chronic longer-term impacts where the changing climate erodes the quality and capacity of natural systems (such as water resources) and infrastructure (for example hydraulic capacity).

In 2024, we published our Climate Change Adaptation Plan[6] which sets out in detail the outcome of our CCRA, the implications for service and adaptation responses we will make. Our CCRA informed our SR27 Plan and explains the key risks to service under the 2- and 4-degree pathways and our adaptation approach through Operational Resilience, Asset Resilience and Service Transformation.

In SR27 (and subsequent periods) we will undertake further CCRAs, updated with the latest climate projections, pathways and tools. We will use this to understand how risk is changing and the effectiveness of adaptation actions and embed this within our asset management and service investment planning approaches. The updated CCRA will inform a refresh of our Climate Change Adaptation Plan that will ensure we are responding to the information the CCRA is telling us. In turn this will support our Long-Term Strategy focussed on our key long-term outcomes over the next 25 years. Actions will be promoted in future investment plans (including the development of SR33), to deliver the climate resilience expectations of Scottish Ministers[7] and the Water Sector Vision[8] shared across stakeholders, to work together to adapt to climate change:

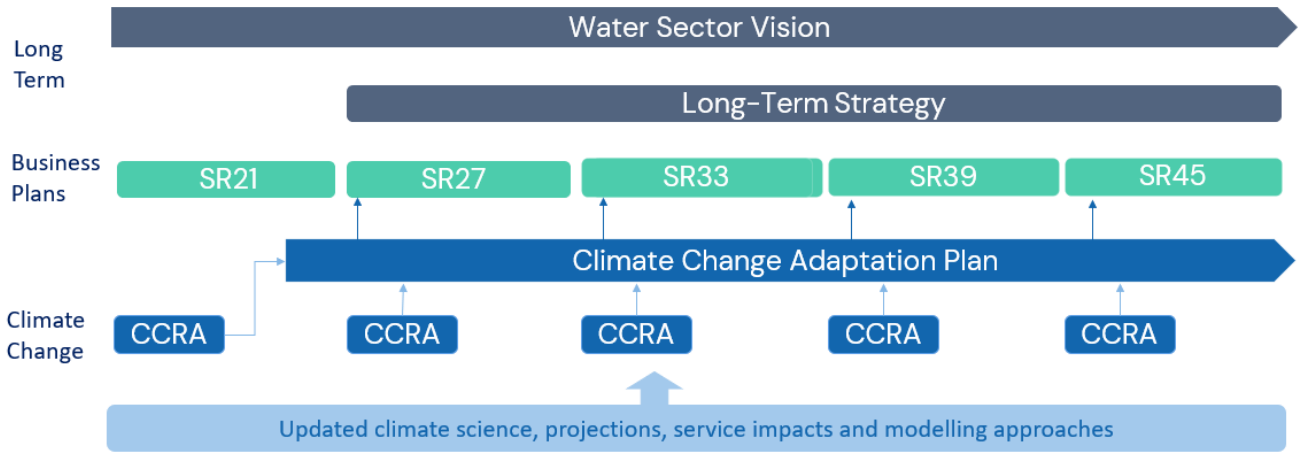


*Figure 1: Alignment of Climate Change Risk Assessments, Business Planning and Long-Term Strategy.*

[5] UK Climate Projections (UKCP) - Met Office
[6] Climate Change Adaptation - Scottish Water
[7] Draft Ministerial Objectives 2027-33
[8] Water Sector Vision - Scottish Water

## 1.1 Our SR27 Investments

Our SR27 plans are directly informed by the Ministerial Objectives to identify and assess the climate risks, continue to implement and evolve plans for adaptation, and to work with customers and industry to reduce water use. We will do this through Operational Resilience, Asset Resilience and Service Transformation. All investment is summarised in Table 2.

***Operational Resilience***

Operational Resilience focuses on sustaining or recovering services and assets during increasingly frequent and extreme weather, driven by climate change. In SR27, we will:

- Invest £30.9m in additional standby generators to provide resilience to water supply assets, from power outages; and
- Continue to respond to weather events to maintain customer service, through our Emergency Planning, Incident Response and Drought Plan procedures.

***Asset resilience***

Asset Resilience focuses on how we make our infrastructure more resilient to climate change. In SR27, we will:

- Deliver climate related adaptation in Water Continuity. Supply Demand Balance investment is projected to require £239.7m, of which climate change adaptation drivers are estimated to contribute £95.9m;
- Deliver climate related adaptation in Customer Flooding. Customer Flooding is projected to require £358.6m, of which climate change adaptation drivers are estimated to contribute £44.6m;
- Invest £7m to further develop our understanding of the impact of climate change on the quality of our raw water sources;
- Invest £4.7m in studies to better understand the resilience of our waste water treatment works to climate change risks; and
- Invest £1.9m to refresh the CCRA and develop further tools to inform future investment.

We will embed the climate projections and models arising from our risk assessment work within our asset management framework at all levels. Management Approaches that set asset policies and choices need to reflect climate risks and responses across service areas, System Plans need to consider long term climate risks, needs, interdependencies and plan interventions at the right time, and Project Investment Appraisal must ensure climate change informs the delivery of resilient options.

***Service Transformation***

Service Transformation recognises that we cannot simply rely on building our way out of climate change but will need to do things differently to secure resilience. It focuses on new ways of working, managing our catchments and working with others to ensure resilient services in a changing climate. In SR27, we will:

- Invest £61.4m in drainage partnerships to collaborate with local authorities, efficiently delivering blue-green infrastructure to reduce high priority surface water flood risk, with £30.7m attributable to a need to adapt to climate change.
- Invest up to £6.5m in multi-disciplinary partnerships to transform three pioneer catchments to become more resilient to climate change, reducing risk of deteriorating raw water quality and asset and customer flooding.

- Invest to restore peatland in our own and third-party catchments to reverse the deterioration of water quality due to climate change and to retain more water in our catchments for drought/flooding resilience; and
- Invest £8.4m in consumer campaigns on the value of water, and importance of only flushing down appropriate items in the toilet or sink to improve waste water network resilience.

Further risks were identified for some service areas, but with too much uncertainty to include in SR27 investment demand. These will be further refined as needs and projects are developed. Instead, these are identified as “retained risks” and are reported in the Risk and Assurance Appendix. If these risks are realised as the programme is developed and climate change considered at project level, they will be considered through the Investment Planning and Prioritisation Framework.

The outcome from this investment is expected to support delivery of Scottish Water’s Climate Change Adaptation plan and meet the Ministerial Objectives, contributing to Scotland’s long-term resilience.

*Table 2: SR27 Climate Change Adaptation Investment Summary*

| Investment Category | Total SR27 Investment (£m) | Investment attributed to Climate Change Adaptation (£m) |
|---|---|---|
| **SR27 Investments** | | |
| **Standby Generators** | 30.9 | 30.9 |
| **Supply Demand Balance** | 239.7 | 95.9 |
| **Managing Sewer Flood Risk** | 297.2 | 44.6 |
| **Climate Change Risk Assessment** | 1.9 | 1.9 |
| **Waste water Treatment Studies** | 48.3 | 4.7 |
| **Research and Innovation** | 25.4 | 7.0 |
| **Pioneer Catchments** | 10.7 | 6.5 |
| **Drainage Partnerships** | 61.4 | 30.7 |
| **Customer Campaigns** | 8.4 | 8.4* |
| **Totals** | | **230.5** |
| **SR27 – Retained investment risks** | | |
| **AR3** | 4,676.4 | 11.7 |
| **Water Environment** | 625.3 | 46.9 |
| **Water Quality** | 716.0 | 53.7 |
| **Enabling Growth** | 66.5 | 1.3 |
| **Totals** | | **113.6** |

*Links specifically to the Ministerial Objective to reduce water demand and prevent sewer abuse

# 2 Background

## 2.1 Global Climate Change

The climate threat is accelerating and is an existential threat to the way we live today as we see more extreme climate events globally and locally. Climate change will have a varying impact, dependent on location and not all places will be impacted equally, or in the same way. Some parts of the world will be more vulnerable to drought and flooding, whilst high latitudes will see the greatest impacts from warming – for example, warming of polar regions leading to loss of ice at the poles and in glaciers. Current projections show that global sea levels will rise between 0.5-1 m by 2100[9], but there is a significant level of uncertainty on how impacts will manifest. Globally, this may mean extreme droughts, floods and loss of agricultural productivity around the world leading to major social and economic challenges. The implications of climate change reflected in weather patterns, and their impact on our environment means we need to understand the impacts in Scotland to inform our adaptation approach to a range of future uncertainties.

## 2.2 What will Climate Change mean for Scotland?

Scotland's climate is changing. Adaptation Scotland[10] provides a summary of data[11] published by the UK Met Office which tells us:

- **Scotland's temperatures have been getting warmer and will continue to do so:** Scotland's 10 warmest years on record have all occurred since 1997. The average temperature for the last decade (2014-2023) was 1.02°C warmer than the 1961-1990 average, and the warmest year on record was 2022.
- **Scotland's winters have been getting wetter and this will continue:** There has been an increase in rainfall over Scotland in the past few decades. The annual average rainfall in the last decade (2014-2023) was 10% wetter than the 1961-1990 average, with winters 29% wetter.
- **Sea levels have been rising and this will also continue:** Mean sea level around the UK has risen by ~18.5cm since the start of the 20th century, and the rate of sea level rise has increased over the last 30 years.

[9] Chapter 9: Ocean, Cryosphere and Sea Level Change | Climate Change 2021: The Physical Science Basis
[10] The Adaptation Scotland Programme is how the Scottish Government offer advice and support to the public sector, businesses, communities and households on how to take adaptation action.
[11] Climate change trends and projections - Adaptation Scotland

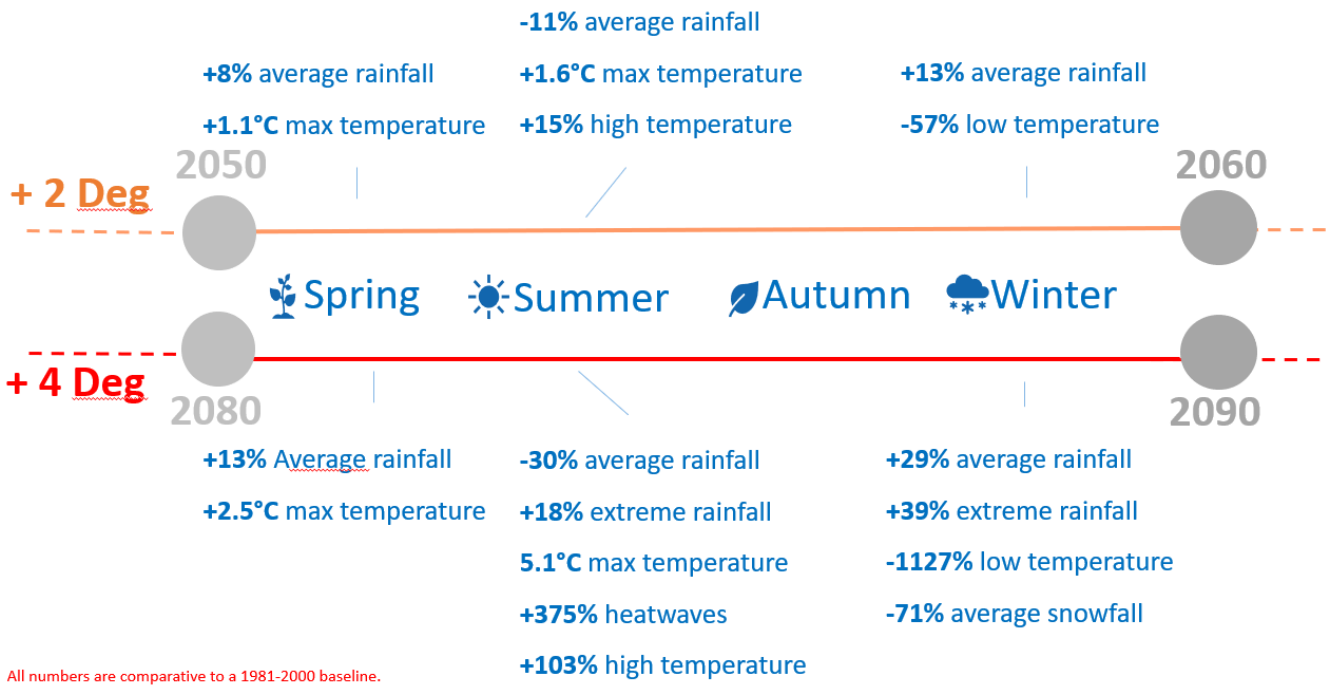


Figure 2), and we detail this in our Climate Change Adaptation Plan. The temperature on the hottest day may increase by 5 degrees C by 2080, whilst the average number of days per month above 25 degrees C may increase from <1 today to >4 per month in 2080. We may see the number of rainy days per summer month fall by a quarter – however, the intensity of summer storms (wettest day) may increase over 50% by 2080[12]. This will have a significant impact on our water resources and ability to drain and treat waste water.

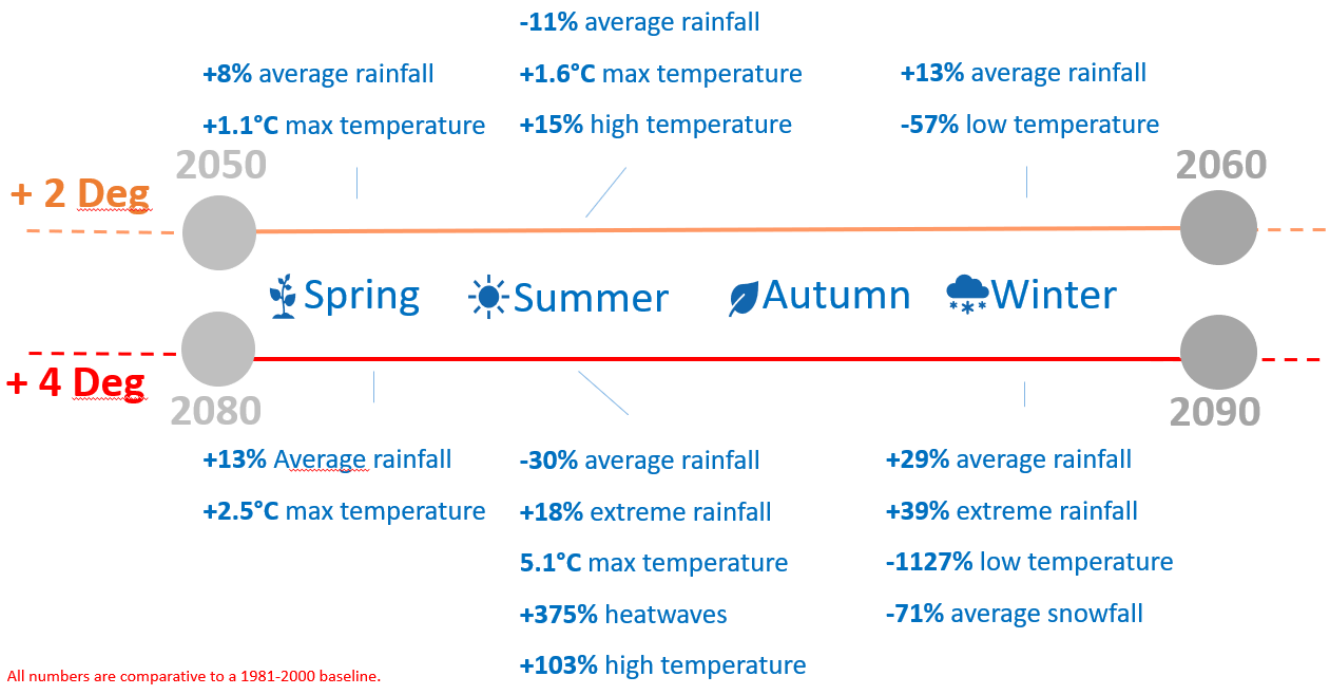


*Figure 2: Average rainfall and temperature changes across 2 and 4 degrees, derived from UKCP18 projections for RCP6.0 and RCP8.5[13]).*

## 2.3 Climate Change and Scottish Water

[12] Projection from UK Met Office using High Emission Pathway and historical weather extremes at this location.
[13] UK Climate Projections (UKCP) - Met Office

We depend on good quality, resilient water catchments for the services we provide: water resources of sufficient quality for treating and supplying to customers, the ability to drain rural and urban landscapes sustainably without flooding, and healthy waterways with sufficient capacity to assimilate waste water discharges. Climate change will drive a range of impacts in Scotland: warmer wetter winters, warmer drier summers and more frequent and extreme storm events throughout. It is the principal threat we face to:

- The ability of water catchments to provide services (good quality water resources, sustainably drained catchments, and healthy waterways);
- The resilience of our built assets; and
- Our ability to meet customers' expectations, today and in the future.

Many of our assets were built to cope with weather patterns from the 20th and early 21st century. These assets have lives that span from a few years (pumps, mechanical equipment), to several decades (treatment works), and even centuries (reservoirs, aqueducts and some pipelines). This means we need to consider long term climate change on different types of assets in different locations and this is set out in our Climate Change Adaptation Plan[14].

We are already seeing impacts. Most of the water resources we rely on are deteriorating in chemical and biological quality[15]. Extended dry periods across the country have led us to invoke our Drought Plans 53 times over the last 10 years, with additional pumping of water from other areas, working with customers to reduce demand or seeking to access other water sources being implemented. Scotland has experienced significant flooding in rural and urban areas. Major storms such as Desmond, Arwen and Babet have driven significant costs in protecting and restoring service. We rely on over 400 water resources, 229 water treatment works, over 1800 waste water works and over 100,000km of water and waste water pipelines across Scotland. Our assets will face different challenges in different parts of Scotland, meaning we need to understand how and where climate change will impact.

## 2.4 Legislation, Policy and Ministerial Objectives

Our approach to Climate Change Adaptation meets our obligations and duties under legislation, the outputs of the UK Climate Change Committee risks assessments, Scotland's 3rd National Adaptation Plan (SNAP3), and Scotland's National Performance Framework. Our approach is also aligned the WICS Final Methodology for SR27 and intended to meet the Draft Ministerial Objectives for SR27

### *2.4.1 Legislation*

Table 3 below sets out our regulatory and legislative duties and how they have informed our approach to climate change.

*Table 3: Scottish Water's legislative duties to adapt to Climate Change*

| Legislation | Duty | Meeting this duty in SR27 |
|---|---|---|
| Climate Change (Scotland) Act (2009) | • To support Scottish Government plans, | Our SR27 approach is aligned to support the achievement of the third |

[14] Climate Change Adaptation - Scottish Water
[15] Climate resilience strategies for upland drinking water sources (FREEDOM-BCCR) | UK Centre for Ecology & Hydrology

| Legislation | Duty | Meeting this duty in SR27 |
|---|---|---|
| | strategies and objectives for climate change.<br>• To report annually progress in delivering plans, strategies and objectives for climate change. | Scottish National Action Plan – and we will continue to contribute annual updates to support its Monitoring and Evaluation framework.<br><br>We will also continue to submit reports on climate change adaptation progress through our Public Bodies Climate Change Duties Reports. |
| Flood Risk Management Act (2009) | • To identify where Scottish Water considers that a flood is likely to originate from a sewerage system and estimate the volume of sewage which is likely to be released in the event of such a flood.<br>• To exercise flood risk related functions with a view to reducing overall flood risk. | In SR27 we will build on our understanding of flood risk from the sewerage system, through the inclusion of detailed climate change projections in our hydraulic models. |
| The Water (Scotland) Act 1980 | • To provide a supply of wholesome water to every part of its limits of supply. | In SR27, we will consider the future climate when designing solutions for problems that are experienced today for both water continuity and water quality. We will work with infrastructure providers to better understand and adapt to events that disrupt our ability to provide service. |
| Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR Regulations) | • To take all reasonable steps to secure efficient and sustainable water use.<br>• To take all reasonable steps to ensure that discharge [containing sewage] does not result in pollution of the water environment. | In SR27 we will promote water efficiency through our “Water is Always Worth Saving” campaign and will consider the future climate when designing solutions for problems that are experienced today in the water environment. |

| Legislation | Duty | Meeting this duty in SR27 |
|---|---|---|
| Sewerage (Scotland) Act 1968 | • To provide and maintain public sewers that can effectively drain surface water from the curtilage of properties under 'usual' rainfall events (currently interpreted to mean up to the 1:30 year rainfall event). | In SR27 we will apply climate change uplifts to rainfall data used to plan improvements to our waste water network. |

## *2.4.2 UK and Scottish Policy*

**UK Level Risk Assessments: UK Climate Change Committee (CCC)**

The CCC produces 5-yearly Climate Change Risk Assessments for the UK (UKCCRA), which include National Assessments for Scotland. The third risk assessment, UKCCRA3[16], was published in 2021 and highlighted that the risk of flooding to people, communities and buildings to be among the most severe risks for Scotland, and the costliest hazard to business. It further identified the impact climate change will continue to have on natural and marine environments with wide ranging negative health and social outcomes

In 2023, the CCC published an independent assessment of progress in adapting to climate change in Scotland[17]. This noted that policies, plans and progress towards a well-adapted water system (all aspects of water policy), were insufficient.

Scottish Water used the CCC advice and CCRA3 to inform its Management Approach for Climate Change. This set out that organisations should adopt clear pathways for climate change and approaches to risk assessment, that organisations should consider 2-4 degrees of warming through this century and focus on the key risks these present. For Scottish Water this means:

- "too little water" and the risk of increasing drought risk;
- "too much water" and rainfall intensity increasing flood risk; and
- combination of both impacting water and environmental quality
- increased risk of extreme weather events disrupting assets and services.

We set this out in detail in our 2024 Climate Change Adaptation Plan[18] and Chapter 4 in this document explains how we have used this to inform our SR27 approach.

The CCC is currently developing its 4th risk assessment (UKCCRA4). We have engaged with the process, made our latest risk assessment and Adaptation Plan available and are informing on specific water service-related risks in Scotland.

**Scotland's 3rd National Adaptation Plan**

[16] UK Climate Risk
[17] Adapting to climate change - Progress in Scotland - Climate Change Committee
[18] Climate Change Adaptation - Scottish Water

The 3rd Scottish National Adaptation Plan[19] (SNAP3), published in September 2024, is the Scottish Government's response to the CCC's independent risk assessments. It sets out how Scotland will address the risks posed by climate change up to 2029. SNAP3 sets out Scottish Governments strategic and policy expectations, which are focussed on 5 outcomes and 23 objectives (Figure 3).

| Five adaptation outcomes; 23 objectives | |
|---|---|
| **Nature Connects** | |
| Nature connects across our lands, settlements, coasts and seas. | |
| NC1: Nature-based solutions | NC2: Landscape scale solutions |
| NC3: Development planning | NC4: Nature networks |
| NC5: Marine, coastal and the blue economy | NC6: Natural carbon stores and sinks |
| **Communities** | |
| Communities are creating climate-resilient, healthy and equitable place. | |
| C1: Regional and place-based collaborations | C2: Locally-led adaptation |
| C3: Community resilience | C4: New and existing buildings |
| C5: Culture and historic environment | C6: Coastal communities |
| **Public Services & Infrastructure** | |
| Public services are collaborating in effective and inclusive adaptation action. | |
| PS1: Public body duties and capacity | PS2: Public service and infrastructure resilience |
| PS3: Scotland's water resources | PS4: Transport system |
| **Economy, Business & Industry** | |
| Economies and industries are adapting and realising opportunities in Scotland's Just Transition. | |
| B1: Business understanding of climate risk | B2: Support for farming, forestry, fishing and aquaculture sectors |
| B3: Innovation opportunities | B4: Economic development and supply chains |
| **International Action** | |
| Scotland's international role supports climate justice and enhanced global action. | |
| IA1: Supporting vulnerable communities globally | IA2: International Advocacy |
| IA3: Knowledge advocacy | |

*Figure 3: Outcomes and Objectives of the Third Scottish National Adaptation Plan, reproduced from the Scottish National Adaptation Plan[20].*

We engaged closely with Scottish Government in the production of SNAP3, which aligns with our Adaptation Plan. Our 2024 Climate Change Adaptation Plan, approach to service delivery and proposed adaptation activities in SR27, support key areas outlined in SNAP3, including:

- Scottish Water operational resilience;
- Drinking water supply during drought, maintaining drinking water quality and "Water is always Worth Saving" campaigns;
- Adapting the sewer network, preventing sewer and drain blockages, waste water treatment;
- Managing water asset flooding and coastal erosion;
- Promoting peatland restoration and landscape scale solutions;
- Prioritising partnership working with other public sector and infrastructure providers; and
- Annual reporting of progress.

[19] Climate change: Scottish National Adaptation Plan 2024-2029 - gov.scot
[20] Climate change: Scottish National Adaptation Plan 2024-2029 - gov.scot

SNAP3 also makes clear the mechanisms for delivery will be across multiple policy and planning frameworks, agencies and strategies, all working together to reduce risks posed by 2 or 4 degrees of climate change. We will work to ensure the challenges of climate change for water, waste water and drainage service resilience are reflected in these policy and planning levers.

### *2.4.3 Ministerial Objectives*

The Draft Ministerial Objectives relevant to adaptation set out that in SR27 Scottish Water must:

- Identify the expected impacts of climate change on its assets and assess the risk and likelihood;
- Continue to implement and evolve plans for adaption measures necessary to protect its services;
- Work with customers and the wider industry to support and measures that reduce water use in homes and businesses and help ensure that only appropriate items are flushed down the toilet or put down the sink.

To meet these, we will:

- Review and update our climate change risk assessment and adaptation plan to reflect the latest models, projections and climate impact intelligence;
- Implement activities identified in our climate change adaptation plan to address drought, waste water flooding and power resilience risks;
- Ensure climate risk is reflected in all elements of investment decision making to inform cost-effective investment in assets to support climate resilience;
- Work in partnership on three pioneer catchments to provide landscape scale adaptation measures;
- Continue our “Water is Always Worth Saving Campaign” to work with customers to increase the value placed on water; and
- Continue our Nature Calls campaign, to work with customers to bin wipes, sanitary products and kitchen waste and keep them out of our waste water network.

## 2.5 The Water Sector Vision, our Long-Term Strategy and our Climate Change Adaptation Plan

Adapting to climate change will be an ongoing challenge over multiple investment periods with good engagement and partnership across many stakeholders.

### *2.5.1 The Water Sector Vision*

The Vision[21] outlines that Scotland’s Water Sector will be admired for excellence, secure a sustainable future and inspire a Hydro Nation. All parts of the sector – Scottish Water, government, regulators, supply chains and others must contribute to “… transform how we work to live within our planet’s resources, work with the natural environment and maximise our contribution to Scotland achieving net zero emissions and adapting to climate change.” We cannot deliver adaptation alone and Scottish Water is committed to working in partnership towards a resilient service.

[21] Water Sector Vision - Scottish Water

## 2.5.2 Long-Term Strategy

Scottish Water's Long-Term Strategy (LTS)[22] highlights the climate crisis as one of the three main challenges to achieving our long-term outcomes. It is also directly relevant to each of the 3 strategic ambitions that drive Scottish Water – Service Excellence, Great Value and Financial Sustainability and Beyond Net Zero. It impacts our ability to serve, how we adapt (or fail to adapt) impacts cost and efficiency, and risks will grow if global emissions are not curbed.

Our Long-Term Strategy key approaches (aligned with the Vision) to address climate change are:

- **Collaborate and lead partnerships**: we cannot deliver adaptation alone - for climate change we need strong committed partnerships for drainage, landscape and catchment resilience, regional and local resilience and adaptation partnerships with communities.
- **Transform and drive efficiency:** embedding climate change into all our investment decision making processes, along with partnerships will support cost-effective pathways for adaptation.
- **Reduce demand on our services and assets:** the ability of nature to provide the services we need will deteriorate with climate change**.** Reducing consumption and leakage to support water resources deficit and to more sustainably draining stormwater will reduce risks from our systems.

## 2.5.3 Our Climate Change Adaptation Plan

Our 2024 Climate Change Adaptation Plan[23] that informs SR27 across all service areas is to:

- Plan for 2 degrees of warming by the 2050s;
- Prepare for 4 degrees of warming by the 2080s.

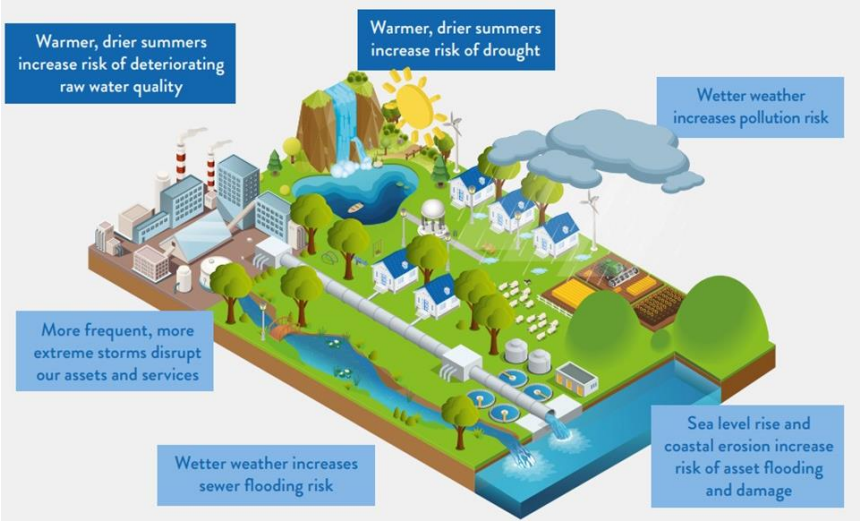


*Figure 4: Summary of climate change risks to service provision*

The plan details the risk assessment and approaches to managing these risks. Adaptation actions are classed under 3 strategic approaches:

- **Operational Resilience**: Increasingly frequent and extreme weather, driven by climate change, will lead to acute service impacts to customers – droughts, water quality incidents, flooding. Operational responses – tankering, standby power, clean ups and service recovery are vital, and operational resilience plans will take account of future climate change to support Service Excellence.

[22] Our Sustainable Future Together - Scottish Water
[23] Climate Change Adaptation - Scottish Water

- **Asset Resilience**: We will fully integrate climate change into our Sustainable Investment Decision Making processes to ensure our natural and built assets are resilient. This will support long term investment planning and operation of water and waste water systems to deliver service resilience.
- **Service Transformation**: We cannot just build our way out of climate change; we need to find new ways to ensure resilient services in a changing climate. We will need to work with customers, stakeholders and industry to reduce the amount of water we need to take from the environment, reducing our exposure to some of the impacts of climate change on water resources, water quality and urban drainage.

Some of the activities enabling us to adapt to the risks identified are summarised in Table 4.

*Table 4: Adaptation action against key climate change risks identified in our CCRA*

| Climate driver | Risk | Impact | Example of adaptation action to date |
|---|---|---|---|
| Drought conditions | Lower river flows and/or reservoir levels affect the ability to abstract from source waters | Local or regional **water supply deficits** lead to service disruption and loss of supply to customers | **Leakage reduced** by 58% over the last 15 years, to support our Supply Demand Balance. |
| Drier conditions followed by extreme rainfall events | Increased land runoff, erosion and flushing of organic matter and pollutants, impacts quality of source water | **Water treatment is more difficult** affecting quality and supply of water to customers | Investing £4.2m in SR21 to **restore damaged peatland** to reduce runoff risk to water quality, in partnership with NatureScot, Peatland Action and Forestry Land Scotland. |
| More frequent / extreme rainfall | Drainage systems and sewers become overloaded with storm water and surface water flows entering the network | Increased **flooding of customer properties**; increased environmental impact | Creation of the innovative Metropolitan Glasgow Strategic Drainage Partnership with over **£1.5 billion invested in major flooding** and environmental projects in Glasgow |
| Drought conditions | River levels fall reducing the ability of the environment to cope with waste water discharges without causing **pollution during low flow events** | Potential tighter standards for environmental discharges | Developed industry leading **modelling improvements** to help us understand future rainfall impacts to drainage catchments and flow at waste water works |
| More frequent / extreme rainfall | Increased frequency and magnitude of river and surface water | Operational impact leading to loss of supply for customers, risk of | **Elevated vulnerable equipment** at critical assets above the flood plain and |

| Climate driver | Risk | Impact | Example of adaptation action to date |
|---|---|---|---|
| | **flooding at water treatment and waste water sites** | environmental pollution & increase in repair & refurbishment costs | installed flood protection measures |
| Extreme weather and storm events | Disruption of power network and **power outages** impacts pumping and treatment as well as communications | Operational disruptions, loss of customer service, increased emergency response | Investing £8m in SR21 on additional **standby generators** for critical assets to ensure we can maintain service during storm events |

# 3 Customer and Communities

## 3.1 Our Customers and Stakeholders

### *3.1.1 Our approach*

Customers are increasingly aware of climate change and its potential to disrupt society, with media reports widely highlighting global impacts from wildfires in California[24] to floods in Spain[25] and extreme storms in Bangladesh[26]. In the UK we have seen a series of damaging storms[27] and in Scotland an increase in drought[28] and wildfires[29] in recent years.

Climate change adaptation is fundamentally about the resilience of the service we provide to customers in the future. Climate change is already disrupting the lives of our customers – the increased intensity and frequency of storm events that can cause service interruptions, and in the increased incidence of droughts that lead to us needing to act to keep customers in supply, and in excess rainfall that can impact the quality of the environment we enjoy. Customers expect that Scottish Water will take the necessary steps to ensure their services are resilient and their lives are not disrupted by climate change.

As part of our SR27 work, we conducted a Research Synthesis exercise - which used more than 50 pieces of customer research, mostly qualitative, spanning the last decade (you can read about this work in more detail in our Customer and Engagement Technical Appendix). The focus of this work was across Direct Benefits, Strategic Topics (such as Asset Maintenance, Climate Change, and Managing Rainwater), and the SR27 Technical Appendices. This work was conducted using the following steps:

1. We defined the purpose of this synthesis;
2. We collected all available sources to assess
3. We extracted insights from these sources and mapped them to our topics (areas of focus);
4. We conducted a topic scoring assessment and identified key insights; and
5. We synthesised these key insights - and identified any changes over time or divergence of views.

### *3.1.2 Summary of engagement*

From this research, we know that climate change is an important issue for our customers – and there is concern about the impacts. This is especially true for younger people and our vulnerable customers[30]. Some of our customers have a good sense of the impact climate change will have on our services and infrastructure but others are surprised by the scale of the issue[31].

Generally, however, our customers understand that the impacts of climate change will be felt more acutely in the longer-term if we do not act today - and there is an expectation on us to act now to protect our services and infrastructure. Our household customers believe we have an

[24] LA fires in maps: Where are they and how bad is the damage? - BBC News
[25] Before and after images show devastating impact of Valencia floods - BBC News
[26] Cyclone Mocha: Deadly storm hits Myanmar and Bangladesh coasts - BBC News
[27] Climate change drives increase in storm rainfall - Met Office
[28] Climate Crisis: informing Scotland's actionable mitigation and adaptation response to water scarcity | CREW | Scotland's Centre of Expertise for Waters
[29] Wildfire Risk in Scotland - James Hutton Institute
[30] % Agree: I am concerned about the impact of climate change on Scotland's water supply:
Current bill payers: 48%
Future bill payers: 68%
Those with vulnerabilities are significantly more likely than non-vulnerable customers to agree (55% vs 47%)
[31] When asked what kind of challenges Scottish Water will face in the future, participants found it relatively easy to identify a range of challenges. The challenges customers mentioned related to four main themes: environmental change, political uncertainty, increased demand and ageing infrastructure. Most groups referred to climate change, pollution and the impact worsening weather conditions will have on current infrastructure.

important leading role to play in the protection of our environment against damage from climate change - with some non-household customers questioning whether it is our responsibility. There is also some uncertainty from customers on how they may contribute to measures that improve our resilience to climate change, questioning the effectiveness and impact of water efficiency behaviours and their own personal convenience.

Customers also highlight issues of specific importance around their service expectations for water continuity, water quality and environmental quality. Within this there is an expectation that their service will be protected from climate change and general support for Scottish Water to seek to use novel solutions such as blue-green infrastructure and to work with nature for climate resilience, whilst acknowledging the continued need for traditional infrastructure.

Table 5 below sets out our key insights alongside the relevant research questions.

*Table 5: Key research insights*

| Research Question | Key Insight |
|---|---|
| What is customer **understanding** of climate change as a challenge? | Climate change is acknowledged as an important issue by customers, with future customers showing more concern around environmental issues. However, customers can be surprised by the scale of the issue and potential impact on Scottish Water's services. After this information has been shared, customers generally acknowledge climate change as a challenge to Scottish Water's long-term outcomes. |
| What are customer **expectations** around climate adaptation of assets? | Once hearing about the scale of challenges from climate change, customers believe it is important to protect infrastructure against the impacts of climate change and there is an expectation for long-term solutions to be used. |
| How do customers **view their role** in supporting Scottish Water's adaptation to climate change? | Customers feel that there is a shared responsibility between the Scottish Government, Scottish Water, businesses, communities and individuals in tackling the impacts of climate change on water and waste water services in Scotland. Whilst many customers believe they are already doing what they can to tackle the causes and impacts of climate change, many customers are unsure of how they can contribute. Customers can also be initially sceptical about the effectiveness of personal behavioural changes, or perceive there to be financial or practical barriers to adopting more sustainable behaviours. However, on learning more about the issue, customers generally support the need to raise awareness of the value of water, and there is an appetite for more information and communications. |

Our SR27 approach to Climate Change Adaptation addresses several aspects of customer feedback:

- We will enhance resilience of our assets to the impacts of climate change by integrating rainfall changes due to climate change into water resources and flooding investments
- We have a good understanding of risks across all areas of water and waste water service provision and climate change will be reflected in the options that are developed for water and environmental quality
- We will continue to pursue blue-green options in drainage, with a goal that 10% of flooding and drainage options should include blue-green measures in SR27, and seek to build partnerships that will address the impacts of climate change through landscape scale interventions, such as at Loch Katrine to protect water quality, improve biodiversity and capture carbon through extensive peatland restoration and over 1.5m new trees to restore the Great Trossachs Forest

- We will continue our "Water Is Always Worth Saving" campaign[32] to engage customers in understanding the value of water to change behaviours on water consumption.

## 3.2 Partnership working

Scottish Water cannot deliver adaptation alone – engaged and committed partnership working focused on long term delivery is vital for effective adaptation. Partnerships must extend across national and local government, public agencies, infrastructure providers, landowners and communities. The expected SR27 outcomes from partnership working are provided in section 4.2.4, and there are some key aspects of partnership working that are central to Scottish Water's Climate Change Adaptation Plan:

- With local authorities, landowners, SEPA, NatureScot, Forestry and Land Scotland, farmers (including our own tenants), industry and others to support regenerative, resilient natural landscapes to safeguard water resources in our pioneer catchments;
- With customers and communities to change our relationship with water – how we value and manage water to reduce our demand on the environment in a water constrained future;
- With local authorities, roads authorities, developers and communities to reshape our urban landscape to deal with extreme rainfall and develop blue-green infrastructure and make our cities more resilient places in a climate changed world; and
- With infrastructure providers whose services we rely upon to deliver water and waste water services, to understand and manage the interdependent risks (from power and telecoms failure, to travel disruption) that climate changes pose.

We need a particular focus on water resources, water quality and flooding in catchments. In response to the climate emergency the Scottish Government is working in partnership with Scottish Water and other industry stakeholders to develop policy for the future of the water industry in Scotland, recognising that water is a precious resource that supports our lives, agriculture and businesses and our environment. The aim of this work is to help protect Scotland's environment and water resources so we can all continue to rely on them for generations to come.

No single organisation can lead this - many sectors rely on nature to provide key services (water quality, flood management, soil health etc) and will benefit from and contribute to catchment measures. To be effective and sustainable at we need to progress interventions such as peatland restoration, woodland creation, riparian flood management and upland soil management at landscape scale to make the water catchments resilient to climate change.

We already have examples of good partnerships that support effective outcomes. Urban drainage partnerships in Glasgow[33] and Edinburgh[34] provide a model for effective delivery between Scottish Water, SEPA, Local Authorities, Developers and others, investing over £1bn in improving water flows across the cities, reducing flood risk and enhancing the environment. Scottish Water's partnership with Forestry and Land Scotland will deliver a 10 year Land Management Plan[35] for landscape scale measures to restore peatland, create woodland, capture carbon, enhance biodiversity and secure the resilience of Glasgow's water supply.

Partnership and collaborative work are also needed to help customers reduce the amount of water they use, supported by national and local planning policy and building standards legislation to

[32] Water is always worth saving - Scottish Water
[33] Metropolitan Glasgow Strategic Drainage Partnership (MGSDP) - MGSDP
[34] vision-for-water-management-in-the-city-of-edinburgh
[35] Loch Katrine Land Management Plan | Forestry and Land Scotland

incentivise developers to make properties and appliances as water efficient as possible, making it easy for customers to be water efficient. We will engage our customers to make them more aware of their water use and how they can reduce it to help the environment and reduce their energy costs.

Society depends on a collection of infrastructure systems that are co-dependent. Local resilience partnerships and fora already support many aspects of this but will be increasingly impacted by climate change. To effectively and efficiently respond infrastructure operators must share knowledge and resources and work collaboratively towards climate resilience between dependent services. Along with Network Rail, Scottish Water is co-chair of the Climate Ready Infrastructure Scotland Forum[36] to foster collaboration between infrastructure operators in Scotland and to support effective adaptation. We will work collaboratively to develop and deliver adaptation and resilience initiatives to enable infrastructure operators in prepare for Scotland's changing climate.

Table 6 below sets out how we will be working with our partners to deliver our outcomes.

*Table 6: SR27 partnership approach for climate change adaptation*

| Partner | How will we work with them in SR27? |
|---|---|
| Local Authorities | We will expand our strategic drainage partnerships to remove the volume of rainwater in our combined sewer system<br>We will co-deliver landscape scale interventions in pioneer catchments to manage flood risk in communities |
| SEPA | We will expand our strategic drainage partnerships to remove the volume of rainwater in our combined sewer system<br>We will co-deliver landscape scale interventions in pioneer catchments to provide resilient and regenerative catchments and urban spaces |
| NatureScot | We will co-deliver landscape scale interventions in pioneer catchments to provide resilient and regenerative catchments and urban spaces |
| Forestry and Land Scotland | We will co-deliver landscape scale interventions in pioneer catchments to provide resilient and regenerative catchments and urban spaces. |
| Landowners and tenants | We will collaborate to ensure landscape scale landscape scale interventions in pioneer catchments to provide resilient and regenerative catchments and urban spaces are sustainable for all.<br>We will collaborate to ensure mutual benefit when delivering outcomes through our drainage partnerships. |
| Our customers and communities | We will encourage the national conversation around water and our ability to manage the entire cycle better within Scotland.<br>We will build on the findings of the household monitoring pilot to reduce per capita consumption through the provision of consumption information to customers. |

[36] Climate Ready Infrastructure Scotland Forum - Adaptation Scotland

| Partner | How will we work with them in SR27? |
|---|---|
| | We will learn from the experience of the England and Wales companies and other behavioural insights to reduce demand in households where monitoring is unduly expensive or impractical.<br>We will collaborate to ensure mutual benefit when delivering outcomes through our drainage partnerships. |
| Developers | We will collaborate to ensure mutual benefit when delivering outcomes through our drainage partnerships. |
| Renewable energy providers | We will collaborate to ensure that our landholdings being used to host renewable energy provision will be improved to become more resilient and regenerative. |
| Network Rail | We will co-develop, co-fund, and co-deliver tactical climate adaptation and resilience initiatives across infrastructure providers through the Climate Ready Infrastructure Scotland Forum. |
| Scottish Power | |
| BT Openreach | |
| Scottish and Southern Energy | |
| Transport Scotland | |
| Scottish Government | We will collaborate on the development of policy for the future of the water industry in Scotland and contribute to the delivery of SNAP3. |
| UK Government | We will influence household appliance efficiency regulation and building regulations that mandate water efficient design |

## 3.3 Demonstrating Customer and Stakeholder Support

Our customers are generally aware of the issue of climate change but are not aware of the significant challenge Scottish Water are facing because of climate change in meeting the long-term outcomes. ***In SR27, we will invest in customer campaigns such as promoting water efficiency through our "Water is Always Worth Saving" campaign to encourage customers to be wearier of how they are using water. This will help customers help us to mitigate the impacts of climate change and increase their understanding of the potential impacts and consequences of climate change and how their behaviours can help.***

Our customers expect long-term solutions to be put in place to protect assets from the impacts of climate change. ***In SR27, we will identify the potential impact and likelihood of impact climate change will have across our assets. We will fully integrate climate change into our Sustainable Investment Decision Making processes to ensure our natural and built assets are resilient. This will support long term investment planning and operation of water and waste water systems to deliver service resilience.***

Many of our customers believe they are already doing what they can to tackle the impacts of climate change and think that there is a shared responsibility to do this between the Scottish Government, Scottish Water, businesses and communities too. ***In SR27, we will invest £30.7m in drainage partnerships and £8.4m in customer campaigns to help us adapt to climate***

***change. We will work with local authorities and communities to remove rainwater from our networks and recover capacity and resilience. We will also work with our customers to increase the value placed on water and wastewater services we provide.***

# 4 Our SR27 Investment Approach to Climate Change Adaptation

## 4.1 Our Management Approach Informing our SR27 Investments

Climate change is not new to Scottish Water; we completed our first climate change risk assessment in preparation for SR10 and have since enhanced our approach[37] [38] [39]. In SR21, we developed our Management Approach for Climate Change Adaptation (MA103). MA103 is comprised of three central elements as shown in Figure 5, and described in the following sub-sections.

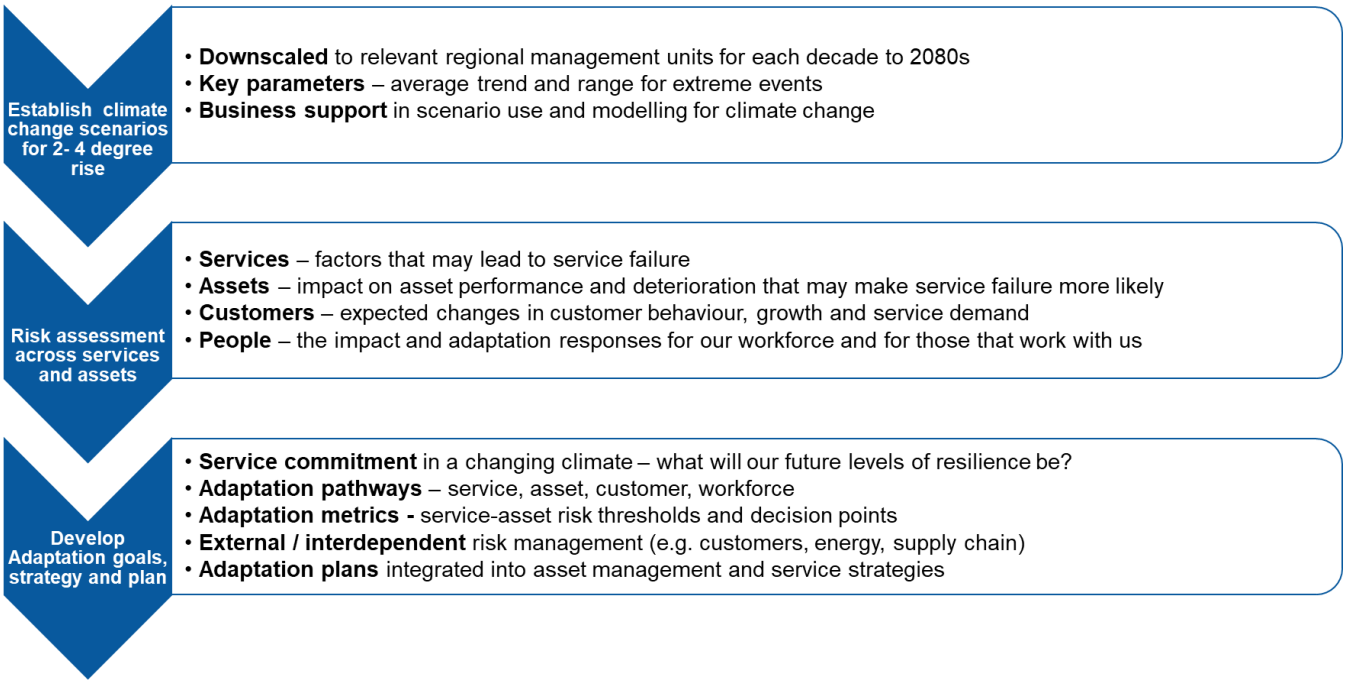


*Figure 5: Summary of SR21 Climate Change Adaptation Management Approach (MA103)*

### *4.1.1 Climate Change Pathways*

Our approach is to plan for 2 degrees warming to 2050 but prepare for 4 degrees of warming by the 2080s and will be kept under review should the evidence change. Using the UK Climate Impact Programme 2018 projections we adopted "Relative Concentration Pathway" 6 (RCP6) to represent the 2-degree world and RCP8.5 to represent the 4-degree world[40] (Figure 6). RCP refers to the projected forcing of global heating by the concentration of greenhouse gas emissions and reflects the Intergovernmental Panel for Climate Change (IPCC) pathways for emissions. RCP6 assumes that globally we are on an emissions path to limit warming to below 2 degrees through international agreements, whilst RCP8.5 assumes less effective mitigation and a "business as usual" emissions pathway.

[37] Water Resources Plan 2015
[38] 2015 Sustainability Report
[39] 2016 CCRA report
[40] ukcp18-guidance---representative-concentration-pathways.pdf

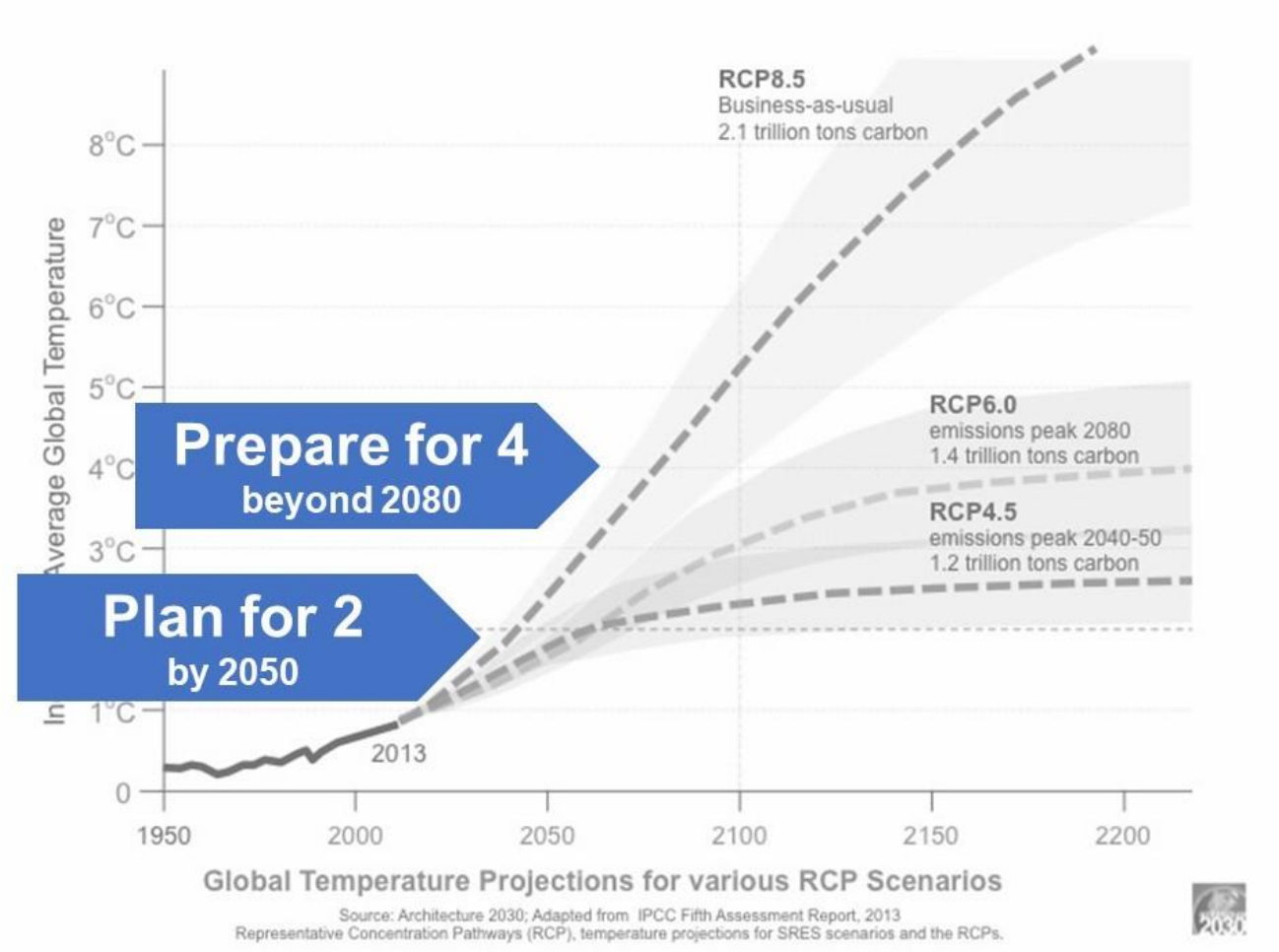


*Figure 6: Climate Change Scenarios used in our CCRA, adapted from [The Global Building Sector and the IPCC Fifth Assessment Report – Ed Mazria's Analysis – Architecture 2030]*

### *4.1.2 Risk Assessments*

We used the above scenarios to perform risk assessments to determine service impacts to our systems in terms of costs, regulatory compliance, customers, Safety, Health and Wellbeing and the environment. Assessments considered:

- **The likelihood of the climate driven risk to operations materialising** during the most recent period of observations, and in the future under the 2 and 4 degree climate scenarios. This refers to how likely is the asset to fail/operations to be disrupted due to weather events and/or other climatic trends.
- **The magnitude of service impacts associated with the risk materialising** during the most recent period of observations and in the future. This refers to the scale of service, financial, regulatory, environmental impacts (when the risk to operations is unmitigated).

We identified and assessed 126 different climate risks and compared the position today, with 2 degrees of warming by 2050 and 4 degrees of warming by 2080. The outputs are summarised in chapter 10 of our Climate Change Adaptation Plan[41], and informed sections 4.2.2, 4.2.3 and 4.2.4 of this Technical Appendix. This assessment will be repeated in SR27 to adopt newer data and projections as they arise, allow tracking of our adaptation progress, and inform SR33.

[41] Climate Change Adaptation - Scottish Water

As well as Met Office projections, the analysis of risk drew on a range of technical and modelling approaches relevant to the key service areas as follows:

- **Drought risk:** During SR15, the earlier climate change projections (UKCP09[42]) were applied to water resource models for the 58 resources deemed vulnerable. For the risk assessment this was extended to include uplifts for the 4-degree pathways to understand the implications for future water resource yields[43] and supply-demand balance risks.
- **Water Quality:** Using information from national assessments[44] of the implications of climate change on water quality, we worked with technical consultants to develop an approach[45] to estimate the impact of climate change uplifts (rainfall intensity, temperature, flow) on the deterioration of catchments across key parameters such as manganese, dissolved organic carbon, and algae. This enabled us to model future source water quality in our catchments and assess when catchment deterioration may exceed the capability of our assets to treat incoming water.
- **Flooding:** In SR15 we worked with UKWIR, Newcastle University and the UK Met Office to develop tools[46] to adjust future rainfall projections to reflect climate change. This enabled catchment level assessments of hydraulic exceedance under climate change to inform customer flood and environmental pollution risk. This was adjusted in SR21 to include uplifts for UKCP18 4 degree pathways, and work continues to improve catchment assessments.
- **Environmental Quality:** We assessed the vulnerability of waste water treatment assets to climate hazards in terms of their ability to deal with increasingly variable flows, and the potential reduction in environmental capacity to receive discharges because of increased periods of low flow and elevated temperatures during dry conditions. Further work is underway to integrate the outcome of the rainfall and catchment work to support flooding, and this will enable improved understanding of the likelihood of future quality risks to CSOs and waste water treatment standards.
- **Asset Flood Risk:** We undertook a spatial analysis of our asset base against SEPA flood maps[47]. For coastal erosion, we used outputs from the Dynamic Coast[48] assessment to determine the risk to our asset base.

## 4.2 Our Climate Change Adaptation SR27 Investments

### *4.2.1 How investment in climate change adaptation appears in our SR27 Plan*

Our SR27 Business Plan will make a significant contribution to help the Scottish Government deliver SNAP3, and our Long-Term Strategy. The changes we have made to our asset management and investment planning processes will ensure that management approaches, system planning, and project appraisals increasingly draw from climate change impact pathways to inform investment demand.

As noted in the Table 5 Commentary document, we are not yet able to provide fully disaggregated, project-by-project data on the proportion of investment spend that relates to climate change adaptation. This is an area of ongoing development, and we will engage with WICS ahead of FBP

[42] [ARCHIVED CONTENT] Met Office UKCP - Crown copyright
[43] These are currently being updated to UKCP18 data in line with the rest of our assessment.
[44] Climate resilience strategies for upland drinking water sources (FREEDOM-BCCR) | UK Centre for Ecology & Hydrology
[45] CCRA WQ Vulnerability_Report.pdf
[46] Red-Up Tool
[47] Flood Maps | SEPA - Flood Maps | SEPA
[48] Dynamic Coast

to discuss how we can best give accurate insight into the level of spending that relates to this issue.

Climate Change Adaptation has become increasingly embedded within the way we plan for our assets. This means that only a relatively small proportion of our SR27 investment in adaptation appears as stand-alone investment. Most of the investment in this area is embedded within service lines (e.g. Water continuity). The investment demand and service outcomes associated with climate change adaptation can therefore be considered in three ways:

1. **Investments where climate change adaptation is the *key* driver:** Customer Experience and Flourishing Scotland investments and outcomes are focused solely on climate change. Specifically, this is climate change risk assessment work (captured in 4.2.3), and Pioneer Catchment Work (captured in 4.2.4). These investments are detailed in this document and associated Data Table.
2. **Service lines where climate change adaptation is an *embedded* investment:** The use of climate models to inform decisions is well established in Water Continuity and Managing Quantity of Flows, and outcomes have built climate change needs into core demands. A proportion of these investments are attributable to climate change adaptation, and this is reported here. It is not "additional" to the demand reported by these service areas but is reported here to clarify the financial impact of climate change. Water Quality (funding included in Transformation and Innovation Data Tables) and Environmental Quality have also identified climate change study needs for SR27. The full rationale for these investments is detailed in their respective Technical Appendices and Data Tables.
3. **Service lines where climate change adaptation has been *retained* as a risk:** The impact and timing of climate change is inherently uncertain, and there are areas with too much uncertainty to promote additional adaptation at this stage across several areas of investment. As climate science and our understanding of risk matures, we may identify additional investment demand in the SR27 period. Climate risk assessments are incorporated into our Sustainable Investment Decision Making (SIDM) processes for Management Approaches and Project Investment Appraisals, and we will ensure that the most relevant and up to date information is considered when making investment decisions during SR27, to ensure they are resilient. Any additional investment identified will be considered through our Investment Planning and Prioritisation Framework (IPPF). Throughout this Technical Appendix we refer to these potential investments as 'retained risks', and they are included in the Technical Appendix for Risk and Assurance.

In the following sections, we will detail our investments to provide Operational Resilience, Asset Resilience and Service Transformation in the following manner;

1. **SR27 Investment**: the known investments we are making in this period, across key drivers and embedded investment.
2. **Retained Investment Risk**: the potential scale of additional investments we might decide to undertake in this period
3. **Relevant SR27 Outcomes:** how our investments in SR27 address the climate risks we have identified in our CCRA.

## *4.2.2 Operational Resilience Investments*

**Our SR27 Investment**

*Table 7: SR27 investment for Operational Resilience*

| ***Key CCRA considerations*** | ***Climate driver*** | ***Risk*** | ***Impact*** |
|---|---|---|---|
| | Extreme weather and storm events | Disruption of power network and power outages impacts pumping and treatment as well as communications | Operational disruptions, loss of customer service, increased emergency response |
| ***Key Driver or Embedded Investment?*** | Embedded | | |
| **SR27 Investments** | Standby Generators at 52 sites: £30.9m | | |
| ***Key Driver or Embedded Investment?*** | Embedded | | |
| **Total Materiality** | £30.9m | | |

**Embedded**

Increasingly frequent and extreme weather, driven by climate change, has the potential to increase deterioration of our assets whilst sustaining service excellence, or for Scottish Water to undertake additional activities to deal with extreme flood, drought or storm events. One of the biggest operational risks we face is loss of power from storm events and during SR21 we invested in standby generation for critical assets.

An additional £30.9m for 52 standby generators and mobile hookups is profiled in SR27 under the Water Continuity programme to further improve resilience, including for climate change impacts.

**Retained Investment Risk**

Aside from loss of power from storms, increasingly frequent and extreme weather, driven by climate change, may mean increased energy usage for pumping and treatment, increased chemical usage or increased site visits and management of assets during events. It is difficult to project future costs owing to the natural variability of events and limited historical data and we will need to keep under review.

Excluding energy costs for elements such as pumping, which are difficult to directly link to climate variables and disaggregate from wider energy data, the operational response costs of weather events over the last 5 years is shown in Table 8[49]. 2019-20 was a benign year, with the remaining years experiencing impacts such as severe winter weather (also considered climate change), drought and storm recovery events.

[49] Source – Scottish Water financial assessment

*Table 8: Operational response costs for weather extreme events from 2019 to 2024*

| | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 2023-24 | 5-year total | Annual average |
|---|---|---|---|---|---|---|---|
| **Weather related cost (£m)** | 0.5 | 4.31 | 4.15 | 3.29 | 4.87 | 17.12 | 3.42 |

Scottish Water's Climate Change Adaptation Plan identifies several case studies of impacts and further information on past events, and key events that drive impact and cost include:

- **Drought resilience:** Significant additional costs may be incurred during drought events. Typical responses see increased pumping costs associated with moving water greater distances and tankering of supplies to some communities. Actual costs associated with drought will be location specific and the drought and supply-demand balance events of 2021-22, 2022-23 and 2023-24 were assessed to cost £1.6m, £1.8m and £2.6m respectively (excluding energy).
- **Recovery from weather extremes:** Between 2019-20 and 2023-24 Scottish Water dealt with a series of weather extremes ranging from severe winters (that climate change may exacerbate), to named storms leading to investment in the recovery of water and waste water services. Storm Arwen recovery cost ~£1m, whilst severe winter and snowfall in 2020-21 cost £3.7m. Attribution studies[50] [51] have shown that severe weather in the UK is likely due to climate change and climate projections indicate an increase in severe weather may be expected in future, with resultant additional operational costs.
- **Flooding – customer impacts and clean ups:** Climate change is projected to increase the risk to customers from internal and external sewer flooding, placing additional demands on sewer response teams and for further clean ups. Based on climate projections and risk assessment with the Flooding team, and with a strategy to ensure that customers are supported through incidents, it is anticipated that up to £16m in clean up response may be needed across SR27 to cover existing levels of support and accommodate further incidents associated with climate change uplifts.

It is reasonable to assume that the average £3.4m per annum costs (Table 8) experienced over the last 5 years from weather incidents will increase across SR27, as weather is predicted to become more extreme, more frequently, due to climate change. However, the data on climate driven events and the uncertainty of how and when we will experience extreme events, means that we are unable to determine an uplift to be applied to this business plan, therefore we have included this as a financial risk within the Risk and Assurance Technical Appendix.

### Relevant SR27 Outcomes

The investment in Operational Resilience will allow Scottish Water to demonstrate that we are fulfilling our Ministerial Objective that we must 'continue to implement and evolve plans for adaption measures necessary to protect its services'. Our CCRA identified the increasing risk to service from extreme weather and storms disrupting the power supply. Investing in additional standby power generators will provide resilience to regional power outages and reduce the impact of this risk materialising.

[50] Climate change drives increase in storm rainfall - Met Office

[51] Climate change made 2022's UK heatwave 'at least 10 times more likely' - Carbon Brief

## 4.2.3 Asset Resilience Investments

### Our SR27 Investment

*Table 9: SR27 investment for Asset Resilience*

| ***Key CCRA considerations*** | ***Climate driver*** | ***Risk*** | ***Impact*** |
|---|---|---|---|
| | Drought conditions | Lower river flows and/or reservoir levels affect the ability to abstract from source waters | Local or regional water supply deficits lead to service disruption and loss of supply to customers |
| | More frequent / extreme rainfall | Drainage systems and sewers become overloaded with storm water and surface water flows entering the network | Increased flooding of customer properties; increased environmental impact |
| | Increased variability in weather; drier conditions followed by extreme rainfall events | Increased land runoff, erosion and flushing of organic matter and pollutants, impacts quality of source water | Water treatment is more difficult affecting quality and supply of water to customers |
| | High summer temperatures and lower rainfall | Algal blooms associated with warmer temperatures and lower flushing of source waters | Water treatment is more difficult, leading to quality taste and odour impacts to customers |
| | | Low reservoir levels and warmer water leads to the release of chemicals such as iron and manganese from sediments impacting the quality of source waters | Water treatment is more difficult affecting quality and supply of water to customers |
| | Drought conditions | River levels fall reducing the ability of the environment to cope with waste water discharges without causing pollution during low flow events | Potential tighter standards for environmental discharges |
| | | More concentrated sewage reaching waste water treatment works during prolonged periods of dry weather | Reduced performance of waste water treatment and increased operational (e.g. chemical) costs |

| | |
|---|---|
| **Key Driver or Embedded Investment?** | Both |
| **Investments** | Supply Demand Balance: £95.9m (embedded) |
| | Managing Sewer Flood Risk: £44.6m (embedded) |
| | Climate Change Risk Assessment: £1.9m (key driver) |
| | Water Quality Research and Development: £7.0m (key driver) |
| | Waste Water Treatment Studies: £4.7m (key driver) |
| **Total Materiality** | £154.1m |

**Embedded Investments**

The impact of climate projections of rainfall patterns has been built into our hydrological and hydraulic models and included in our planning for some time. This means that we are already planning for and adapting to climate change as business as usual for investment areas covering Water Continuity and Managing Quantity of Flows. The investment demand identified for these areas has been generated with a consideration of the future rainfall that we can expect with climate change.

In the generation of the investment demand for these areas, there was no separate consideration of climate change as an 'optional extra', it was fully embedded in the analysis. It is therefore not straightforward to attribute the proportion of the demand that is solely driven by climate change adaptation. However, we have used expert judgement to assess what portion of investment is likely driven by climate change adaptation in SR27.

The methodology we followed to identify climate change related demand for these areas is summarised below.

***Water Continuity – Supply Demand Balance***

- For the 52 Water Resource Zones deemed to be the most vulnerable to climate change, the impact of reduced rainfall, and increased evapotranspiration from a medium emissions scenario (SRES A1B, UKCP09[52]) on the hydrological yield was assessed.
- This follows Environment Agency guidance[53], consistent with the rest of the UK.
- The impact in 2080 was scaled back, linearly, to the present day, and used in our Supply Demand Balance model to determine the impact on water availability for customers.
- From this, we understand that our supply demand balance deficit will increase from 60Ml/d currently to 240Ml/d by 2050.

Analysis of the deficit in our supply demand balance in 2022 and 2047 shows a combination of existing deficit, growth and reduction in yield associated with climate change. In SR27 we will address this by reducing leakage through mains rehabilitation, non-domestic metering

[52] The analysis was undertaken prior to the release of the current UKCP18 climate projections, however a high-level comparison of the two dataset was undertaken and deemed to provide broadly similar outputs. An update to UKCP18 data, in line with the rest of the climate change risk assessment is currently underway.
[53] Climate change approaches in water resources planning: new methods - GOV.UK

programmes and developing options for influencing customer demand. We estimate that 40% of the investment demand for Supply Demand Balance in SR27, or £95.9m, is associated with adapting to climate change.

***Managing Quantity of Flows – Managing Sewer Flood risk***

- SEPA's guidance on Climate Change Allowances for Flood Risk Assessment in Land Use Planning[54] informed future rainfall when designing solutions for problems in our waste water network.
- An uplift to peak rainfall was applied, appropriate for the relevant river basin, between 35% and 48%, based on the CCRA, Met Office Projections and work undertaken with UKWIR to develop the RedUp tool[55] for sewer design for exceedance.
- From this, we ensure that investments we make today are climate resilient and that Scottish Water fulfils requirements under the adopted National Planning Framework 4[56], adopted in 2023.
- Further detailed work is finalising projected perturbations of time series rainfall to the 2080s to inform detailed catchment analysis of hydraulic exceedance for option development.

Solutions to incorporate future rainfall intensity are estimated to account for 15% of the investment demand. This translates to £44.6m of a total investment of £297.2m to Manage Sewer Flooding (excluding investment associated with Drainage Partnerships, covered in section 4.2.4).

For a detailed view of the outputs that our customers will benefit from these investment areas, please refer to the Technical Appendices for Water Continuity and Managing Quantity of Flows.

**Key Driver**

***Customer Experience & Flourishing Scotland***

We will refresh our CCRA in SR27 to ensure that our projections, data sets and models reflect the latest projections, science, meteorological information and guidance, and to further develop the tools to support embedding adaptation in asset management. This will ensure the progress made in SR21 continues and SR33 fully reflects climate change demands. We made an allowance for this at the same level as for SR21 (£1.9m).

***Water Quality***

During SR27 we shall continue to develop our understanding of the impact of climate change on the quality of our raw water sources, particularly in relation to variations in rainfall patterns, increasingly extreme and frequent weather events and increasing temperatures. We will invest £7.0m in research and development in the following areas:

- Understand the risks to source water treatability associated with climate change impacts, including algal blooms, taste and odour and increasing levels of organics and pathogens;
- Evaluation of alternative treatment technologies such as nanofiltration ceramic membranes and ozone nanobubble, and the development of low chemical, low cost and low carbon treatment;
- Assess the efficacy and environmental impacts of nature-based, in-reservoir and catchment solutions;
- Development of monitoring and modelling techniques to predict and manage variations in raw water quality, including organics and pathogens;

[54] climate-change-allowances-guidance_v6.pdf
[55] Red-Up Tool
[56] National Planning Framework 4 - gov.scot

- Assessing techniques to improve our ability to prevent and control discolouration events in distribution.

Additional water quality and catchment resilience benefits will be delivered as a further outcome from work within the Climate Mitigation Technical Appendix. This focuses on improving the carbon status of Scottish Water's landholdings and will see 500-1,000 hectares of peatland restoration and up to 4,000 hectares of new woodland creation (including around Loch Katrine). This will also make a significant contribution to Scotland's biodiversity targets.

### *Water Environment*

There is still much uncertainty over the resilience of our waste water treatment works to the impacts of climate change. Continuing from work undertaken in SR21, additional studies are required to understand future investment needs to ensure our works can adequately treat waste water flows to a water environment impacted by climate change. An allowance of £5m has been included.

### Retained Investment Risk

Our retained risks identify additional potential operational costs and investment that may arise as the programme and projects develop. They reflect the outcome of the Scottish Water CCRA, but there is uncertainty on the extent of the need in SR27. In the absence of fully quantitative data, expert judgement was used to assess the percentage uplift of identified demand that may be needed as projects are developed to address climate risks (summarised below).

This covers investment areas such as Water Environment, Water Quality, Enabling Growth and AR3. As described in section 4.2.1 these needs will be developed through our SIDM processes and considered through our IPPF and are identified as retained risks in the Risks and Assurance Technical Appendix to the plan.

### *Water Quality and Water Environment*

We expect that the guidance developed to include climate change risks during the Project Investment Appraisal process will result in additional costs to the final solutions delivered. It is hard to quantify what additional costs there might be until the detailed optioneering and design is undertaken through our SIDM processes, however an indicative figure of 7.5% has been identified. This might allow for increased sizing of tanks, flood protection, coastal defences, or additional treatment stages. This risk allocation equates to £53.7m for the Water Quality programme, and £46.9m for the Water Environment Programme across the SR27 period.

### *Enabling Growth*

The SR27 demand is split across transmission (part 3) and treatment (part 4) assets. The investment required to upgrade part 4 assets is mature and no additional climate change adaptation investment is expected. For part 3 assets, there is a potential for a small uplift in demand to cope with future rainfall intensity. This is estimated to be 2% of the investment demand for SR27, or £1.3m, if Scottish Water chooses to enlarge pipes, or a larger percentage if the choice is made to remove surface water completely from the network.

***AR3***

For AR3, we expect to progressively increase the resilience of our assets to climate change. Future iterations of our Management Approaches will specifically appraise policies to increase flood protection for assets to maintain current service. As this has not yet been built into our deterioration models, we cannot quantify the cost impact for SR27 and have included an assessment of 0.025% of the total AR3 investment as an indication of the potential additional demand.

**Relevant SR27 Outcomes**

Updating our CCRA and undertaking water and waste water treatment vulnerability studies will allow us to demonstrate achievement of the Ministerial Objective to 'identify the expected impacts of climate change on its assets and assess the risk and likelihood'.

The other investments in Asset Resilience will allow Scottish Water to demonstrate that we are fulfilling our Ministerial Objective that we must 'continue to implement and evolve plans for adaption measures necessary to protect its services'.

Our current CCRA identifies drought as the most significant climate change risk for Scottish Water. The SR27 investments proposed will reduce demand for water through leakage reduction, mains renewal, non-domestic smart metering and customer demand management by ~48Ml/d, and improve drought resilience in key areas including Edinburgh, Lothian, Tayside and Fife. We will also continue to improve our drought management capability and develop our Strategic Drought Plan.

Our current CCRA also highlights the increasing risk of our drainage systems and sewers becoming overloaded from increasingly extreme rainfall, resulting in increased flooding of customers properties. The SR27 investments proposed will ensure that when reducing the risk of, or mitigating the impacts of, sewer flooding to our customers, we are designing solutions that will be resilient to future rainfall patterns.

### *4.2.4 Service Transformation Investments*

**Our SR27 Investment**

With respect to the CCRA presented in our published Adaptation Plan, these transformational activities are required to support long term outcomes across all key risk areas – water resources, water quality, flooding and environmental quality.

They reflect that we cannot deliver adaptation alone and need to do things differently for long term resilience.

*Table 10: SR27 investment for Service Transformation*

| **Key CCRA considerations** | ***Climate driver*** | ***Risk*** | ***Impact*** |
|---|---|---|---|
| | Increased variability in weather; drier conditions followed by extreme rainfall events | Increased land runoff, erosion and flushing of organic matter and pollutants, impacts quality of source water | Water treatment is more difficult affecting quality and supply of water to customers |
| | More frequent / extreme rainfall | Drainage systems and sewers become overloaded with storm water and surface water flows entering the network | Increased flooding of customer properties; increased environmental impact |
| | Drought conditions | Lower river flows and/or reservoir levels affect the ability to abstract from source waters | Local or regional water supply deficits lead to service disruption and loss of supply to customers |
| | More frequent / extreme rainfall | Increased frequency and magnitude of river and surface water flooding at water treatment sites | Operational impact leading to loss of supply for customers |
| | | Increased frequency and magnitude of river and surface water flooding at waste water sites | Operational impact leading to loss of supply for customers, risk of environmental pollution and increase in repair/refurbishment costs of damaged equipment and structures |
| **Key Driver or Embedded Investment?** | Both | | |
| **Investments** | Pioneer Catchments: £6.5m (key driver)<br>Drainage Partnerships: £30.7m (embedded)<br>Customer Campaigns: £8.4m (embedded) | | |
| **Total Materiality** | £45.6m | | |

**Key Driver**

**Pioneer Catchments**

We need transformative action to make our natural landscapes resilient to climate change, ensuring they can continue to provide the natural capital on which we rely. Scottish Water cannot transform catchments alone – many sectors (industry, agriculture, water and forestry) impact on water bodies and rely on the benefits arising from a healthy ecosystem. As such it is

critical that all parties identify, contribute to and co-ordinate delivery of effective actions that will support future service.

This is exemplified at Loch Katrine where, as sole landowner, we have worked with our long-term tenant to develop an innovative land management plan[57] that provides benefit to water quality, climate resilience, biodiversity and our net zero goals. In other catchments with multiple landowners' landscape-scale work is more challenging and needs to engage a range of public and private stakeholders to act, underpinned by robust governance, financing (public and private) and effective delivery mechanisms to build confidence and engagement of others.

Under the Public Sector Reform initiative, the Environment and Economy Leaders Group (EELG[58]), a partnership of chief executives from a range of public bodies is establishing pilots to align policy and action in two catchments for climate, carbon, nature and societal benefits.

Through this, Scottish Water will work to support multi-agency action in two rural Pioneer Catchments, the River Dee in Aberdeenshire and the South Esk/Angus Glens. Both are important drinking water catchments under threat from climate change, with significant flooding challenges. Scottish Water will also promote a third, urban Pioneer Catchment, the River Almond in the central belt, directly related to its challenges around environmental quality and flooding.

Scottish Water analysis[59] has identified a series of risks associated with climate change and the ability to support long term services, as well as some opportunities to explore and develop nature-based solutions to improve catchment resilience.

Expected outcomes are:

- The demonstration of how strong, effective multi-agency partnerships can commit to long term coordination, management and delivery of landscape scale measures to support resilient catchments and thereby meet society's needs in a changing climate (water resources, quality, flooding environmental capacity).
- A clear understanding of the risk climate change presents to current outcomes society relies on (food, water place, wellbeing, economy), the opportunity, costs and benefits of nature-based measures and the scale needed to support long term resilience.
- A collectively owned and well governed plan for delivery, supported by policy, regulatory and planning agencies and mechanisms to deliver efficiently.
- Pilot measures to evidence the opportunity, cost-benefit and delivery approaches that can be scaled to deliver multiple benefits.

In SR27 we will invest up to £6.5m to support (with others) the development of the multi-agency approach and establishment of catchment resilience delivery programme. We will promote pilot interventions, which will include wetland restoration or creation, native woodland restoration or creation, including buffers, floodplain connectivity, riparian corridor restoration, peatland restoration, Sustainable Urban Drainage Solutions (SUDS), rain gardens, bio retention, regenerative agriculture and integrated constructed wetlands. We will monitor the efficacy of these approaches to determine cost-effectiveness compared with hard engineered solutions such as enhanced water treatment processes, artificial flood defenses and storage tanks.

[57] Loch Katrine Land Management Plan | Forestry and Land Scotland
[58] Scotland's Environment and Economy Leaders' Group - Tackling the climate emergency and sharing our stories - gov.scot
[59] Unpublished, technical report, available on request.

**Embedded investments**

**Drainage Partnerships**

As part of the approach to address chronic issues, begin building resilience and ensure we protect against the threat of climate change, the SR27 investment plan allows for an expansion and enhancement of partnership working with local authorities and local communities. This will allow us to seize opportunities as they arise to remove rainwater from our networks and recover capacity and resilience. The creation and development of these drainage partnerships is estimated to be 50% attributable to the need to adapt our urban centres to climate change. When these percentages are proportionally applied to the SR27 investment demand, £30.7m is attributed to adapting to climate change.

**Customer Campaigns**

We also need to work with our customers to increase the value placed on the water and waste water services that we provide, and Scotland relies upon. We have identified £2.2m of investment for education campaigns targeted at customers in sewer choke hot spot areas and £6.1m to manage and reduce customer demand (both domestic and non-domestic).

**Relevant SR27 Outcomes**

Our investments in Pioneer Catchments will allow Scottish Water to demonstrate to the Scottish Government that we are meeting our legislative duty to contribute to the delivery of SNAP3, through collaborative adaptation action with other public sector bodies. It may also deliver tangible benefits to reduce the risk of deteriorating raw water quality, flood risk to our assets and increased environmental impact from waste water discharges, as identified in our CCRA.

The investments in Drainage Partnerships will allow Scottish Water to demonstrate that we are fulfilling our Ministerial Objective that we must ‘continue to implement and evolve plans for adaption measures necessary to protect its services’. Our current CCRA identifies the increasing risk of our drainage systems and sewers becoming overloaded from increasingly extreme rainfall, resulting in increased flooding of customers properties.

The SR27 investments proposed will result in rainwater being removed from our sewers and thus reducing the risk of sewers becoming overloaded and flooding our customers. Our customer campaign investments will allow Scottish Water to demonstrate that we are fulfilling our Ministerial Objective to ‘work with customers and the wider industry to support and measures that reduce water use in homes and businesses and help ensure that only appropriate items are flushed down the toilet or put down the sink’.

## *4.2.5 Summary of investments*

A summary of our proposed investment on climate change adaptation for SR27 is outlined in Table 11 below. In some areas climate change is embedded within the identified demand, and here we present the total demand, and the proportion estimated to be driven by or supporting climate resilience. For example, standby generators to support current operational need will also deliver climate resilience; 40% of the need for supply demand balance has been attributed to climate change uplifts, whilst the need for an updated climate risk assessment is wholly climate driven.

The table also presents “retained risks”. These are potential demand driven by climate change but where there is insufficient evidence to include in the SR27 business plan at this time. These investment risks will be referenced in the Risk and Assurance Technical Appendix where we will also highlight the potential operational costs from climate change adaptation.

*Table 11: SR27 Investment Summary for Climate Change Adaptation, including retained risks*

| Investment Category | Total SR27 Investment (£m) | Investment attributed to Climate Change Adaptation (£m) | Outputs |
|---|---|---|---|
| **SR27 Investments** | | | |
| **Standby Generators (nr)** | 30.9 | 30.9 | 52 |
| **Supply Demand Balance** | 239.7 | 95.9 | Embedded investment – total outputs across all investment detailed in Water Continuity TA |
| **Managing Sewer Flood Risk** | 297.2 | 44.6 | Embedded investment – total outputs across all investment detailed in Managing Quantity of Flows TA |
| **Climate Change Risk Assessment (Studies)** | 1.9 | 1.9 | 1 |
| **Waste water Treatment Studies** | 48.3 | 4.7 | 1 |
| **Research and Innovation** | 25.4 | 7.0 | 23 [60] |
| **Pioneer Catchment Pilots** | 10.7 | 6.5 | 3 |
| **Drainage Partnerships** | 61.4 | 30.7 | Embedded investment – total investment supports 3 outputs detailed in Managing Quantity of Flows TA |
| **Customer Campaigns** | 8.4 | 8.4 | Embedded investment – outputs detailed in Water Continuity and Managing |

[60] Outputs cover potential studies and pilots that will be further scoped by technical stakeholders and confirmed ahead of the final business plan.

| Investment Category | Total SR27 Investment (£m) | Investment attributed to Climate Change Adaptation (£m) | Outputs |
|---|---|---|---|
| | | | Quantity of Flows TAs |
| **Totals** | | **230.5** | |
| **SR27 – Retained investment risks** | | | |
| **ARRR** | 4,676.4 | 11.7 | |
| **Water Environment** | 625.3 | 46.9 | |
| **Water Quality** | 716.0 | 53.7 | |
| **Enabling Growth** | 66.5 | 1.3 | |
| **Totals** | | **113.6** | |

## 4.3 Future Investment Requirements

In our Climate Change Adaptation Plan, we estimate that the additional cumulative cost to maintain current service levels in a changing climate to 2050, will be between £2bn and £5bn. Based on the prioritised investment in the SR27 business plan and expectations that climate change impacts will increase, we anticipate that investment in climate change adaptation will increase in each subsequent investment plan within this £2bn-£5bn range as shown below (Figure 7). Increasing investment from SR27 levels by an additional 50% in each subsequent investment period will meet the lower estimate, or increasing by 125% per investment period will reach the upper estimate.

From SR33 onwards, we expect that all service areas will have climate change adaptation embedded in their investment demands. This will be achieved using climate change risk assessments to inform all investment decision making.

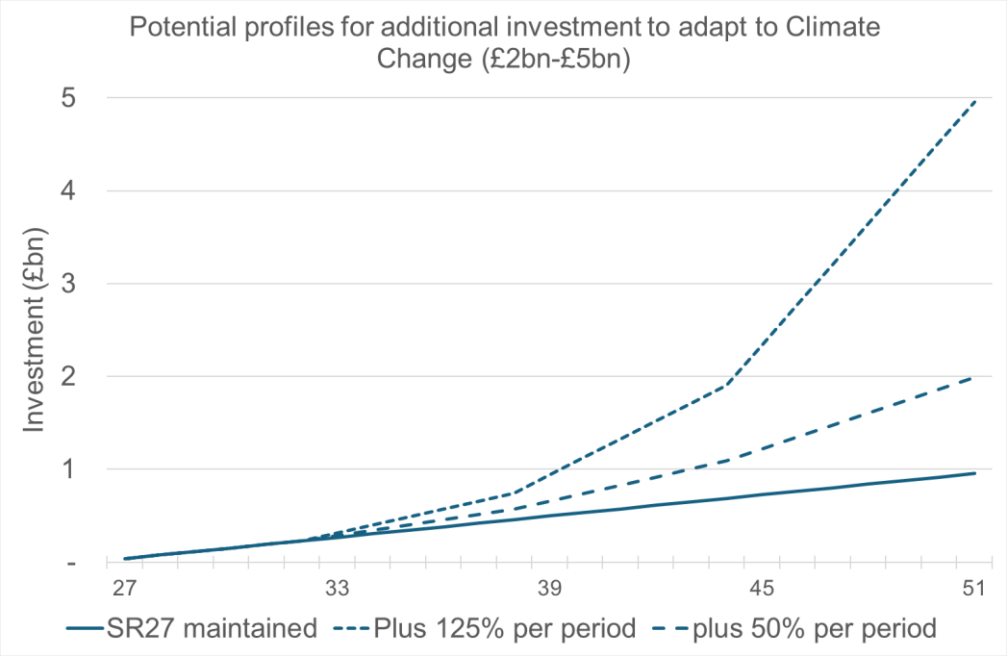


*Figure 7: Potential investment profiles to address future climate change adaptation needs*

# 5 Interdependencies

## 5.1 Alignment with other Technical Appendices

Our approach to climate change adaptation in SR27 is aligned with our Climate Change Adaptation Plan, published in March 2024, our Long-Term Strategy and the Scottish Government's third National Adaptation Plan (SNAP3). As climate change impacts all areas of our organisation it cannot be viewed in isolation from the other investment demands detailed in this business plan. This document should therefore be read in conjunction with our Long-Term Strategy, overall Business Plan, Data Tables and Commentary, and the following Technical Appendices:

- **Water Continuity:** Climate change is embedded in our hydrological models such that all investments associated with reducing our supply demand deficit are taking account of our future climate.
- **Managing Quantity of Flows:** Climate change is embedded in our planning approach to design solutions taking account of future rainfall patterns.
- **AR3:** As we work to repair, refurbish and replace our ageing asset base we will adapt our Management Approaches to ensure that we progressively adapt our assets to a changing climate.
- **Water Environment:** When designing solutions to today's Water Environment problems, we will avoid 'locking in' investment decisions based on today's climate.
- **Water Quality:** When designing solutions to today's Water Quality problems, we will avoid 'locking in' investment decisions based on today's climate.
- **Enabling Growth:** When designing solutions to enable growth, we will avoid 'locking in' investment decisions based on today's climate.
- **Risk and Assurance:** in service areas where there is less certainty or confidence in the extent of climate driven investment, potential costs associated with climate change are not included in current demand but identified as a risk.
- **Climate Change Mitigation:** key investment areas associated with carbon capture within this appendix will also support climate resilience, notably the commitment to restore between 500 and 1,000 hectares of peatland across our water catchments and to create up to 4,000 hectares of new woodland in our catchments (including at Loch Katrine).
- **Transformation and Innovation:** investment to improve our understanding of the impact of climate change on the quality of our raw water sources is detailed in our Transformation and Innovation technical appendix.

# 6 Conclusion

Climate change adaptation is required across all service areas. SR27 adaptation investment is largely integrated within other Technical Appendices of this Business Plan, such as Water Continuity, Quantity of Flows and Water Quality. This Climate Change Technical Appendix therefore reflects the planned investment and outcomes presented under the Working Reference Scenario (CPI+4%) as selected by these service areas.

This Technical Appendix is aligned to meeting the Ministerial Objectives for climate change adaptation (*Table 1*) and contributing to the delivery of our Long-Term Strategy to 2050. Across all service areas, adaptation to climate change in SR27 will require £230.5m of investment to deliver the following:

**Operational Resilience**

To sustain or recover services and assets during events which are projected to become more frequent and intense, we will:

- Provide additional standby generators to provide resilience to water supply assets, including during climate change driven events, from power outages; and
- Continue to respond to increasingly frequent and extreme weather events to maintain customer service.

**Asset resilience**

To make our infrastructure more resilient to climate change, we will:

- Improve our Supply Demand Balance, taking account of climate change impacts to water availability;
- Maintain Customer Flooding, taking account of climate change impacts on rainfall intensity;
- Undertake research to better understand the resilience of our waste water treatment works to climate change risks and the impact of climate change on the quality of our raw water sources; and
- Update our CCRA with the latest climate projections and service impacts.

**Service Transformation**

To develop transformative ways of working as we adapt to climate change, we will

- Collaborate in drainage partnerships with local authorities to efficiently deliver blue-green infrastructure to reduce high priority surface water flood risk;
- Transform three pioneer catchments to become more resilient to climate change through multi-disciplinary partnerships;
- Restore peatland in our own and third-party catchments; and
- Deliver consumer campaigns on the value of water, and importance of only flushing down appropriate items in the toilet or sink to improve waste water network resilience.

There are wider benefits from the climate adaptation approach, particularly with respect to landscape, natural capital and biodiversity benefits from the Pioneer Catchment, peatland and blue-green infrastructure work. The benefits from this in terms of carbon capture and hectarage of land improved for nature will contribute directly to SR27 regulatory reporting outcomes, and to Scottish Water's land carbon inventory.

# Climate Change Mitigation
## Technical Appendix 007

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# 1 Executive Summary

## 1.1 Net Zero Emissions by 2040 remains our boldest challenge

Scottish Water has statutory duties to support both the Scottish Government's climate change plan to deliver net zero emissions, and Scotland's National Adaptation Plan. This Technical Appendix focuses on mitigating the emissions that cause climate change.

Global heating, driven by greenhouse gas (GHG) emissions, leads to climate change with significant impacts on the water environment and the assets we rely on, disrupting services to our customers. The Scottish Government's declaration of a climate emergency in 2019 focussed attention on net zero emissions with a ministerial objective in place for Scottish Water since SR21.

Our proposed climate change investment in the SR27 period allows us to meet relevant statutory obligations and the Ministerial Objectives (Table 1).

*Table 1: Ministerial Objectives relevant to Climate Change*

| **Climate Change Related Ministerial Objectives** | |
|---|---|
| **Climate Change Adaptation** | Identify the expected impacts of climate change on its assets and assess the risk and likelihood; |
| | Continue to implement and evolve plans for adaption measures necessary to protect its services; |
| **Climate Change Mitigation** | Make substantive progress in the 2027-33 period towards climate change targets[1], and ensure it is on an appropriate trajectory to meet or exceed those targets. |

The scope of our emissions covers operational, investment and land management activities:

- Operational - delivering services to customers relies on a large asset base with thousands of treatment works, pumping stations and over 100,000 kilometres of pipes and sewers requiring a lot of energy to treat and pump water and waste water. Waste water treatment also gives rise to methane and nitrous oxide emissions, potent greenhouse gases that are hard to abate.
- Investment - we invest over £1bn[2] annually to maintain and improve our assets, with associated emissions from our supply chain.
- Land Management - we own over 23,000 hectares of land across water catchments, comprising areas that are losing carbon, for example poor quality peatland, and areas that are capturing carbon such as woodland.
-

*Figure 1: Scope of emissions*

This Technical Appendix covers all these emissions, and net emissions is the sum of operational and investment emissions minus carbon captured on our landholdings. Net Zero is achieved when residual emissions we cannot eliminate are balanced or exceeded by carbon capture.

[1] Climate change targets are defined in the SR21 Ministerial Objectives as "achieve net zero emissions by 2040" and "increase the renewable electricity generated or hosted on its land and assets to 300% of its annual usage by 2030"

[2] Annual return 23/24

In 2025 the water sector was identified for action in the UK Climate Change Committee's (CCC) advice to the UK government on the UK's Seventh Carbon budget[3] to support net zero. Specifically, it recommended the sector invests in monitoring, research and innovation to deal with waste water processes emissions, noting these would require ~£100m capital investment per annum by 2040. More widely the CCC emphasised the need for the UK to significantly increase delivery of peatland restoration and woodland creation to support carbon capture. The CCC is expected to publish similar advice for the Scottish Government to inform Scotland's carbon budgets on 21 May.

## 1.2 Our Climate Change Mitigation Strategy

Our strategy is to achieve net zero emissions across operational activities, investment and land management by 2040. Our Net Zero Emissions Routemap[4] (NZER) explains how we will:

- **Reduce consumption of grid electricity and fuels** through energy efficiency, leakage management, renewable generation and lower carbon energy products;
- **Eliminate or minimise** waste water process emissions by developing and adopting new technologies
- **Reducing the distance** we travel and transition to a lower carbon fleet;
- **Embrace low carbon** designs, materials and techniques in the assets we build; and
- **Store emissions** that cannot be avoided by improving our peatland, creating woodland and managing our land to capture carbon.

Net zero is a challenging objective with extensive risks and dependencies. We rely on the continued decarbonisation of grid electricity, development of new technologies to abate process emissions and the development and adoption of low carbon materials in the supply chain to support net zero. Additionally, there are uncertainties associated with the performance of landholdings to capture carbon. We are the only water company to include investment emissions within the scope of net zero, representing a leading ambition in the UK Water sector and the Scottish Public sector.

We have made strong progress in SR21 delivering the activities set out in our NZER, significantly increasing the amount of renewables hosted on our sites, delivering energy efficiency programmes (particularly for waste water), developing pathways to reduce emissions from investment, restoring significant areas of peatland and creating woodland. Progress is reported annually in our NZER[5] and work delivered in SR21 has informed our approach to SR27.

The increased scale of the investment programme under a CPI+4% scenario has elevated our projections for emissions associated with investment above what was included in our NZER. There are also further increases in risk around land carbon from our initial NZER understanding, but land carbon capture is projected to increase in the 2040s as trees mature.

## 1.3 Our SR27 Investment

In SR27 we will invest in measures to meet statutory obligations to support the Scottish Government's climate change plans and strategies and deliver the Ministerial Objective to meet net zero by 2040, following the pathway set out in our NZER[6]. To minimise operational and investment emissions and increase carbon capture, we will:

[3] The Seventh Carbon Budget
[4] www.scottishwaternetzero.co.uk
[5] Annual Update - Net Zero
[6] ww.scottishwaternetzero.co.uk

**Minimise Operational emissions**

- **Bioresources:** invest in advanced anaerobic digestion and energy recovery at Allanfearn Waste water Treatment Works. Replace the sludge drying facilities at Daldowie Sludge Treatment Centre with an advanced anaerobic digestion process with energy recovery.
- **Fleet:** continue adoption of low emission vehicles and infrastructure as we renew our fleet. Utilise hydro-treated vegetable oil (HVO) for existing diesel vehicles not yet able to transition.
- **Property and Estates:** adopt zero emission systems as heating, ventilation, and air conditioning (HVAC) and other building systems require renewal. Replace our Juniper House laboratory, reducing our gas and electricity demands
- **Energy:** displace 45GWh of grid electricity through energy efficiency and on site renewable generation.
- **Reduce water demand**: implement of leakage reduction, mains renewal and non-domestic metering to support reduced water production and energy.
- **Process emissions:** implement monitoring, real time control and optimise existing waste water systems to reduce emissions; invest in research and piloting of new technologies to capture methane and ammonia and to limit process emission production and release.

**Increase Carbon Capture on our Land**

- Restoration of 500-1000 hectares of actively eroding peatland; continued management and maintenance of existing peatland.
- Creation of up to 4,000 hectares of new woodland with 6 million trees through active planting and natural regeneration.

**Biodiversity and Natural Capital**

- Biodiversity gain, nature-based measures and improved carbon on operational sites, water catchments, including with farming tenants for development of whole farm plans, and in capital projects;
- Improve biodiversity & natural capital assessment and reporting, and contribute to Scotland's 2045 Biodiversity goals
- Engage with landscape scale Pioneer Catchment partnerships to support service resilience through nature based and natural capital resilience measures (outlined in the Climate Change Adaptation Technical Appendix)

### *1.3.1 Minimise Investment Emissions*

It is important to note that there is no additional investment identified for investment emissions in SR27. The cost of decarbonising investment needs to be considered relative to the cost of decarbonising the economy. The UK Climate Change Committee estimates the cost of net zero to ~0.2% per annum of GDP for the Seventh Carbon Budget[7] and estimates of up to 3% of global GDP have been suggested[8]. Mechanisms such as the EU and UK carbon border taxes[9], along with global measures will increasingly penalise high carbon products, incentivising development of low carbon alternatives. The key materials in our capital programme are directly targeted by these measures.

It is expected that carbon will be reflected in programme costs, with high carbon materials increasingly costly in future. Scottish Water's pathway targets adoption of low carbon products as they become cost effective. As such, there is not an additional cost to the programme for decarbonising but we will drive action within existing strategies and procurement frameworks. We will work with our supply chain to make choices that will reduce the carbon intensity of our programme and avoid exposure to future carbon costs. We will:

[7] The Seventh Carbon Budget - Climate Change Committee
[8] the-net-zero-transition-what-it-would-cost-and-what-it-could-bring-final.pdf
[9] Draft legislation: carbon border adjustment mechanism - GOV.UK

- Reduce annual carbon in our investments from ~100,000 $tCO_2e$ to ~70,000 $tCO_2e$ (in a bigger programme) through the carbon reduction hierarchy set in our PAS 2080:2023[10] accreditation, which will be monitored and incentivised in the SR27 Enterprise Model. We will:
  - **Avoid:** evaluating the basic need of the development by exploring alternative means for satisfying the need without a new construction or through reusing and repurposing existing assets
  - **Switch:** assess alternative solutions that would reduce whole life carbon emissions through initiatives such as alternative scope and design, alternative low carbon materials and technologies
  - **Improve**: identify and adopt solutions, materials and techniques that improve the use of resources and design life of assets, including applying circular economy principles, nature-based solutions and low carbon construction techniques.

- This will be supported by investment carbon decision making and leadership where we will:
  - Continue to embed integrated carbon tracking systems within our procurement and costing processes such as BES (Benchmark Estimating Software)
  - Continue development and implementation of organisation-wide carbon literacy training programmes
  - Put in place a carbon procurement team to drive low carbon frameworks and specifications and Environmental Product Declaration (EPD) verification protocols.

Table 2 below summarises our key investments, alongside the costs and benefits to customers. You can also read, in more detail, our strategy and associated pathways to achieving net zero here: http://www.scottishwaternetzero.co.uk.

*Table 2: Climate Change Mitigation Investments*

| Investment Category | Investment Summary | Proposed investment (£m 23/24) | Projected Benefit |
|---|---|---|---|
| **Enhancement** | Bioresource Strategy* and PFI Return<br>• Allanfearn<br>• West Central Bioresource Strategy (Daldowie) | 475 | 77GWh energy generation<br>Natural gas and process emission reduction 20,000 $tCO_2e$ |
| **AR3** | Fleet Decarbonisation** | 127 | 5377 $tCO_2e$ |
| **AR3** | Property and Estates | 25 | Progress towards statutory requirement of net zero public buildings by 2038 |
| **Enhancement** | Juniper House Laboratory | 104 | Natural gas and electricity reduction [TBC tonnes $CO_2e$] |
| **Enhancement** | Energy | 46 | 45GWh from energy efficiency and on-site renewable generation [10,000 $tCO_2e$] |
| **AR3** | Mains renewal<br>Non-domestic metering<br>Additional leakage | 52 | 48Megalitres/day reduction in water<br>11GWh energy benefit |

[10] PAS 2080:2023 Carbon Management in Infrastructure | BSI

| Investment Category | Investment Summary | Proposed investment (£m 23/24) | Projected Benefit |
|---|---|---|---|
| | | | [2,500 $tCO_2e$] |
| **Enhancement** | Process Emissions | 42 | [6,000] $tCO_2e$ reduction |
| **Enhancement** | Carbon Capture | 18 | 500-1000Ha peatland<br>4,000Ha woodland contributing to overall net carbon sink of ~60,000 t $tCO_2e$ by 2040 |
| **Enhancement** | Biodiversity | 11 | 3x pioneer catchment programmes supporting adaptation and mitigation<br>Improved biodiversity and carbon across wider SW landholdings<br>Improved tracking and reporting biodiversity |
| **Total** | | **901** | |

*Bioresource strategy and PFI return are critical to the delivery of net zero emissions, but are driven primarily for other reasons and are presented in the relevant Water Environment Technical appendix
**this is the expected maintenance and replacement of existing fleet through which we will adopt low emission vehicles as appropriate

In addition to the above, and out with the regulatory business plan, we will continue to maximise the amount of third-party renewable electricity generation hosted on our estate. This will support Scotland's decarbonisation and meet our SR21 Ministerial Objective to produce or host three times the amount of electricity we consume by 2030 (up to 1320GWh) by 2030. A further 650GWh is expected to be delivered in the early part of SR27 to meet this objective[11].

[11] The Government's Programme for Scotland 2019-20

# 2 Background

## 2.1 Scope of Net Zero

Greenhouse gases (GHG) is the collective term for a range of gases that drive global heating, including key emissions relevant to the water sector: carbon dioxide ($CO_2$), methane ($CH_4$), and nitrous oxide ($N_2O$). Further trace gases include refrigerants, flame retardants and insulating materials that are also reported by the water sector. Each gas has a different "global warming potential" – for example nitrous oxide has almost 300 times the global warming potential of carbon dioxide. This means that although we emit far more carbon dioxide, relatively small amounts of nitrous oxide from waste water processes can have a big impact. For reporting purposes carbon dioxide is the reference gas and emissions are reported as tonnes of carbon dioxide equivalents ($tCO_2e$).

The scope of Scottish Water's emissions is set out in our NZER and covers:

- **Operational emissions**: emissions associated with the day-to-day delivery of services through operating assets, waste water process emissions, travel and fuels;
- **Investment emissions:** the emissions associated with maintaining and improving assets, including the carbon embodied within the materials we use; and
- **Land Carbon:** losses or gains of carbon across our landholdings.

Net Zero emissions is achieved when the balance of residual operational and investment emissions is matched or exceeded by the emissions captured by our landholdings (figure 1).

*Figure 2: Our net zero definition*

### *2.1.1 Operational Emissions*

Our annual operational emissions are calculated using the UK Water Industry Research (UKWIR) carbon accounting workbook[12] and are independently verified. The UKWIR workbook established the reporting boundary for the sector in terms of Scope 1, 2 and 3 emissions:

- **Scope 1:** Direct emissions - onsite combustion of fossil fuels; water, waste water and sludge process emissions; emissions from vehicles owned or leased by Scottish Water and refrigerants
- **Scope 2:** Indirect emissions - use of grid electricity
- **Scope 3:** Indirect emissions - business travel by public transport and private vehicles; outsourced activities including sites operated by PFI companies.

Scottish Water has reported operational emissions annually since its baseline year 2006-7, where it reported 470,000 $tCO_2e$ per annum. By 2023-24 operational emissions had fallen to 225,000 $tCO_2e$ through the reduced carbon intensity of grid electricity (greening of the grid), along with energy efficiency and renewables projects delivered in SR10 and SR15. A breakdown of the current emissions by type is shown below in Figure 3 and further information can be found in the NZER[13], whilst earlier footprint reports can be viewed in previous Sustainability Reports[14].

[12] www.ukwir.org
[13] Annual Update - Net Zero
[14] Energy and Sustainability - Scottish Water

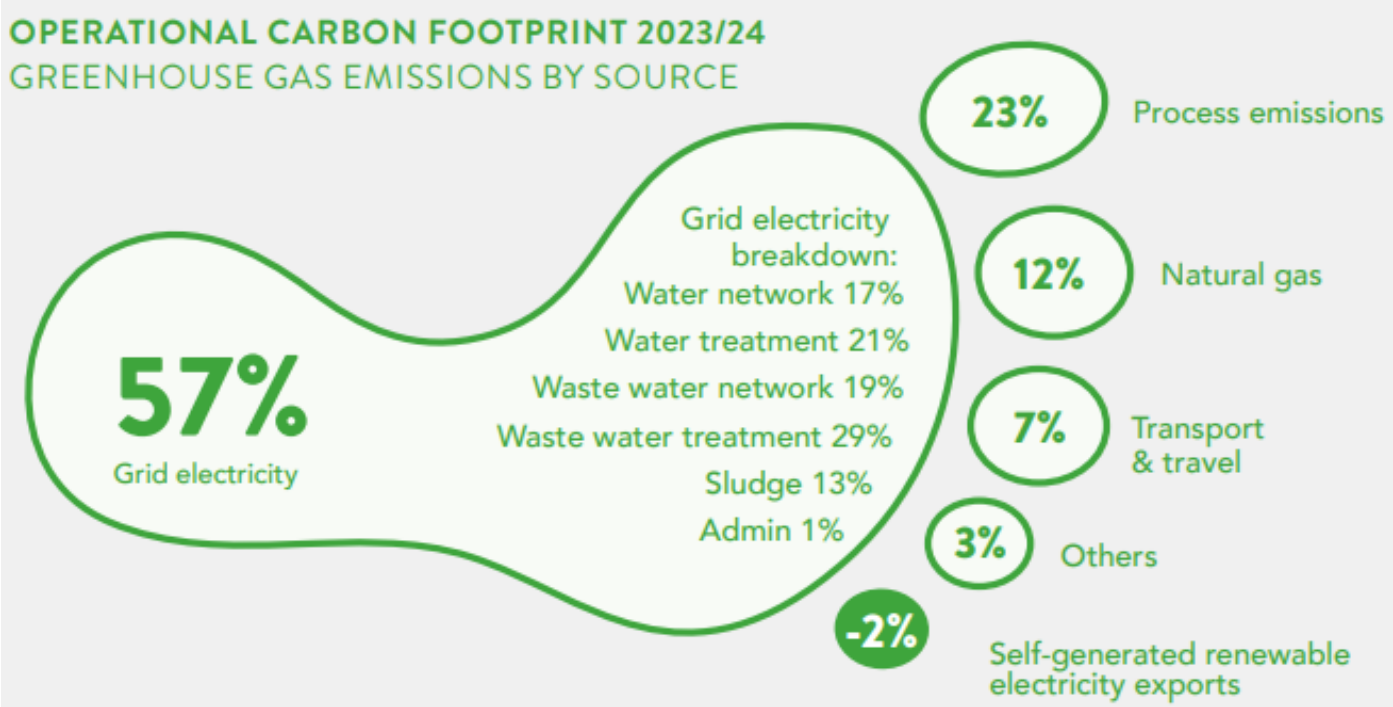



*Figure 3: Operational Carbon Footprint 2023/24*

Electricity remains our principal source of operational emissions. Grid decarbonisation is progressing, albeit slowly, with current UK projections suggesting it will be mid-late 2030s before the carbon intensity of grid electricity reduces to ~0.015 tonnes $CO_2e$ / GWh[15].

Process emissions arise from the breakdown processes to meet ammonia and biochemical oxygen demand (BOD), which liberate nitrous oxide ($N_2O$) and methane ($CH_4$) respectively and make almost a quarter of our operational emissions. Natural gas emissions comprise 12% of Scottish Water's footprint, dominated by natural gas in sludge processes, notably the PFI facility at Daldowie.

Process emissions are a feature of the UK Climate Change Committee's (CCC) advice to the UK government for the Seventh Carbon Budget[16] to meet net zero. It notes that emissions from the treatment of waste water and sludge are the most problematic for the sector with significant uncertainties and a need for new technologies to be developed. The CCC sets out the following water sector recommendations to the UK Government:

- Advanced anaerobic digestion is rolled out to all plants by 2030. Membrane aerated biofilm reactors are rolled out from 2030 to 10% of sites by 2045.
- Enhanced monitoring, real-time control and Digital Twins reduce process emissions through optimisation along with biomethane gas, covering and containment are rolled out from 2025 to 70% of sites.

These actions are reflected in our pathway to net zero and proposals for SR27, and in May 2025 the CCC is expected to publish similar advice to the Scottish Government to for the development of the Scottish emissions budget.

### *2.1.2 Investment Emissions*

Investment emissions are associated with materials and activities to maintain or enhance our assets. Technically such emissions are "owned" by the supply chains and industries that produce

[15] Valuation of energy use and greenhouse gas: background documentation
[16] The Seventh Carbon Budget

them, but as Scottish Water has a significant annual investment programme, and the opportunity to influence the investment choices, options and materials, we include them within our net zero emissions goal. The boundary of investment emissions is set out in sectoral guidance through UK Water Industry research[17] and described in our NZER (Figure 4).

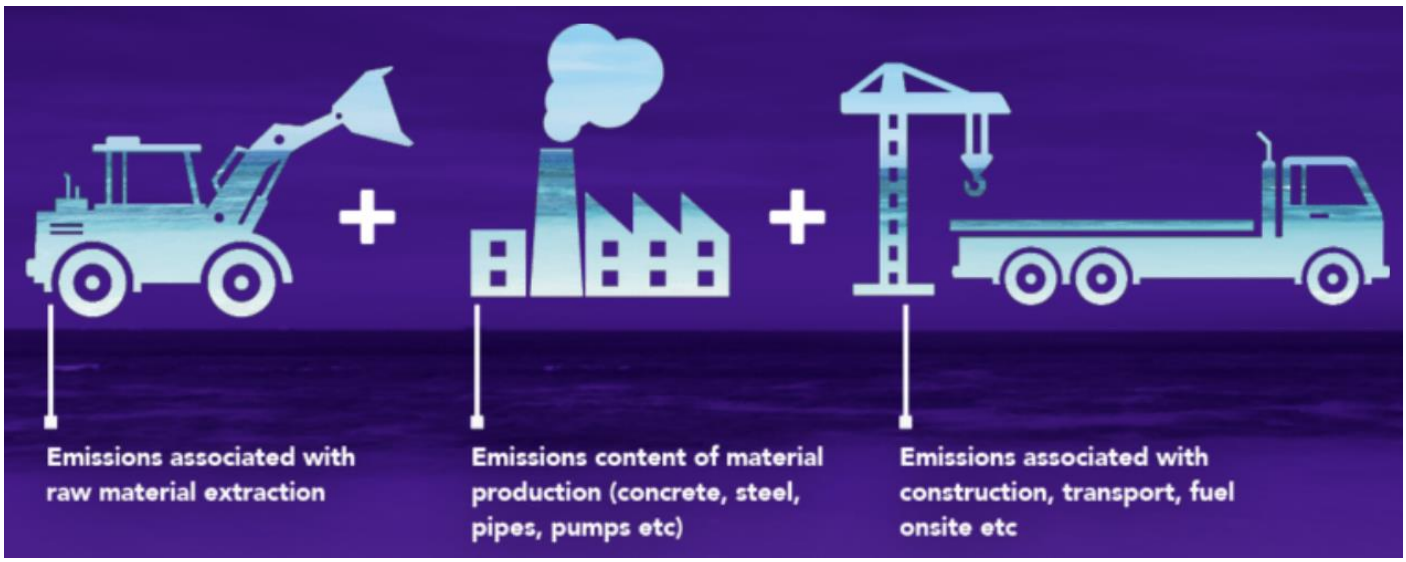



*Figure 4: Scottish Water Investment Emissions*

Data to support assessment and management of investment emissions is drawn from standard sources for materials[18], and from our supply chain partners. These are integrated into our investment cost and carbon databases that allow us to assess and report carbon associated with different projects in the delivery programme. Emissions are reported in absolute terms for projects, and aggregated as the emissions per unit of spend across the programme.

When the NZER was published in 2020 we estimated 200-300 tonnes $CO_2e$ were emitted for every £1m invested. Since then, data improvements and increasing adoption of lower carbon materials and techniques mean in 2024-25 we estimate 90 $tCO_2e$ per £1m, or 100,000 $tCO_2e$ across the programme. A breakdown of the sources of emissions across the programme in Figure 5 shows the highest carbon sources across concrete, steel, plastic, diesel and aggregate.

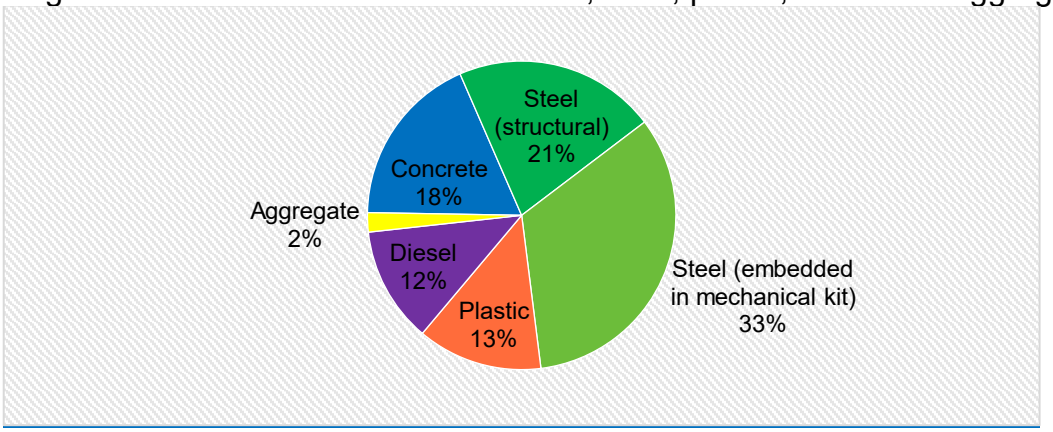



*Figure 5: Carbon source breakdown across materials*

## *Whole Life Carbon*

[17] www.ukwir.org
[18] Bath University / CESMM / Circular Ecology data

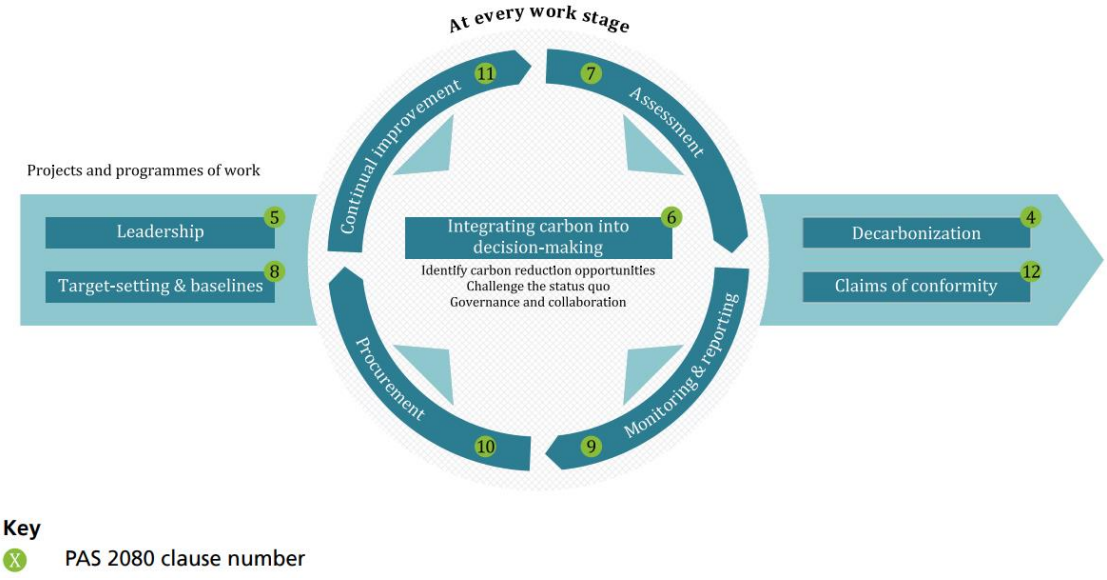
All projects in SR27 are expected to target the lowest carbon outcomes in terms of the emissions associated with investment and the ongoing emissions for the operation of the asset.

Carbon is integrated in decision making at all levels. Our asset management policies, approaches and outcomes must demonstrate how carbon has been considered for embodied carbon associated with delivery and the impact on operational emissions across the life of the asset. Projects must set out this "whole life carbon" across with options and show how the lowest carbon option has been selected or, if not, why (e.g. cost, service risk etc).

The opportunity to reduce carbon must be considered at the start of a programme. Across the stages of project development and delivery the opportunities to reduce carbon diminish as a project matures[19]. Working with our planning and delivery teams and supply chains we seek to:

- **Avoid Carbon:** The lowest carbon is where we do not have to invest. By reviewing needs, understanding performance, and if the outcome can be met in other ways, we only invest where there is a clear need and benefit
- **Select Low Carbon Options:** Where a need is confirmed we seek low or no carbon options. This may include Nature Based Solutions (NbS)[20] for example in natural drainage schemes or catchment management[21]; retaining as much of the existing infrastructure as possible and minimising construction
- **Design Low Carbon**: switch to different materials - By engaging with supply chains and delivery partners we have been piloting new low carbon concrete, adopting recycled materials for roads and adopting new products utilising low carbon materials within our standard specifications
- **Construct Low Carbon:** With delivery partners we have increasingly adopted techniques such as offsite manufacture, designing out materials and use of low or zero emission plant. These reduce time on site, reduce cost, increase safety and reduce carbon

In 2025 Scottish Water secured accreditation with the *PAS 2080: Carbon Management in Infrastructure*[22] standard. This recognised the establishment of processes, tools and data to support carbon management, and its embedment within decision making, project delivery with supply chains and in reporting, and compliance with the PAS: 2080 carbon management process (set out in Figure 6 below).




[19] Infrastructure Carbon Review
[20] Scottish Water Turns to Nature to Create Rainproof Communities - Scottish Water
[21] Work Progressing on Scottish Water's Largest Peatland Restoration Project to Date - Scottish Water
[22] PAS 2080:2023 Carbon Management in Infrastructure | BSI

*Figure 6: PAS 2080 carbon management process*

With this accreditation in place, we will continue growing our capabilities in SR27 to support net zero across all activities.

### 2.1.3 Land Carbon

Scottish Water owns over 23,000 hectares of land largely comprising rural and upland catchments around water sources. Much of this is open grass and moorland with ~13,000 hectares under agricultural tenancy (rough grazing). We have substantial woodland which is likely to be capturing significant amounts of carbon, this is balanced by peatland, which in poor condition is a net source of emissions.

Our most recent Biodiversity Report[23] set out our land carbon inventory produced by the James Hutton Institute which showed a range of losses and gains of carbon across landholdings. This is being used to target where and how we might improve carbon status – for example prioritising peatland restoration will significantly improve the carbon balance of our land, whilst creating new woodland will further ensure our land is a significant carbon sink.

*Table 3: baseline total estimated annual carbon released to or removed from the atmosphere by our land*

| | Annual Carbon Emissions (kt $CO_2e$/year) | | |
|---|---|---|---|
| **Land cover** | **Area (hectares)** | **Minimum net emissions** | **Maximum net emissions** |
| Peatland | 4,614 | 28 | 52 |
| Woodland/ Forestry | 3,808 | -54 | -24 |
| Grassland | 5,898 | -7.8 | -4.7 |
| Other landcover types | 8,899 | 14 | 14.9 |
| Total | 23,219 | -19.8 | 38.2 |

Fuller details of this approach are available in a technical report[24]. We continue to develop the methods, data and approaches, and have committed to updating this inventory three-yearly to understand and report how our land is changing and how this is impacting the amount of carbon captured.

The ranges reflect the uncertainty in the first assessment and the James Hutton Institute are presently finalising our first 3-yearly update. This will show narrower ranges and be reported in our 2025 Annual Return and 2026 Biodiversity Report.

In its advice to the UK Government on the UK pathway to net zero the UK Climate Change Committee highlighted the importance of reducing land-based emissions and improving carbon capture. Specifically, it recommended a "considerable ramp up" in peatland restoration with the proportion of natural or rewetted peatlands rising from 26% to 55% by 2040, and national tree planting rates doubling from 12,000 hectares per annum to 32,000 per annum by 2030[25]. As a significant landholder both are central to Scottish Water's actions.

[23] Scottish Water Biodiversity Report 2023
[24] Link to JHI report – not currently published externally
[25] The Seventh Carbon Budget page 108

## 2.2 Emissions targets, policy and legislation

### *2.2.1 Global and National Goals*

Globally the United Nations continues to pursue efforts to limit global temperature to below 2 degrees, with efforts to limit to 1.5 degrees in line with the Paris agreement. In keeping with this objective, the UK has a goal to achieve net zero by 2050, informed by the UK Climate Change Committee's advice[26] to UK and devolved administrations on a pathway to meet this.

The UK is expected to be net zero by 2050, and the CCC indicated Scotland could achieve net zero by 2045. In 2019 the Scottish Government declared a climate emergency[27] and committed Scotland to achieving this by 2045. This goal informed updates to the legally binding climate change targets set under the Climate Change (Scotland) Act 2009.

The Act places a duty on public bodies in Scotland to support the strategies and plans of the Scottish government to achieve its goals, and to report annually on progress. In 2020 Scottish Water published its NZER[28] to achieve net zero emissions across operational and investment activities by 2040.

### *2.2.2 Ministerial Objectives*

The Scottish Government issued objectives for SR21 to "make substantive progress in the 2021-27 period towards the climate change targets", defining targets such as achieving net zero emissions by 2040 and that Scottish Water should increase hosted wind and on-site renewable generation to 300% of its electricity consumption by 2030[29].

The Scottish Government will publish a revised Scottish Climate Change Plan with updated targets, profiles and budgets in late 2025. This will be informed by advice from the UK Climate Change Committee, due on 21 May 2025.

The draft Ministerial Objectives for SR27 continue to set expectations on carbon and climate change, noting again that Scottish Water must "make substantive progress in the 2027-33 period towards the climate change targets, and ensure it is on an appropriate trajectory to meet or exceed those targets".

Scottish Water's NZER outlines the actions and pathways needed to deliver this outcome, noting the risks and challenges we face and the need for further innovation and technology development to support the outcome in current and future regulatory periods.

### *2.2.3 Statutory Duties*

The statutory duties as they relate to climate change mitigation are presented in *Table 4: statutory duties related to climate change mitigation*.

*Table 4: statutory duties related to climate change mitigation*

[26] The Seventh Carbon Budget - Climate Change Committee
[27] The Global Climate Emergency - Scotland's Response: Climate Change Secretary Roseanna Cunningham's statement - gov.scot
[28] Intro - Net Zero
[29] The Government's Programme for Scotland 2019-20

| Statutory Duty/Regulatory Obligation | Summary |
|---|---|
| Climate Change (Scotland Act) 2009 (as amended) | • Scotland is targeting net zero emissions by 2045 in line with the guidance from the UK Climate Change Committee, and statutory climate change targets and budgets are set accordingly.<br>• We await publication of the updated statutory climate change plan that will set carbon budgets in the Scottish economy, due for consultation in late 2025.<br>• The Scottish Government expects public bodies to achieve net zero emissions and support delivery of its Climate Change plan.<br>• Public bodies must seek to eliminate all emissions before netting off or offsetting and must report annually on progress<br>• Further statutory guidance on compliance with the Act and the Public Body Duty is presently being consulted by the Scottish Government[30] |
| Nature Conservation Act 2004<br>Wildlife and Natural Environment Regulations 2011 | Scottish Water has obligations under the 2004 Nature Conservation Act and the 2011 Wildlife and Natural Environment Regulations to further the conservation of biodiversity in Scotland, contribute to the Scottish Government's biodiversity goals and to report progress 3-yearly. |
| Streamlined Energy and Carbon Reporting Regulations | Scottish Water is captured under the UK Streamlined Energy and Carbon Reporting regulations (SECR), required to report energy and carbon across the Scottish Water group. |
| Circular Economy (Scotland) Act | Scotland has also enacted the Circular Economy (Scotland) Act 2024, a significant piece of legislation aimed at fostering a sustainable, circular economy.<br>This Act mandates Scottish Ministers publish a comprehensive circular economy strategy, setting clear targets to reduce waste, enhance recycling, and promote the reuse of materials.<br>It also empowers Ministers to implement measures that ensure businesses manage waste responsibly, thereby contributing to environmental conservation and the reduction of carbon emissions. |

[30] Public Consultation Summary - Climate change duties - draft statutory guidance for public bodies: consultation - gov.scot

## 2.3 Strategic Enablers

Our NZER highlights that Scottish Water cannot deliver net zero on its own. We must work with academics, industry and wider partners to identify, develop and deploy new technologies in areas such as process emissions and low carbon materials. Our NZER identified key strategic enablers as:

- **People**: the skills, capabilities and behaviours needed to support net zero pathways is a priority and we will invest in training and recruitment to support the net zero skills we will need;
- **Procurement:** strong partnerships with delivery partners and supply chains, backed by procurement frameworks that require carbon plans for products, materials and services, backed by appropriate incentives are vital to support net zero;
- **Investment Planning / Governance**: the embedment of carbon within strategy, policy and project appraisals, a focus on "lowest whole life carbon" and the creation of a Net Present Cost and Carbon assessment for all projects is ensures low carbon is central to making low carbon choices; and
- **Innovation**: many of the technologies we will need are not yet available and we will continue to pursue research in waste water process emissions, digital and analytical tools and materials research for low carbon.

## 2.4 Wider Benefits to Customers and the Environment

Providing water and waste water services releases over 200,000 tonnes of carbon dioxide equivalent (tCO2e) annually. Failing to address emissions may lead to increased financial exposure to carbon prices. The UK Government currently projects that carbon price will increase significantly towards 2040[31]. These costs will be reflected in the cost of carbon offsets to meet net zero should we fail to do so within our actions and will become more expensive as more organisations seek to purchase carbon credits. Globally, carbon taxation, particularly measures such as the UK[32] and EU[33] Carbon Border Adjustment Mechanisms will make carbon intense materials (specifically concrete, iron, steel and aluminium) across the EU and UK more expensive. This will impact input prices across the economy and our investment programme.

Playing our part and making progress on net zero will help sustain our service and reduce our, and ultimately our customers, exposure to these risks. The way we propose to deliver net zero will also deliver wider benefits to society, the economy and the environment.

**Enhancing our Environment**

Scottish Water's latest Biodiversity Report[34] sets out the current biodiversity and natural capital status of our landholdings. Investing in land carbon capture through peatland restoration and woodland creation will have significant benefits to biodiversity and make a major contribution to Scotland's Biodiversity Strategy to 2045[35].

**Climate Resilience**

A major benefit to landscape scale restoration and woodland creation is to make nature, and hence the water we rely on, more resilient to climate change. The Adaptation Technical Appendix and our Climate Change Adaptation Plan note that most of our water sources are under pressure from climate change. Improving the carbon status of our lands will also deliver more resilience in our catchments.

[31] Traded carbon values used for modelling purposes, 2024 - GOV.UK
[32] Carbon Border Adjustment Mechanism - House of Commons Library
[33] Carbon Border Adjustment Mechanism - European Commission
[34] 211223Biodiversityreport23FINAL.pdf
[35] Scottish Biodiversity Strategy to 2045 - gov.scot

### *2.4.1 Rural Economy – Forestry*

Planned woodland creation will be a mix of native, biodiverse woodlands and commercial woodlands where appropriate. Scotland is a net importer of timber, and our programmes will support future high grade materials for construction.

**Access and Recreation**

Scottish Water promotes responsible access to its sites for recreation and supports this through seasonal rangers and working with partners such as Forestry and Land Scotland to increase access and pathways. Landscape restoration and woodland creation will provide more opportunities.

**Electricity Generation**

Hosting more third-party wind on our land will make a significant positive contribution to the greening of the UK National Grid

**Circular Economy and Resource Recovery**

Adopting advanced anaerobic digestion technologies for managing bioresources will significantly increase the amount of value (energy, materials). The process emission methane and nitrous oxide pathway development will offer further resource recovery opportunities, particularly for ammonia.

Decarbonising investment will drive partners and supply chains to explore and develop innovative materials and techniques to reduce resources and emissions, including recovering and reusing materials wherever possible.

**Innovation and Learning**

Our NZER notes that innovation and research are critical to delivering net zero. We will build on the existing partnerships (e.g. Hydro Nation Chair[36]) with academia and research providers to stimulate innovation with a focus on piloting and deployment to support net zero.

[36] Hydro Nation Chair Research & Innovation Programme

# 3 Our Customers

## 3.1 What our customers expect from us

### *3.1.1 Our approach*

Climate change and the need for emission reduction, adaptation and energy/resource security continues to have a growing profile and impact. Frequent global weather events across the news cycle, impacts felt in Scotland through droughts, floods, and elevated energy costs have increased the visibility and awareness of our climate emergency amongst the public. Our customers expect us to:

- Provide an affordable, sustainable, low carbon service;
- For us to protect our services from the impacts of climate change; and
- To contribute to a Flourishing Scotland.

As part of our SR27 work and to understand what our customers think, we have conducted a Research Synthesis exercise – which used more than 50 pieces of customer research (mostly qualitative), spanning the last decade. The focus of this work was across Direct Benefits, Strategic Topics (such as Asset Maintenance, Climate Change and Managing Rainwater), and the SR27 Technical Appendices.

This work was conducted using the following steps:

1. We defined the purpose of this synthesis;
2. We collected all available sources to assess;
3. We extracted insights from these sources and mapped them to our topics (areas of focus);
4. We conducted a topic scoring assessment and identified key insights; and
5. We synthesised these key insights – and identified any changes over time or divergence of views.

You can read about this work in more detail in our Customer Research Technical Appendix.

### *3.1.2 Summary of engagement*

From this research, we know that climate change is an important issue for our customers – and there is concern about the impacts of climate. This is especially true for younger people and our vulnerable customers[37]. Most of our customers have a good sense of the impact climate change will have on our services and infrastructure but others are surprised by the scale of the issue[38].

Customers generally support our ambition and objective of tackling our greenhouse gas emissions – and we know businesses, in particular, are more interested in the *how* of achieving our net zero targets. Our customers believe we have a role to play in leading on protecting the environment and tackling climate change – and express an urgency for us to take action. There isn't, however, a consensus amongst customers on the methods/steps we should use to tackle climate change – but there is a general sense that Government and businesses should be doing more on the 'how' and leading by example.

Table 5 sets out our key insights alongside the relevant research questions[39].

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[37] % agree: I am concerned about the impact of climate change on Scotland's water supply
- Current Bill Payers: 46%
- Future Bill Payers: 68%
- Those with vulnerabilities are significantly more likely than nonvulnerable customers to agree (55% vs. 47%)

[38] When asked what kind of challenges Scottish Water will face in the future, participants found it relatively easy to identify a range of challenges. The challenges customers mentioned related to four main themes: environmental change, political uncertainty, increased demand and ageing infrastructure. Most groups referred to climate change, pollution and the impact worsening weather conditions will have on current infrastructure.

[39] Customer Research Technical Appendix

*Table 5: key research insights from our Customer Research Technical Appendix*

| Research Question | Key Insight |
|---|---|
| What are **customer views** on climate change? | Climate change is acknowledged as an important issue by customers, with many customers concerned about the impact of climate change on the natural environment. Many customers have a sense of urgency, referring to recent weather events, and younger people in particular feeling anger at the damage that has already been done. Customers look to governments and businesses to provide leadership and guidance on tackling climate change, and to lead by example. Many customers report that they are already doing what they can to address climate change, whilst other are less certain about what they can personally do to help. |
| What are customer **expectations** of Scottish Water's carbon footprint? | Many customers look to Governments and businesses to bear the most responsibility for reducing carbon emissions. Many customers also expect companies to act as good corporate citizens in this respect with environmental sustainability being a key factor in finding an organisation admirable. Increasingly, customers expect companies to be 'carbon neutral'.<br><br>Customers are generally supportive of Scottish Water's Net Zero ambitions, resonating most with younger customers, but also with older customers, who are concerned for future generations. Business customers support Scottish Water taking accountability for carbon neutrality and feel that the level of ambition is fair. Expectations for investment are more variable. Investing to adapt to effects of climate change (e.g. increased droughts), can be seen by some customers as addressing the symptom, rather than solving the root cause of carbon emissions. Other customers accept that reducing carbon emissions is important, but place a higher priority on Scottish Water's core services. |
| What are customer **expectations** of Scottish Water protecting and improving the environment? | The natural environment in Scotland is perceived by customers to be one of Scotland's greatest assets, with rivers and coastlines particularly identified as an important part of Scotland's national character. Customers expect Scotland's natural environment to be protected for social and economic reasons, in addition to nature and ecosystems.<br><br>As a publicly owned company, customers expect Scottish Water to care about the environment and to be sustainable. Customers are positive about Scottish Water objectives around enhancing the natural environment, with some customers pleased to see Scottish Water going 'above and beyond' their perception of standard water company operations. Some customers can be uncertain about how much responsibility Scottish Water can or should take in enhancing the natural environment. This uncertainty, combined with customers' perception that Scotland is already beautiful, can mean that this can be less of an immediate concern for customers in comparison to what are seen as core services. However, when customers are informed of the work that Scottish Water does in this area they respond positively, and want Scottish Water to share information about these inherently interesting and impressive initiatives more widely. |

Our SR27 approach to Climate Change Mitigation addresses customer feedback by:

- **Continuing to place Net Zero as one of the 3 key ambitions** for the business and linking mitigation and adaptation responses to climate change to longer terms service benefits;
- **Continuing to focus on measures that reduce emissions** cost effectively – energy efficiency and renewables can deliver financial benefits;
- **Focussing on land based emissions** through peatland restoration and woodland creation in ways that are cost effective and also deliver for climate resilient landscapes and biodiversity gain;
- **Working with industry and supply chains** to support decarbonising the materials we need and the wider economy; and
- **Being open around the challenges, our emissions and the importance of innovation** to identify and develop the technologies needed for net zero.

## 3.2 Partnership working

Scottish Water cannot deliver net zero emissions in isolation – we must work in partnership with many stakeholders and sectors to find and deliver the changes and interventions to achieve net zero. A range of partnerships are essential to provide intellectual support to research, identify, pilot and develop newer approaches to managing carbon, and some of the more critical ones are:

## 3.3 Partnering for Capital Investment

Strong partnerships have been built with the existing delivery partners and major supply chain organisations. This is critical as whilst investment emissions are part of our net zero journey, they are "owned" by supply chains and industries, we need them to act.

Partnering is critical to building capacity and knowledge, and confidence in suppliers to invest in low carbon. Engagement and partnership at all levels is helping learning and knowledge sharing through tools and platforms such as the "Net Zero Network" (Net Zero Network ).

More widely we are engaging the wider sector, such as Infrastructure Client Group, OFWAT Innovation projects (e.g. 3D Print infrastructure), UKWIR and Water UK to develop approaches to common problems. We also continue to strengthen our engagement in Scotland with the Supply Chain Sustainability School (Home - Supply Chain Sustainability School ) to shape and share knowledge including finding and developing further innovative opportunities.

### *3.3.1 Partnering in Research - Process emissions*

UK Water Industry Research highlighted in its WWTWs' Process Emissions: Optimisation of Current Processes report that joint work across water companies, research providers and technical consultancies in the mitigation of process emissions is essential. We are members of the **U.K. and Irish Community of Practice for Process Emissions** and the **Process Emissions Action Community (PEAC).** Both groups support shared learning from UK, European and global partners to accelerate our understanding. This also supports collaborative projects and joint work to develop and pilot new technologies on the common and urgent problems of process emissions, driving progress at a water sector level.

### *3.3.2 Partnering for Land Management*

To deliver land use change for carbon, biodiversity gain and climate resilience we need to work with communities, other land interests (tenants, neighbouring landowners), regulators and government. Partnerships are bespoke and geographically specific and current examples include Loch Katrine with our tenant, Forestry and Land Scotland. The Angus Glens Partnership comprises Angus Council, NatureScot, Forestry and Land Scotland and landowners focused on how we might improve the carbon, biodiversity and landscape resilience of that area, protecting key water sources from climate change and capturing carbon. Similar partnerships exist in Lothians and Borders.

Joint work is also critical with organisations such as Peatland Action[40], Scottish Forestry[41] and with researchers such as the James Hutton Institute to understand, plan and deliver land use change.

Strong partnerships for delivery will be further developed as set out in our Climate Change Adaptation Technical Appendix, where Pioneer Catchment work in the Dee, Angus Glens and Almond involving Scottish Government, SEPA, NatureScot, Local Authorities and others will focus on co-ordinated action. This will provide a model for further such work to support net zero, climate resilience and biodiversity at landscape scale.

[40] Peatland ACTION | NatureScot
[41] Scottish Forestry - Home

## 3.4 Demonstrating Customer and Stakeholder Support

Our customers view climate change as an important issue to resolve, with some customers themselves doing what they can to help mitigate the effects of climate change, and others looking to government and leadership as they are unsure how to personally help. ***In SR27, we plan to invest in the right people: the skills, capabilities and behaviours needed to support net zero pathways is a priority and we will invest in training and recruitment to support the net zero skills we will need to resolve this important issue.***

Generally, both our household and business customers agree that more needs to be done to mitigate against the effects of climate change. However, it is a mixed view as to how to deliver this. Some customers believe we should be investing in the mitigation of the systems of climate change (e.g. drought) and others believe we should be investment in the cause which is reducing emissions. ***In SR27, our goal is to reduce annual carbon in our investments from ~100,000 tCO2e to 70, 533 tCO2e across a bigger programme through the carbon reduction hierarchy PAS 2080:2023 which will be monitored and incentivised in the SR27 Enterprise Model.***

Some of our customers are happy with the lengths we go to protect our environment whereas others believe that it is already beautiful and therefore should not be a priority. However, they are positive about the work that has been done already. ***In SR27, we plan to invest in land carbon capture through peatland restoration and woodland creation in line with our latest Biodiversity Report.***

# 4 Our SR27 Investment Approach to Climate Change Mitigation

## 4.1 Long-term Outcomes and Pathways to Net Zero Emissions by 2040

### *4.1.1 Climate Mitigation Strategy Outcomes by 2040*

Our Climate Mitigation Strategy is to go "Beyond Net Zero Emissions" by 2040, as set out in our Net Zero Emissions Routemap (NZER)[42]. We will do this across Operational Emissions, Investment Emissions, and through Carbon Capture, following the "emissions hierarchy" of prioritising emission reduction before looking to 'net off' through carbon capture residual emissions we cannot eliminate (covered in more detail below in 3.3).

The NZER identified long-term outcomes (*Table 6* below) and we report progress annually through the NZER update, our Annual Report and our Annual Regulatory Returns to the WICS.

*Table 6: Our outcomes across sources of emissions by 2040*

| Source Of Emissions | Outcome |
|---|---|
| **Electricity** | • We will reduce our consumption of electricity;<br>• We will maximise the energy we generate from bioresources; and<br>• We will generate or host all the energy we consume. |
| **Process Emissions** | • We will reduce our production of process emissions; and<br>• We will maximise the energy we generate from bioresource. |
| **Gas & Fuel Oil** | • We will maximise the energy we generate from bioresource;<br>• We will reduce the consumption of fuel oil for standby generation; and<br>• We will reduce the use of gas for heating buildings. |
| **Transport & Travel** | • We will reduce the miles travelled by our fleet;<br>• We will reduce our business travel; and<br>• We will replace our fleet with zero emission vehicles. |
| **Investment** | • We will select low emissions options and design for net zero;<br>• We will procure low or zero emission construction materials; and<br>• We will build using low or zero carbon construction techniques. |
| **Storing Carbon** | • We will store more carbon than we produce;<br>• We will increase the amount of carbon dioxide stored on the land we own; and<br>• We will increase biodiversity on the land we own. |

## 4.2 Management approaches informing investments

Carbon mitigation is promoted across all areas of investment in terms of the need to consider the "Whole life Carbon" in any choices we make, and its inclusion in Net Present Cost + Carbon calculations for investment appraisal. There are several Management Approaches that support net zero either directly (e.g. energy efficiency) or indirectly (bioresource treatment) that form the

[42] Intro - Net Zero

basis of climate change mitigation investments, summarised in Table 7 below.

*Table 7: Net Zero related Management Approaches summary*

| Management Approach | Strategic Elements Related to Net Zero |
|---|---|
| MA024 Waste water Bioresources Treatment and De-watering Centres | Establishes strategic investment choices and approaches to recover value (resources, energy etc) and minimise emissions across sludge and bioresources. |
| MA027 Energy Efficiency (Water and Waste water) | Reduce consumption of grid electricity by investing in energy efficiency where there is a positive payback. Portfolio of opportunities prioritised based on payback. |
| MA028 Catchment Management | Establishes approach to catchment assessment and management (including peatland restoration) to reduce risk to water quality, with associated carbon benefit. |
| MA029 Property and Estates | Promote planned and statutory maintenance of existing buildings and make progress towards carbon neutral buildings (2038 deadline for public bodies in Scotland), with carbon central to decision making. |
| MA077 We Enhance Scotland's Environment | Understand the status of Scottish Water landholdings and promote projects to improve carbon capture. |
| MA099 Water Demand Management | Manage and reduce losses of water (including leakage) across the water asset base, manage and reduce losses from customer supply pipes. |
| MA101 Renewable Energy Enhancement | Promote on site renewables at Scottish Water assets to displace the use of grid electricity, including the use of battery storage and export of excess power. Portfolio of projects developed and prioritised based on IRR of 4% and delivered through Scottish Water Horizons |
| MA102 Biodiversity and Natural Capital | Establish the biodiversity and natural capital status of Scottish Water land, develop approaches to biodiversity gain and land management that supports services through investment in natural capital on Scottish Water estates, and embed in future investment planning to support biodiversity and carbon gain. |
| MA108 Private Finance initiative Return of Assets to Scottish Water | Manage the PFI contract expiry process and promote the return of assets (notably Daldowie sludge treatment centre) in ways that support carbon objectives. |

## 4.3 Selecting the right investments

### *4.3.1 Emissions Hierarchy and Public Body Duty*

The "emissions hierarchy[43] highlights the importance of eliminating emissions at source wherever possible, and that offsetting emissions should only be applied to those emissions that cannot be eliminated. The Scottish Government's draft Guidance to Public Bodies[44] on compliance with their duty under the Climate Change (Scotland) Act draws from this and requires public bodies to develop net zero pathways where "…*net zero carbon (or net zero) is intended to describe an approach which reduces an actor's emissions as far as possible, with only the remaining unavoidable residual emissions offset through credible and robust offsetting mechanisms*.". Unavoidable emissions are further defined by as "…*those emissions which remain after a body has taken all reasonable steps to reduce or remove them*".

### *4.3.2 Strategic Pathways to Net Zero*

#### Operational Emissions and Carbon Capture

Our NZER outlines the activities required to support a pathway to net zero emissions by 2040, and we have used this to prioritise activities in SR27. The profile in Figure 7 is the anticipated trajectory for operational emissions and carbon capture to 2040.

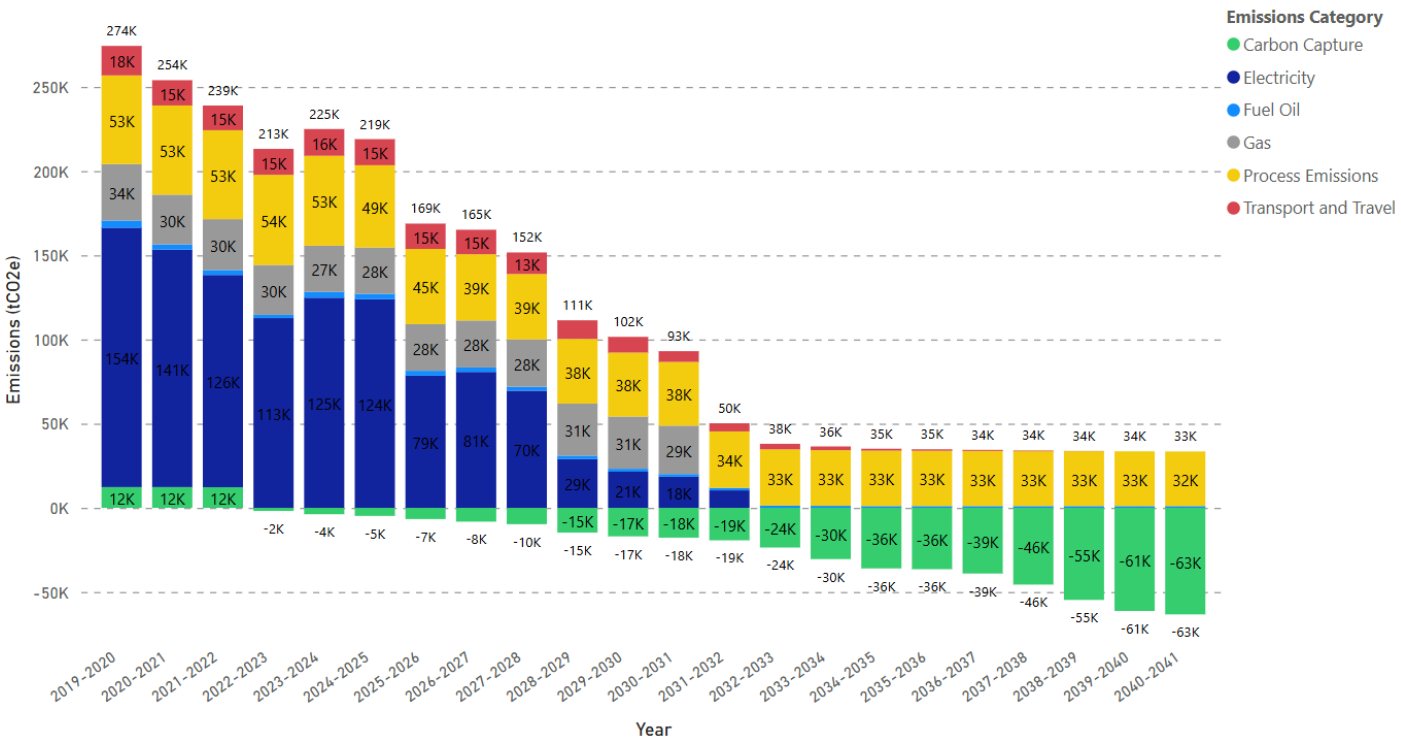


*Figure 7: Anticipated trajectory for operational emissions and carbon capture*[45]

This profile reflects the NZER and planned investment in SR27, specifically the benefits arising from:

- The greening of the electricity grid (projections from the Department of Energy Security and Net Zero[46]);

[43] GHG Management Hierarchy updated for net-zero
[44] Public Consultation Summary - Climate change duties - draft statutory guidance for public bodies: consultation - gov.scot
[45] For SR27 outcomes see Table 1
[46] Energy and emissions projections 2023 to 2050

- Hosting a further 650GWh wind generation on our land (3rd party investment benefit in Daer and Dunwan Dam 2028-29 and Whitelees 2032-33);
- 45GWh energy efficiency or onsite renewables by 2033;
- Leakage and demand management delivers 11GWh reduction in electricity;
- Improvements in monitoring and reduction of process emissions;
- Creation of over 4000 hectares of new woodland (including natural regeneration) and restoration of all peatland in poor condition; and
- The Bioresource Strategy and PFI Return - notably Allanfearn STW and West Central Bioresource Strategy (Daldowie) deliver 80GWh energy generation and $CO_2e$ reduction due to natural gas cessation and process emission reduction.

We will require further progress, particularly on process emissions in SR33 and SR39, but this pathway maintains the goal of net zero by 2040.

## Investment Emissions

Our NZER outlined the scope and scale of investment emissions based on data gathered from delivered projects. The bulk of emissions are associated with the use of concrete, steel, aggregates, plastics (e.g. pipes), onsite fuels etc, and techniques used to deliver capital investment (e.g. excavation vs building on the surface, offsite fabrication vs *in situ* construction).

We developed a pathway for construction decarbonisation using industry supply chain analysis to identify carbon profiles for materials such as concrete, steel and plastics, and when lower carbon products (e.g. electric arc furnace steel) might be available. It also considered potential cost premia that might be applied for early adoption of low carbon materials and mechanisms such as the EU and UK Carbon Border Adjustments[47] [48] that will penalise high carbon materials (including those used in our investment programme) through carbon taxation. Together with our data this enabled a pathway with a range of carbon outcomes depending on the pace and adoption of materials (Figure 8).

[47] Carbon Border Adjustment Mechanism - European Commission
[48] Draft legislation: carbon border adjustment mechanism - GOV.UK

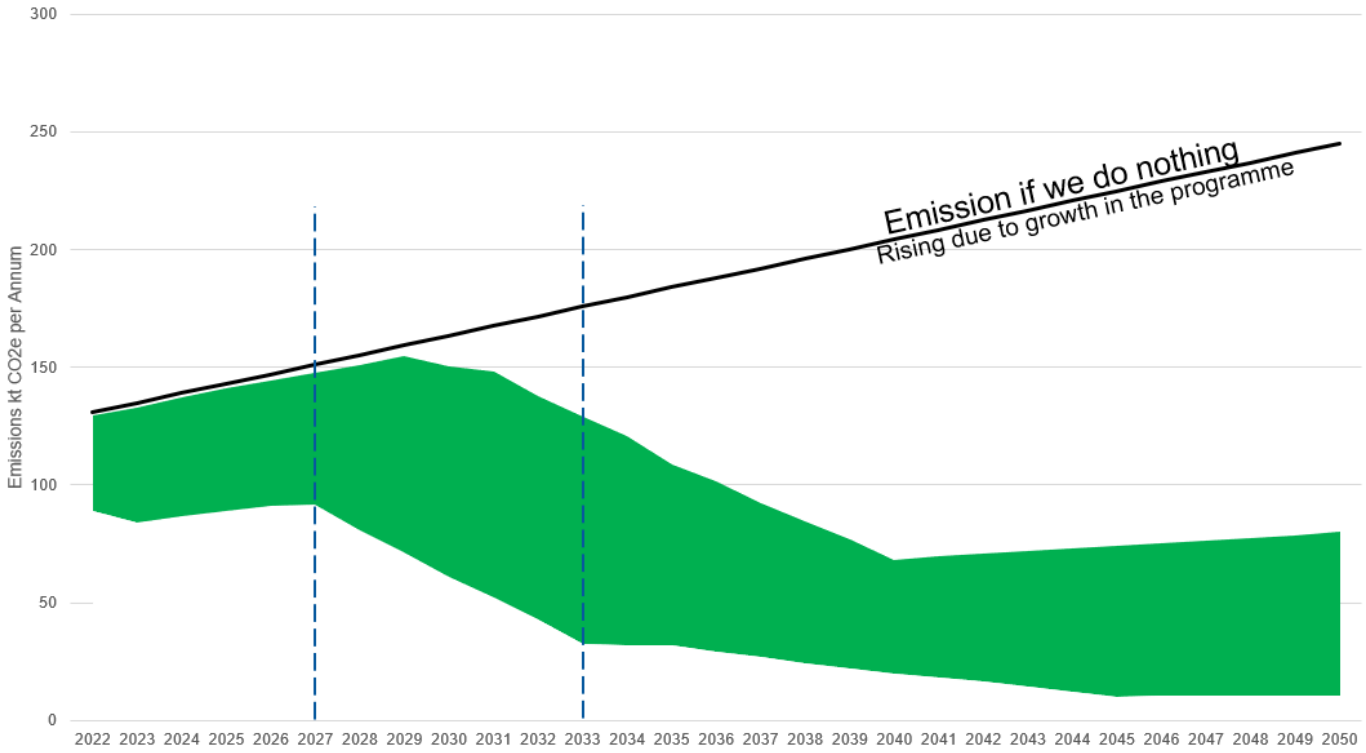


*Figure 8: potential pathways for investment emissions*

There are wide ranges in emission projections owing to the significant uncertainty. If we, or the market, do nothing then gross emissions will rise owing to increased investment forecast to 2040 will naturally lead to more emissions. The CPI+4%investment projection will increase the overall scale of the programme and the need for innovation and adoption of new techniques to minimise emissions.

Decarbonisation of capital investment is **not considered an additional cost to the programme** – i.e. no premium for low carbon choices has been applied under the CPI+4% scenario. Legally binding UK, European and global goals for decarbonisation remain, the costs of which may be reflected in the wider economy and measures such as UK and EU carbon border taxes due to commence in 2026[49] will target high carbon materials, principally those used withing our programme – concrete, iron, steel and aluminium. The goal is to increase the costs of high carbon materials and incentivise low carbon materials, and we expect in the long term that low carbon choices will increasingly be the cost-effective measure.

*Case Studies – Investment Decarbonisation*

We already deploy approaches to avoid / low carbon design; procure low carbon materials and build with low carbon techniques, across our programme, and will continue to drive this across the SR27 programme through the new Enterprise model:

*Emergency Sewer collapse at St Andrews* – our delivery partner implemented a low carbon site set up, no dig technologies, re-use of existing materials, zero emission plant and low carbon pipe. This reduced carbon and delivered work sensitively for the customers and the environment, keeping the golf course open throughout the works. Despite the urgency to complete 100tCO2e of carbon was saved.

*Stanley Hollowhouse, sample tap kiosk* – our delivery partner trialled a net zero carbon site approach. Traditionally, constructing a standard kiosk produced ~3,150kg$CO_2$e in emissions.

[49] Draft legislation: carbon border adjustment mechanism - GOV.UK

Through innovative design, construction methods (zero emission plant, zero offsite waste) and low-carbon materials (pre-cast cemfree concrete), this project achieved 83% reduction in emissions. This is being replicated across the sample tap programme.

Across the programme we are increasingly seeing zero emission plant and alternative fuels being adopted to reduce site establishment emissions by up to 90%, and we are making progress in identifying and adopting low carbon concrete and green steel. Two of our partners in the manufacture of mechanical and electrical equipment such as treatment units have offsite manufacturing facilities around the country to support low carbon assembly and reduced time on site.

For pumps and valves one of our delivery partners is now offering a remanufacture service rather than replace. Depending on the size of the asset there can be carbon, cost and time savings associated with this approach rather than replacing.

This is a developing area with significant uncertainty and reliance on external actions in the supply chain. We will continue to work with supply chains and delivery partners to further decarbonise the programme.

### *4.3.3 Our Marginal Abatement Cost Curve*

In line with the emissions hierarchy and our Public Body Duty, we developed a Marginal Abatement Cost Curve (MACC) to visual the costs and potential emissions reductions associated with various abatement options. It is a snapshot in time and needs to be updated regularly, and based on projects we have delivered and wider market information it currently shows:

- Energy efficiency and renewables are the most cost-effective abatement options, presenting a positive Net Present Value (NPV) payback;
- Land measures sit in the middle of our curve, with a cost of ~£30 per tonne of Carbon;
- Process emission abatement is towards the right of the curve reflecting the need for more innovation to develop cost-effective deployment of measures;
- The high cost for Combined Heat and Power (CHP) is linked in with the wider costs of the bioresources sludge strategy, which has further investment drivers.

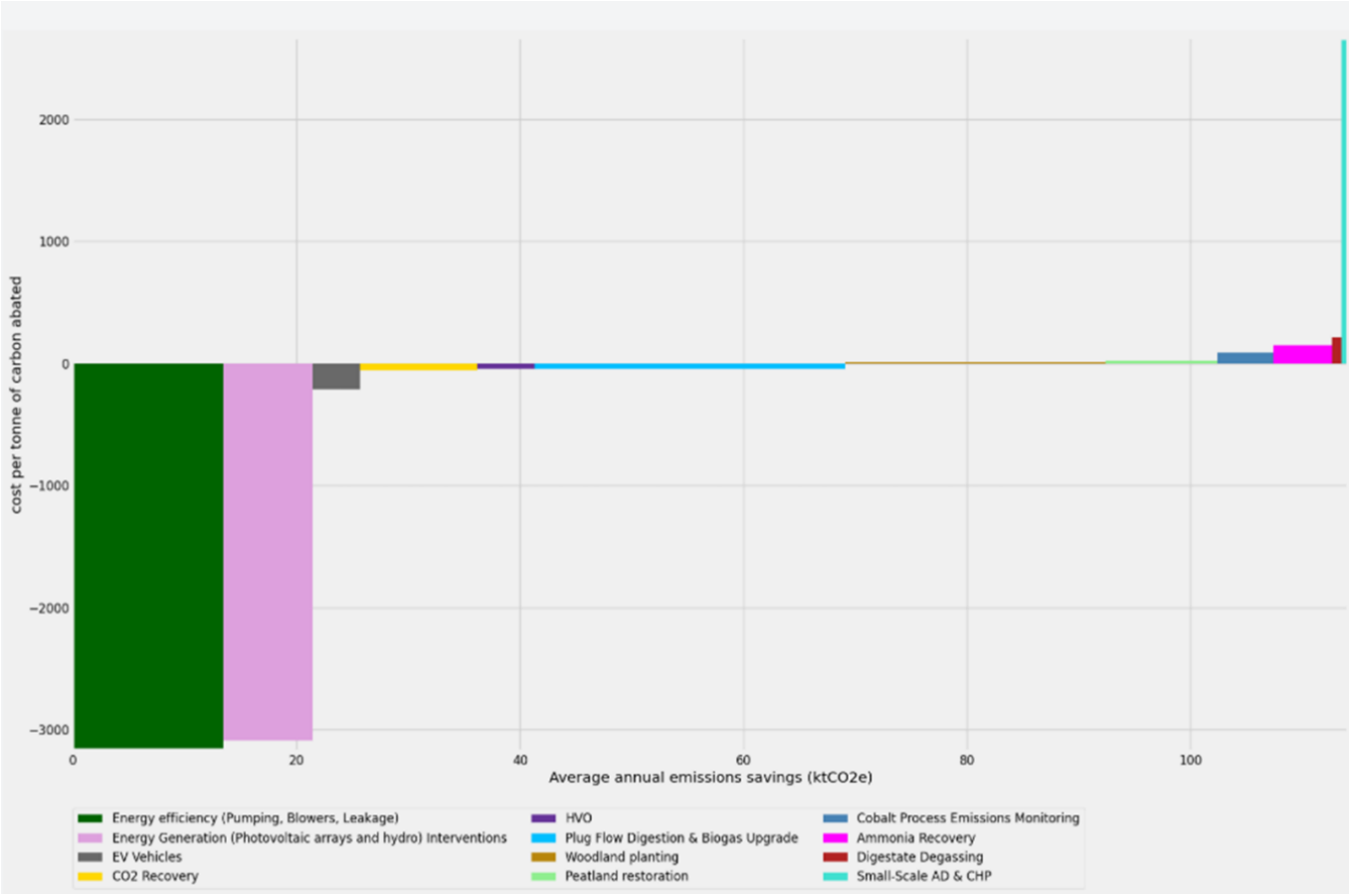


*Figure 9: Marginal Abatement Cost Curve*

Our SR27 plans are informed by this, noting we will need to regulatory review and update the MNACC to reflect actual costs and the impact innovation and new approaches may have on the attractiveness of options.

## 4.4 Our SR27 Investments to deliver against our Net Zero Emissions Routemap

The level of investment we require in SR27 was developed through several investment planning scenario options. The first phase of optioneering involved creating a comprehensive range of overall investment scenarios, which encompassed potential outcomes and investment requirements across all areas of investment demand.

For climate change mitigation, this was informed by the NZER which sets the activity areas we need to pursue to support net zero by 2040. There are limited pathways to net zero and we need all measures to be deployed along with innovation and further action in future periods.

An initial investment option was developed from the bottom-up to incorporate the necessary investment demand needs to fulfil the long-term investment strategy, our net zero outcomes, and draft SR27 Ministerial Objectives. This was followed by the development of a series of top-down investment scenarios, which imposed constraints on the bottom up first pass demand needs. The effect of these constraints was to require certain investments to be reduced or eliminated.

The three constrained investment scenarios we considered were:
1. High: total investment which would raise bills by CPI + 6.5%;
2. Working Reference: a total investment which would raise bills by CPI + 4%; and
3. Flat charges: total investment which would keep bills flat at CPI +0%.

These three investment scenarios each have an impact on our ability to meet our net zero goals. Based on the NZER and the mitigation options available to us, there is limited scope to reduce climate mitigation investment if we want to achieve net zero. We have set out the potential implications across all three scenarios in *Table 8* below.

*Table 8: climate mitigation implications across investment scenarios*

| Scenarios | Implications for Climate Mitigation |
|---|---|
| High (CPI + 6.5%) | • Investment emissions increase reflecting the increased size of the programme.<br>• We deliver the activities in the Working Reference scenario but expand the scope and scale of interventions to reduce risk and make 2040 a more secure goal.<br>• Investment emissions – actively pursue and pilot new materials and techniques with delivery partners to accelerate emission reduction from investment<br>• Process emissions – extend planned activity to more sites to further reduce emissions<br>• Fleet – accelerate fleet decarbonisation as technology permits<br>• Carbon capture – acquire new land or work in partnership with estates within our water catchments to develop further carbon capture projects |
| Working Reference (CPI + 4%) | • Investment emissions increase reflecting the increased size of the programme.<br>• Operational emissions reduce through grid greening. Modest energy efficiency and renewables (with associated operational cost benefits) support improvements in SR27. Adoption of some low emission vehicles depending on cost-benefit.<br>• Process emission pathways and site optimisation developed to enable some benefits in SR27, but primarily to shape SR33 and SR39 wider rollout in line with UK Climate Change Committee advice.<br>• Carbon capture improved as far as feasible on Scottish Water land with ~4,000 hectares new woodland and 500-1,000 hectares peatland restoration<br>• Net Zero by 2040 is challenging and further activity in SR33 and SR39 is needed to deliver success. |
| Flat Charges (CPI + 0%). | • Scale of investment emissions is lower in 2040 owing to the size of the programme.<br>• Operational emission gains are made primarily through greening of the grid and adoption of low emission vehicles through fleet renewal programmes to meet statutory requirements.<br>• Limited development and implementation of process emissions pathways in SR27 restricts the ability to implement measures in SR33 and SR39.<br>• Limited progress on new carbon capture; peatland restoration only occurs where there is a direct water quality benefit.<br>• Net Zero Emissions is not achievable by 2040 or 2045 per the Scottish national objective. |

## 4.5 Chosen Option

Considering the implications above, as well as our Management Approaches, pathways, Emissions Hierarchy and Public Body Duty, Working Reference Scenario (CPI+4%) represents most of the activities set out in our NZER and means that we can continue to target net zero in 2040, and allows us to reduce the potential financial impact on customers, while meeting the Ministerial Objectives and our relevant long-term strategic ambitions (including our 2040 net zero goal). We, therefore, progressed with the Working Reference Scenario as the basis for our final recommendation.

**Our final chosen option is the Reference Scenario, a matured and refined version of the Working Reference**

We did this across all investment areas by:

- Refining the available budget associated with a CPI+4% pa customer charge profile, re-running the Financial Model using the latest modelling assumptions and the application of the most up to date top-down global efficiency factors to be applied.
- We incorporated feedback from sector stakeholders, clarification of Regulator requirements, customer research feedback and further considering the requirements of the draft Ministerial Objectives. Decisions were required to navigate these limitations while ensuring a balanced investment plan.
- Several strategic options were considered to manage budgetary constraints and investment reallocation. These included potential further removal of demand in the asset repair, refurbishment, and replacement (AR3) programme areas or reduce outcomes where there is service choice. As a result, there were upwards adjustments in some areas, and downwards adjustments in others.

For Climate Change Mitigation, the **Reference Scenario** will deliver:

- **Operational emissions**
  - **Energy:** 45GWh displacement of grid electricity through energy efficiency and renewable generation from a portfolio of opportunities across our assets.
  - **Electricity:** 11GWh reduction of grid electricity through leakage control, mains renewal and non-domestic metering
  - **Bioresources:** increase advanced digestion and energy recovery at Allanfearn Waste-Water-Treatment-Works and change technology through PFI return at Daldowie Sludge Treatment Centre.
  - **Fleet:** continued adoption of low emission vehicles and infrastructure as we renew our fleet, and reduction in operational emissions: energy emissions, process emissions, transport.
  - **Property and Estates:** progressive adoption of zero emission systems as HVAC and other building systems require replacement, noting focus on 2038 net zero public buildings goal. Further benefit will be realised through the refurbishment of Scottish Water's laboratories at Juniper House, but this is too early to confirm.
  - **Process emissions:** monitoring and optimising of existing systems to reduce emissions; research on pilot work to develop and implement methane and nitrous oxide pathways.

- **Investment emissions**
  - We do not propose additional investment specific to decarbonising the investment programme, but here we outline what we will do.

- Our goal is to reduce annual carbon in our investments from ~100,000 $tCO_2e$ to 70, 533 $tCO_2e$ across a bigger programme through the carbon reduction hierarchy PAS 2080:2023[50] which will be monitored and incentivised in the SR27 Enterprise Model.
  - **Avoid:** evaluating the basic need of the development by exploring alternative means for satisfying the need without a new construction or through reusing and repurposing existing assets
  - **Switch:** assess alternative solutions that would reduce whole life carbon emissions through initiatives such as alternative scope and design, alternative low carbon materials and technologies
  - **Improve**: identify and adopt solutions, materials and techniques that improve the use of resources and design life of assets, including applying circular economy principles, nature-based solutions and low carbon construction techniques.
- The progressive adoption of carbon incentives through measures such as the Carbon Border Adjustments Mechanism in the UK and EU will support the optimal pathways we have identified for investment emissions. It will make low carbon versions of the principal items we rely on (concrete, steel, iron, aluminium, with further measures expected for ceramics, plastics and glass) more competitive and progressively penalise traditional high carbon materials.
- Specifically our procurement models for SR27 will further drive engagement with partners in delivery and the supply chain to take advantage of this by:
  - Continuing to drive low carbon options – avoiding traditional "build" solutions wherever we can
  - Where we need to "build" we will seek low carbon design
  - We will work with supply chains to adopt low carbon materials, switching from high carbon wherever we can
  - We will continue to seek innovative low carbon delivery methods such as offsite fabrication, zero emission plant and site establishment methods
- Our analysis of the maturity and pathways to adoption of key measures and low carbon materials in current and planned contracts and commitments we ask of the supply chain is shown in figure 10 (red = no progress; green = fully embedded):

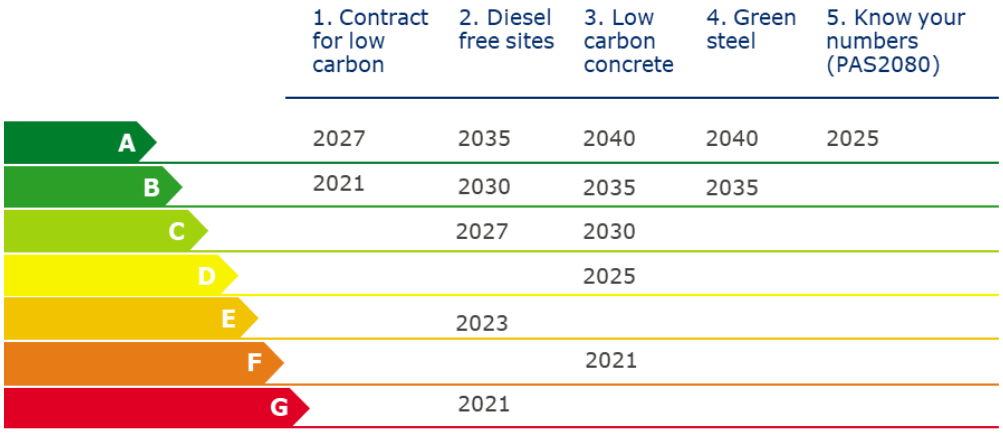


*Figure 10: current commitments for our capital investment programme*

- **Carbon Capture**
  - Restoration of 500-1000 hectares of actively eroding peatland; continued management and maintenance of existing peatland.
  - Creation of up to 4,000 hectares of new woodland through active planting and natural regeneration, including delivery of the 10-year Loch Katrine Land Management plan and extensive woodland creation in our Angus Glens catchments.
  - Collectively this will continue to increase the amount of carbon captured on our land to ~60,000 tonnes per annum by 2040

[50] PAS 2080:2023 Carbon Management in Infrastructure | BSI

*Table 9: Summary of SR27 investments*

| Investment Summary | Proposed investment (£m 23/24) | Projected Benefit | Investment Category |
|---|---|---|---|
| Bioresource Strategy and PFI Return<br>• Allanfearn<br>• West Central Bioresource Strategy (Daldowie) | £475m | 80GWh energy generation<br>Natural gas and process emission reduction<br>20,000 tonnes $CO_2e$ | Enhancement |
| Fleet Decarbonisation | £127m | 5377 tonnes $CO_2e$ | AR3 |
| Property and Estates | £25m | Progress towards statutory requirement of net zero public buildings by 2038 | AR3 |
| Juniper House Laboratory | £104m | Natural gas and electricity reduction [TBC tonnes CO2e] | Enhancement |
| Electricity – energy efficiency and on site renewables | £46m | 45GWh displacement of grid electricity | Enhancement |
| Mains renewal<br>Non-domestic metering<br>Additional leakage | £52m | 48Megalitres/day reduction in water<br>11GWh energy benefit | AR3 |
| Process Emissions monitoring, innovation and deployment | £42m | [6,000] $tCO_2e$<br>Investment pathway for SR33 and SR39 | Enhancement |
| Carbon Capture | £18m | 500-1000Ha peatland restoration<br>4,000Ha woodland contributing to net carbon sink of 60,000 tonnes by 2040 | Enhancement |
| Biodiversity | £11m | 3x pioneer catchment programmes supporting adaptation and mitigation<br>Improved biodiversity and carbon across wider SW landholdings<br>Improved tracking and reporting biodiversity | Enhancement |
| **Totals** | £901m | | |

## 4.6 SR27 Investment Plan

## 4.6.1 Bioresource Strategy and PFI Return

*Table 10: Bioresource Strategy and PFI Return investment summary*

| Investment Summary | Proposed investment (£m 23/24) | Projected Benefit | Investment Category |
|---|---|---|---|
| Bioresource Strategy and PFI Return<br>• Allanfearn<br>• West Central Bioresource Strategy (Daldowie) | £475m | 77GWh energy generation<br>Natural gas and process emission reduction<br>[20,000] tonnes $CO_2e$ | Enhancement |

A significant contributor to Scottish Water's continuing operational emissions is represented by the Daldowie Private Finance initiative (PFI) Sludge Treatment Centre. The thermal drying of sludge to produce fuel pellets represents >90% of Scottish Water's natural gas consumption. At the point of burning additional nitrous oxide emissions are released.

This was a leading technology 25 years ago but is now considered obsolete. The scheme is due to resume to Scottish Water by 2031. As part of the Bioresource Strategy we will adopt technologies that secure outlets for waste water sludge and support net zero demands. The West Central Bioresource Strategy will see new facilities developed at Daldowie ahead of the resumption of Scottish Water control utilising advanced digestion technologies for most Scottish Water Bioresources, as set out in the Water Environment Technical Appendix. In addition, the Allanfearn Bioresources project will adopt similar technologies at smaller scale to deal with north of Scotland sludge.

Our net zero profile includes the replacement of this asset with options that maximise energy and resource recovery per the work continuing to develop the Bioresource Strategy. The technological options are still in development however the approach will eliminate the use of natural gas on our sites and generate 77GWh of renewable power (see link to Water Environment Technical Appendix).

## 4.6.2 Fleet Decarbonisation

*Table 11: Fleet investment summary*

| Investment Summary | Proposed investment (£m 23/24) | Projected Benefit | Investment Category |
|---|---|---|---|
| Fleet Decarbonisation** | £127m | [5377] tonnes $CO_2e$ | AR3 |

The transition of our fleet to low or zero carbon is a key element in reducing our controllable emissions and investment demand is expected to be reported through the AR3 programme for support services. Over the course of SR27 Scottish Water is expected to continue to reduce emissions from its own fleet through the transition of [1454] vehicles to low or zero emissions (link to fleet investment within support Services).

## 4.6.3 Property and Estates

*Table 12: Property and Estates investment summary*

| Investment Summary | Proposed investment (£m 23/24) | Projected Benefit | Investment Category |
|---|---|---|---|
| Property and Estates | £25m | Progress towards statutory requirement of net zero public buildings by 2038 | AR3 |
| Juniper House Laboratory | £104m | Natural gas and electricity reduction [TBC tonnes CO2e] | Enhancement |

Scottish Water will progressively move to zero emission buildings by [2038] in line with Scottish Government expectations for the public estate, and this is captured under Support Services AR (link to property investment within support Services). In addition, it is exploring options for the refurbishment or replacement of its current laboratory facilities in SR27.

### *4.6.4 Energy*

*Table 13: Energy investment summary*

| Investment Summary | Proposed investment (£m 23/24) | Projected Benefit | Investment Category |
|---|---|---|---|
| Energy | £46m | 45GWh | Enhancement |

Grid electricity is our biggest source of emissions (55%) and, as well as carbon, reducing usage has a financial benefit through reduced operational costs. The grid is projected to decarbonise over time as the proportion of renewables that supply the grid increase. To date the greening of the grid has not kept pace with UK Government projections, but we may anticipate that the carbon benefit of reducing the use of grid electricity will diminish over time. We will seek to minimise our use of grid electricity through efficiency and on site renewable generation.

#### Efficiency

Energy efficiency measures are the most attractive on the Marginal Abatement Cost Curve (MACC), with an overall negative cost per tonne of carbon (investment in efficiency pays back more than it costs over the life of the intervention), with benefits to operational energy costs.

Opportunities have been identified by reviewing energy intensities and performance across water and waste water assets and development of a portfolio for promotion based on financial payback, and in accordance with the management approach.

Investment in energy efficiency in SR21 has on average seen a return of 1GWh for £0.7m invested. Interventions ranged from more efficient pumps and equipment through to switching out high energy blowers with lower energy systems. Returns are expected to be lower in future as the most attractive opportunities are delivered early. It is anticipated that the benefit may fall to ~1GWh per £1m invested, but remain attractive in terms of the Management Approach and the MACC.

#### On-site Renewables

Onsite renewable generation is similarly attractive in terms of payback and reduction in operational costs, sitting alongside efficiency in the MACC and in some cases may be more

financially beneficial than efficiency. As for energy efficiency opportunities are considered as party of a wider portfolio across our assets and prioritised in terms of on site electricity demand (ability to use all the electricity generated) and financial payback.

We will not be constrained to just considering energy efficiency. If a more attractive return is available by installing onsite renewables to power the asset (e.g. solar PV) it will be considered alongside energy efficiency as we seek to reduce the consumption of grid electricity at our sites. This will also contribute to our wider ministerial objective to host or generate 300% of our electricity consumption.

### 4.6.5 Mains Renewal, Non-domestic Metering and Additional Leakage

*Table 14: Mains renewal, non-domestic metering and additional leakage investment summary*

| Investment Summary | Proposed investment (£m 23/24) | Projected Benefit | Investment Category |
|---|---|---|---|
| Mains renewal<br>Non-domestic metering<br>Additional leakage | £52m | 48 Megalitres/day reduction in water<br>11 GWh energy benefit | AR3 |

Through a combination of water mains rehabilitation, non-domestic metering and further leakage management we aim to reduce the amount of water we need to treat and supply by 48 megalitres per day. This will improve the supply-demand balance for the water service and is expected to reduce electricity demand by 11GWh.

This will be delivered through the investments set out in the Water Continuity Technical Appendix.

### 4.6.6 Process Emissions

*Table 15: Process emissions investment summary*

| Investment Summary | Proposed investment (£m 23/24) | Projected Benefit | Investment Category |
|---|---|---|---|
| Process Emissions | £42m | 6,000 $tCO_2e$ | Enhancement |

Process emissions – nitrous oxide and methane form waste water treatment – are our most problematic emissions to eliminate, requiring extensive research and development. The UK Climate Change Committee advice to government[51]" on pathways to net zero identified specific action for the water sector to deal with these emissions.

In SR21 we worked with the wider UK water sector and others to understand the source and fate of methane and nitrous oxide across the waste water cycle through extensive monitoring, control systems and technologies to understand and model the conditions that give rise to emissions[52]. This enabled us to identify and prioritise the sites and types of process that may be the greater sources of emissions and to begin to trial operating under different conditions to minimise emissions targeting multiple benefits:

[51] The Seventh Carbon Budget
[52] Wastewater treatment works' process emissions: optimisation of current processes

- Reduced process emissions
- Optimised treatment and stable compliance
- Lower energy use

In SR27 we will progress further research and innovation into new technologies to continue to minimise emissions, recover ammonia (preventing nitrous oxide ($N_2O$) formation) and recover methane for energy.

## Nitrous Oxide

In SR27 we will deliver monitoring and interventions on our activated sludge assets, specifically the top 25 highest emitting sites that treat >70% of the total population equivalent in Scotland[53]. We will also build understanding for smaller and non-activated sludge waste water assets to enable cost effective monitoring and development of potential interventions for future deployment. Specifically, we will:

- Deploy liquid sensors at 25 sites and establish baselines for each site, as per current industry best practice, and develop further monitoring techniques to other sites where liquid sensors are too costly to maximise coverage
- Data analysis and modelling will help identify options to avoid or reduce process emissions and machine learning will be refined to support data interpretation and intervention options.
- Digital twins will model operational performance to implement real time control (RTC) with artificial intelligence (AI) to support predictive control to prevent or minimise emissions and implement interventions such as altering process controls and ammonia recovery/removal.
- Identify future interventions - emerging technologies such as photocatalytic activated sludge process (ASP) covers, predictive RTC control, alkalinity changes for consideration in SR33

## Methane

We will target our 5 Anaerobic Digestion (AD) and Advanced Anaerobic Digestion (AAD) sites which treat over 100,000 tonnes dry solids of sludge per year to reduce or capture methane, along with cost effective methane reduction in our existing and planned bioresource centres, sludge storage facilities, septic tanks and other assets where methane production is a risk.

We will:

- Implement best practice methane monitoring across Scottish Water's Anaerobic Digestion (AD) sites.
- Expand methane recovery at scale at 4 AD sites (Nigg, Allanfearn, Hatton and Seafield) and promote for new assets at Daldowie under the Bioresource Strategy.
- Deploy novel technology to increase biogas generated and collected - reducing downstream emissions and increasing energy benefit.
- Research additional measures for other sites, undertake monitoring for fugitive leaks across systems to inform further measures, and investigate methane capture opportunities across wider processes.

## Carbon Dioxide

The amount of carbon we can capture in our landholdings to balance residual emissions and support net zero has a number of risks and uncertainties and will take time to develop (maximal carbon capture is projected to occur beyond 2040 as trees mature). There is a risk it will fall short so we will also focus on technological approaches to carbon dioxide capture from our waste water treatment processes.

We will:

[53] Link to Phase 1 risk assessment work).

- Promote research and innovation and undertake trials on $CO_2$ capture technologies from our waste water treatment processes
- Apply successful R&I trials at scale across the asset base as appropriate which will also support our other net zero aims, wider efficiency drivers and support wider business sustainability goals.

SR27 will continue the delivery of our $N_2O$ and methane pathways at scale across our larger asset base and broaden our knowledge to enable us to extend the $N_2O$ and Methane pathways at scale across our wider asset base in SR33 and beyond. SR27 will establish a foundation for us to embed process emissions monitoring and reductions into Scottish Water's Waste water Service Strategy and long-term vision in SR33 onwards.

Recognising the imperative that we make progress up to 2040 and noting the need to inform further investment in SR33 we propose to invest £42m in process emissions in SR27 to deliver the above activities. We will prioritise the activities which will deliver the greatest benefit and anticipate the investment will be allocated as below, subject to amendments as we improve our understanding:

*Table 16: Process Emissions Activities*

| **Process Emissions Activities** | **% of £42m** |
|---|---|
| $N_2O$ monitoring and data analysis including R&I activities | 9% |
| $N_2O$ Interventions including process changes, digital twins and new technologies | 45% |
| Methane monitoring including R&I activities | 5% |
| Methane recovery and maximising generation | 30% |
| Other methane interventions | 5% |
| $CO_2$ capture (primarily R&I activities) | 6% |

## *4.6.7 Carbon Capture*

*Table 17: Carbon capture investment summary*

| **Investment Summary** | **Proposed investment (£m 23/24)** | **Projected Benefit** | **Investment Category** |
|---|---|---|---|
| Carbon Capture | £18m | 500-1000Ha peatland 4,000Ha woodland contributing to overall net carbon sink of 60,000 tonnes by 2040 | Enhancement |

Scottish Water owns over 23,000 hectares of land covering mostly upland catchments characterised by rough grazing, woodland, moorland and peatland. During SR21 Scottish Water worked with external experts to develop a "land carbon inventory" – a view of the carbon losses (e.g. from poor condition peatland) and gains (e.g. in growing woodland) within its land. This enabled Scottish Water to understand the carbon performance of its land, current land use and tenancy status, evaluate opportunities based on carbon benefit and develop a portfolio of peatland and woodland opportunities under the Carbon Capture Management Approach (MA077).

Currently Scottish Water is a modest carbon sink – significant carbon in woodlands is largely outweighed by carbon lost from peat. In SR21 Scottish Water has restored [1500] hectares of peatland on its land to support water quality and prevent losses of carbon and deliver over [500] hectares of new woodland through planting along with [1,000] hectares of natural regeneration. Major projects included the commencement of the Loch Katrine Land Management Plan – a 10 year plan that will cross regulatory periods to 2034 and ultimately see over 4,000 hectares of new native woodland, and the restoration of peatland around major catchments such as Afton.

This is not yet included in our land carbon inventory but will be incorporated in future updates following review by the James Hutton Institute. Collectively, the restoration of peatland, creation of new woodland and the maintenance/enhancement of existing land is projected to enable Scottish Water to net off ~60,000 tonnes $CO_2e$ by 2040, with improvements in subsequent years as trees mature.

Most of the woodland needs to be created before 2030 to enable sufficient growth to the phase where they are capturing higher amounts of carbon by 2040 and beyond.

During SR27 we will continue working according to the Carbon Capture Management Approach and:

- Continue restoration and management of 500-1,000 hectares of Scottish Water's peatlands within water catchments (range reflects uncertainties in areas still to be fully surveyed)
- Continue delivery of the 10-year Loch Katrine Land Management Plan through our tenant Forestry and Land Scotland to deliver over 4,000 hectares of new native woodland
- Work with tenants, stakeholders and regulators to create a further 1000 hectares of new woodland across our estate.
- Continue to seek access to grants to part fund woodland and peatland activities as appropriate, noting that future changes to such schemes may impact costs.

We will also continue to invest in the management of estates to ensure the carbon gains are maintained, and in the further analysis of the carbon status of our land to inform annual reporting and net zero outcomes.

## *4.6.8 Biodiversity and Natural Capital*

*Table 18: Biodiversity and Natural Capital investment summary*

| Investment Summary | Proposed investment (£m 23/24) | Projected Benefit | Investment Category |
|---|---|---|---|
| Biodiversity and Natural Capital | £11m* | 3x pioneer catchment programmes supporting adaptation and mitigation<br>Improved biodiversity and carbon across wider SW landholdings<br>Improved tracking and reporting biodiversity | Enhancement |

* £6.5m for Pioneer Catchment work is referenced in the Adaptation TA

Under the Nature Conservation (Scotland) Act 2004 Scottish Water has a public body duty to "further the conservation of biodiversity when carrying out [its] responsibilities" and contribute to Scotland's national biodiversity targets. This is augmented by the Wildlife and Natural environment (Scotland) Act 2011, which requires public bodies to report 3-yearly on progress and compliance with the duty.

Climate change, carbon and nature are integrally linked across the 23,000 hectares of water catchments and landholdings we own. In SR21 we established a Biodiversity and Natural Capital Management Approach, baselines and methods to improve biodiversity on operational sites and through its capital programme. "Biodiversity Standard Products" were piloted to support operational and investment teams adopt measures for biodiversity gain.

Our 2023 Biodiversity Report[54] outlined the natural capital, carbon and biodiversity baseline of our landholdings and how we are improving it. Restoring catchments through peatland restoration and woodland creation protects water quality, captures carbon and enhances biodiversity and contributes to Scotland's Biodiversity Strategy to 2045.

In SR27, under the Biodiversity and Natural Capital Management Approach we will continue to meet the biodiversity duty in ways that also deliver service resilience and carbon benefit. We will:

- Invest £4.5m to develop biodiversity gain, nature-based measures and improved carbon on operational sites, water catchments, including with farming tenants for development of whole farm plans, and in capital projects; improve biodiversity & natural capital assessment and reporting, and contribute to Scotland's 2045 Biodiversity goals
- Invest £6.5m in 3 Pioneer Catchment partnerships to support service resilience through nature based and natural capital resilience measures, as outlined in the Climate Change Adaptation Technical Appendix

Biodiversity gain will be reported in SR27 in terms of "area of land improved for biodiversity" and draw from a several areas including:

- Peatland and woodland programmes (4,000 hectares of woodland creation and natural regeneration, and 500 hectares of peatland restoration) outlined in the Climate Mitigation Technical Appendix (Carbon Capture Management Approach)
- Wider landholdings (e.g. embedding nature and climate sensitive farming on our catchments)
- Operational sites and investment programme – biodiversity gain through site management, reinstatement and expansion of "biodiversity standard products"
- Investment programme – area of nature-based measures to meet service outcomes (e.g. blue-green sustainable drainage solutions)

## External Investment - Hosted Wind Generation

Whilst not an investment demand, a key assumption for the carbon profile in the medium term is that the work to continue to develop [650GWh] of new hosted wind on our estate will secure the export carbon benefits (i.e. they are not transferred or sold elsewhere, and SW retires any associated REGO).

Additionally, this is required to meet our SR21 Ministerial Directions where a target of delivering the equivalent of 300% of our electricity demand through onsite renewables and hosted wind by 2030[55].

[54] 211223Biodiversityreport23FINAL.pdf
[55] Scottish Water: directions 2020 - gov.scot

### *4.6.9 Assumptions and Uncertainties*

There are significant uncertainties associated with our programme:

- **Greening of the grid**: – electricity remains our biggest source of operational emissions. The pace of grid greening has not followed government projections which directly impacts both the emissions profile for grid electricity and the carbon benefits we may get from energy efficiency and renewables
- **Emission factors:** there is ongoing work globally to assess the science and emissions associated with waste water processes. There is a prospect that factors may increase, particularly for nitrous oxide making it even more important we improve our understanding and are better able to manage these emissions in future
- **Embodied investment emissions**: capital investment emissions comprise assessments of carbon in materials and processes across a vast supply chain. Projections indicate these will green over time, supported by global carbon goals and taxes, but relies on continued innovation and on suppliers, supply chains and delivery partners actively seeking and adopting low carbon.
- **Scale of investment programme:** further increases in capital investment, particularly in traditional investment (concrete, steel etc) will lead to increases in emissions simply owing to more money being spent.
- **Land based emissions:** the science around carbon in soils and vegetation continues to develop and over the last 2 years we have seen material adjustments to the Peatland and Woodland Carbon Codes. Soil carbon is a further area of development. We will need to review and update our land inventory to reflect changes 3-yearly
- **Technology:**– areas such as Fleet rely on the market being able to deliver the requisite zero emission vehicles. The performance of smaller vehicles such as vans and cars is working well and we are piloting larger vehicles. Progress on heavier plant remains uncertain and we will need to keep under review
- **PFI Return and Bioresources:** – the biggest single source of gas usage is at Daldowie sludge treatment centre PFI where the current technology of drying pellets for burning contributes significantly to gas and process emissions. Our pathway relies on this site ceasing and the installation of an alternative Bioresources Strategy to maximise energy recovery.

Our NZER highlights further uncertainties and emphasises the importance of further innovation and new technologies to support net zero. We will need to keep these under review during SR27.

# 5 Interdependencies

## 5.1 Net Zero Across All Areas

Net zero needs to be supported across the business but there are key dependencies in some areas:

- **Scale of the Investment Programme:** Scottish Water's investment profile is CPI+4%, above the level assumed at the time of the NZER development as is the level of progress already made on decarbonising key materials such as steel and concrete. We are confident in decarbonising investment and recognise that the whole construction sector will need to do more to secure net zero during the 2030s. Global goals and measures such as Carbon Border Taxes will support innovation. We will work with delivery partners and supply chains to explore how materials may achieve "net zero status" as part of the procurement process.
- **PFI Return (Daldowie) and Bioresources Strategy:** This Technical Appendix assumes that PFI return and delivery of the West Central Bioresources Strategy is complete by 2031. If this does not occur it will have a material impact on the profile for emissions and pathway to net zero.

### *5.1.1 Innovation*

We highlight there will be a potential shortfall in achieving net zero emissions by 2040 owing to increased scale of investment and increased risks around the scale of land carbon capture. Net Zero is a challenging ambition and Scottish Water's NZER highlights the importance of research and innovation to find ways to reduce emissions. Progress has been made during SR21, but there remain key areas of research and innovation that are vital to the net zero emissions pathway including:

- **Process emissions:** process emissions from waste water and sludge remain the most challenging area of emissions. More research and technology development is required to identify methods for treating waste water without liberating significant emissions and to monitor and reduce process emissions from our existing asset base.
- **Renewable energy**: greater diversity of renewable energy options are needed to de-risk delivery and ensure renewable energy can be deployed across our asset base.
- **Materials science and capital investment**: progress has been made with the supply chain and with research partners to explore and develop materials such as low carbon concrete, alternative equipment fabrication and low carbon steel. Scottish Water and its partners will need to engage in finding and piloting new materials and products to reduce the carbon intensity of investment. This will also need to include the use of recycled materials and the refurbishment of assets – circular economy approaches.
- **Nature based solutions**: significant potential of reducing both our investment and operational emissions is from the implementation of nature based solutions. More research to confirm and optimise performance is required to increase uptake of nature based solutions and blue-green infrastructure.
- **Land based emissions and carbon capture:** work with the James Hutton Institute has established an approach and mechanism to target improved carbon capture, but this remains an area of intense research to support global efforts to increase carbon sinks. New information (e.g. from IUCN, or academic papers) is kept under review to inform Scottish Water's carbon inventory. More research is required to develop and scale wider non land based carbon capture approaches and continued research is required to ensure peatland and woodland carbon capture is optimised and effectively monitored.

Scottish Water will continue to keep science and guidance under review and actively seek innovative approaches to reduce carbon across our services and investments in SR27, in line with commitments in the NZER.

# 6 Conclusion

The Working Reference Scenario is the preferred scenario for SR27, aligning with Ministerial Objectives, customers and stakeholders' expectations, long term strategy for the water sector, climate change adaptation plan, meeting Scottish Water's Board expectations on progress towards our Long-Term Strategy and risk appetite.

For climate change mitigation Working Reference Scenario will deliver £901m investment across a number of Management approaches to support a profile for net zero emissions that enables Scottish Water to meet Minister's Objectives to "make substantive progress in the 2027-33 period towards the climate change targets" (net zero emissions by 2040).

The majority of this investment – Bioresources and PFI return (£475m), Fleet (£127m), Leakage, metering and mains renewal (£52m) and Property and Estates (£25m) is driven by other statutory or asset maintenance needs, with the replacement of the current sludge treatment centre at Daldowie the biggest single contributor to carbon benefit in the period.

£112m of the investment is driven specifically by net zero covering:

- Grid electricity reduction (£46m) to deliver 45GWh benefit through energy efficiency or on site renewable generation
- Process emissions (£42m) to implement measures to develop and deploy site control and optimisation, methane recovery and new processes to eliminate emissions
- Carbon Capture (£18m) to restore peatland and create woodland, contributing to the long-term carbon capture across Scottish water landholdings.

Investment emission reduction is not specifically funded in SR27. Instead, we will continue to work with delivery partners and supply chains to promote low carbon options, develop low carbon designs, procure low carbon materials and deliver investment through low carbon construction techniques.

Further benefits will be realised from the hosting of windfarm developments on Scottish Water estates where the export benefits of electricity are retained by Scottish Water.

Net Zero remains a challenging goal with significant uncertainties around land, process and investment emissions, and key dependencies on the continued greening of the electricity grid and the development of new technologies for deployment. The actions proposed in SR27 and further activity in SR33 and SR39 will keep Scottish Water on a pathway towards achieving net zero emissions by 2040.

# Investment Planning
## Technical Appendix 008

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# 1 Executive Summary

This Investment Planning Technical Appendix outlines our approach to creating a Reference Investment Planning Scenario (IPS) and two Alternative Scenarios which is a core element of the Draft Business Plan submission.

We are responsible for providing water and waste water services that are essential to everyday life for households and businesses across Scotland. Our activities make a critical contribution to the country's health, wellbeing, economic prosperity and the natural environment. Our customers expect us to provide affordable, sustainable, low carbon services and the changing climate is increasingly challenging our ability to do this.

To do this we must make the right investment decisions at the right time. The scale of these potential investments is significant, so we must relentlessly pursue efficiency opportunities in the management of our assets to deliver the best value for customers.

Over the last 5 years, we have enhanced our approaches to asset management, particularly in relation to investment planning and prioritisation to embrace the move to a more rigorous, dynamic and rolling investment planning process. This improved approach allows us to continually incorporate the latest evidence into our decision-making, collaborating with stakeholders to ensure the costs and benefits of competing investment priorities are balanced appropriately.

Our process to create the SR27 Reference IPS involved starting with unconstrained strategic analysis, then creating a broad range of potential investment planning scenarios, with a focus on honing in on what would be our Reference Scenario. This is underpinned by detailed bottom-up analysis and refinement phases and executive challenge that takes account of a broad array of tests and feedback cycles from customer research and stakeholder engagement. We also recognise that there are very real concerns and considerations about the impacts of our charges, so we developed a "top-down" view of the upper and lower boundaries of what we considered to be an acceptable range of charges influencing total investment envelopes for SR27. All of this activity was completed with visibility and engagement (in line with Ethical Business Regulation and Practice) with our stakeholders and supported by robust customer research.

We are satisfied that the Reference Scenario is a well-evidenced, balanced plan that meets Ministerial Objectives (MOs), and represents good value for customers, communities and benefits the environment that makes adequate progress towards the Water Sector Vision and our Long-Term Strategy.

The output of this investment planning process is our recommendation of a Reference Scenario of £8.3bn[1] in SR27. This would equate to an increase in customer charges of CPI + 4% per annum during this 6-year period. We have laid out our associated draft performance levels against a set of existing and new outcome measures. This would equate to an increase in customer charges of CPI + 4% per annum during this 6-year period. We have also included two Alternative Scenarios which represent a £400m increment above and below this Reference Scenario.

[1] Post-efficiency adjustment in 2023/24 price base

# 2 Background

## 2.1 Scope of this Technical Appendix

This Technical Appendix describes our investment planning process for SR27. We will set out the overall stages we have gone through to create a single Reference Investment Planning Scenario and two alternative scenarios required by the WICS Final Methodology. We will explain our process:

- Starting from our long-term strategic investment forecasts to 2050;
- To creating the unconstrained investment demand of what could be required to be done in the SR27 period;
- Then exploring a wide range of scenarios and introducing the concept of a "Zone of Acceptability" within that broad range to consider a number of key influencing factors; and,
- Explaining how we have narrowed and refined the proposal to a single Reference Scenario and two alternative scenarios for the purposes of this Draft Business Plan.

This Technical Appendix also highlights the significant improvements we have made over the last 5 years in relation to how we make sustainable investment decisions from strategic planning to project planning and lays out further improvement commitments in the coming years.

## 2.2 Context

The Scottish Government Commissioning Letter, Ministerial Objectives and the Water Industry Commission for Scotland (WICS) Final Methodology outline the strategic direction and regulatory framework for the water industry in Scotland for the period 2027-2033. The following section summarises these requirements:

### *2.2.1 Commissioning the Strategic Review of Charges: 2027-2033*

Scottish Ministers have outlined several key requirements for the Strategic Review of Charges process in their letter[2] sent to WICS in April 2024. The strategic review for 2027 – 2033 aims to ensure that high-quality water services are delivered in Scotland by focusing on long-term planning, efficient investment, robust governance, and active customer engagement.

The process requires WICS to publish the Final Determination by 29 October 2026, preceded by a Draft Determination 30 June 2026. The determination should include a range of possible charge paths for both domestic and non-domestic sectors, considering progress towards objectives and the level of risk associated with different investment levels. It is assumed that lending levels will be similar to the 2021-2027 period, ~£1.03 billion. Consumers, communities, and the environment must be central to the review, with demonstrated customer support for the Final Determination.

The letter focuses on ensuring that Scottish Water aligns with the broader water industry vision, while achieving the Ministerial Objectives. Stating the need to demonstrate clear and demonstratable progress towards this vision and understanding the investment over the short, medium and long term. Ministers expect Scottish Water to continue the transition to a risk-based approach to maintaining the overall condition and performance of assets, ensuring no deterioration in service levels to customers.

[2] 2027-33 Commissioning letter | WICS

Maintaining an efficient investment programme that addresses industry challenges and ensures the delivery of necessary outputs is a requirement from the Strategic Review. There is an expectation that average annual expenditure on the investment programme remain at a level that allows for efficient delivery.

Ministers require there to be a suitable governance structure to enable the delivery of objectives and outputs in a rolling programme. There is also an expectation that a monitoring framework is in place to track delivery.

Regarding the Principles of Charging, it is expected that the principles from the 2021-27 regulatory period will evolve with minor amendments. This evolution should indicate the level of finance available for the investment programme and ensure a smooth transition of investment activity between regulatory periods.

The Statement of Ministerial Objectives should also evolve from the 2021-27 regulatory period with minor amendments. Consultation on draft Ministerial Objectives is to take place during 2025, with finalisation by October 2026. The letter also stated that the Strategic Review must remain cognisant of Scottish Government's ongoing policy development and any resulting legislative changes. It highlighted that Ministers will confirm the extent of changes required in their final Ministerial Objectives.

### *2.2.2 Ministerial Objectives*

As stated above, the Ministerial Objectives are currently in draft form and will not be finalised until October 2026. The Final Business Plan will be published in February 2026 and therefore will be based on the latest draft of the Ministerial Objectives available at that time. Scottish Water is committed to supporting WICS and Scottish Government throughout the process of developing the Ministerial Objectives to provide a view of the implications of any changes proposed.

The draft Ministerial Objectives for Scottish Water encompass 11 key areas aimed at enhancing the water sector and its services. These objectives are summarised in Table 1 below:

*Table 1: Draft Ministerial Objectives*

| Ministerial Objective | Description |
|---|---|
| **Long term water sector vision** | Involves collaboration with partners and communities to realise this vision, applying the place principle to ensure better resource impact and outcomes |
| **Standards of service** | Emphasises the importance of maintaining or improving service levels, engaging with stakeholders to set standards, reporting annually, and reviewing performance criteria |
| **Asset maintenance** | Development of an evidence-based strategy for asset replacement, consulting with regulators, and integrating maintenance with investment programmes |
| **Supporting Sustainable Economic Growth** | Focuses on providing strategic capacity for new housing and commercial developments, working with the industrial |

| Ministerial Objective | Description |
|---|---|
| | sector, and supporting reliable and sustainable rural services. |
| **Circular Economy** | Emphasis on assessing potential resource recovery from sewerage |
| **Drinking Water** | Quality standards must be complied with, and resilience must be addressed. The objectives also include removing lead pipes and working towards a lead-free Scotland |
| **Environment** | Includes improving compliance with environmental licenses, preparing delivery plans for infrastructure improvement, and supporting plastic and priority substance control |
| **Flooding and surface water management** | Sets an aim of collaborating on sustainable storm water management to reduce flooding and pollution, while creating natural spaces for communities. |
| **Security and resilience** | Focus on improving network security and systems resilience against malicious attacks, informed by government advice and best practice. |
| **Climate change, adaption and mitigation** | Expectation to assess climate change impacts, implementing adaptation plans, progressing towards climate targets, and promoting water use reduction. *This is an area where potential changes may be made in line with the policy development work being undertaken by the Scottish Government.* |
| **Private finance initiative funded projects** | Prepare and implement plans to manage the remaining private finance initiative contracts which end in the 2027-33 period |

### *2.2.3 WICS Methodology*

The WICS' Methodology[3] provides a detailed framework for how the Strategic Review of Charges will be conducted, to meet the requirements set by Scottish Government. This process will enable WICS to establish a cumulative charge cap over the six-year period, allowing flexibility for adjusting the profiling of charges as required, while ensuring transparency and reflecting customer views as established from the comprehensive customer research programme established for SR27. The Methodology requires Scottish Water to submit a draft Business Plan with associated Data Tables and Commentary by 12 June 2025 and a final Business Plan to be published by 26 February 2026. Both Draft and Final Business Plans should include detailed financial forecasts, plans for investment and expected levels of service performance. This is to ensure that customers receive good value for money for essential water and waste water services while ensuring the maintenance of high standards of service, reliability, and sustainability.

The review is rooted in several foundational principles, including the embedding of Ethical Business Practice and Regulation (EBP&R). It emphasises the importance of high-quality evidence and analysis, accountability for performance, and maintaining flexibility to respond to emerging challenges. Moreover, it situates the Strategic Review within the broader context of the long-term sector vision and long-term investment strategy.

[3] SRC27-Final-Methodology.pdf

In terms of investment, Scottish Water is required to provide detailed, bottom-up evidence for future asset replacement needs, incorporating assumptions for maintenance interventions, unit costs, and overall expenditure. Investment proposals will be divided into asset maintenance, enhancement, and growth, with climate change adaptation recognised as a significant driver. There is an expectation that during the regulatory period there will be a governance process in place that will involve annual updates to the delivery plan to reflect changes in the investment baseline, ensuring transparency and accountability.

The Methodology expects Scottish Water to define outcome measures and annual targets to monitor progress towards the sector vision and Ministerial Objectives, including benchmarking against specific performance metrics in England and Wales. Additionally, Scottish Water is required to provide evidence of meeting efficiency challenges and detailing changes to expenditure during the regulatory period.

Customer engagement is a key element of the Methodology and in response to the requirement for a Customer Challenge Group Scottish Water, Consumer Scotland and WICS have signed a Memorandum of Understanding for the Independent Customer Group to fulfil this role. This group is there to offer independent assurance on the quality of customer engagement and the integration of customer views into Scottish Water's business plan. Further details are available in the Customer Research Technical Appendix.

The Board of Scottish Water will provide assurance on the business plan (additional information available in the Risk and Assurance Technical Appendix), with specific expectations for external assurance on key areas, including cost benchmarking and efficiency analysis.

These key components make up the framework for the Strategic Review so that Scottish Water can continue to deliver high-quality services, adapt to future challenges, and engage customers in its decision-making processes.

### *2.2.4 Water Sector Stakeholders*

Scottish Water operates within a framework of diligent oversight and collaboration, engaging with multiple stakeholders. The above section sets out the requirements from Scottish Government and WICS. The role of role of our key sector stakeholders within the context of the Strategic Review is set out as follows:

- The **Scottish Government** sets national policies and objectives for the water industry and its role is pivotal in shaping the regulatory backdrop and ensuring that public health and environmental sustainability are at the forefront of water management practices.
- **WICS** is responsible for economic regulation, ensuring Scottish Water operates efficiently. The economic regulator scrutinises financial and operational plans to guarantee that investments deliver value for money while maintaining and improving service quality.
- The **DWQR** acts as quality regulator on behalf of customers to ensure that the water supply in Scotland meets regulatory standards and is considered safe to drink. Activities include regular auditing of our assets, reviewing our performance against regulatory standards, investigating water quality events and incidents, enforcing or seeking commitment to address areas of non-compliance and identifying investment requirements.

- **SEPA** focuses on environmental protection, ensuring compliance with environmental regulations and sustainability goals. This oversight ensures that water treatment processes minimise environmental impact, safeguarding ecosystems and biodiversity.
- **Consumer Scotland** represents the interests of water customers, ensuring that their needs and concerns are prioritised. Consumer Scotland works in partnership with businesses, consumer bodies, the public and third sectors to promote the interests of consumers, understand consumer vulnerabilities and promote good business practice.

Stakeholders are engaged through a suite of stakeholder groups that are led by Scottish Government to oversee Water Industry investment. The interaction between these stakeholders and Scottish Water is collaborative and crucial to building the investment requirements for each regulatory period.

### *2.2.5 Integrating the Customer Voice*

We have the **Independent Customer Group** (ICG) which works closely with Scottish Water to provide independent insights and perspectives on customers priorities, ensuring customers interests are central to decision making.

We are committed to working collaboratively with Consumer Scotland and the Independent Customer Group (ICG) to co-ordinate the development and delivery of the programme of customer research which will provide the evidence base of customer views to inform the Business Plan for SR27. The parties have committed to the efficient co-design of research requirements to ensure a high-quality programme of research which meets the needs of all parties.

A collaborative programme of research has been developed to shape the content of the Draft and Final SR27 business plans. The full programme is being overseen by a Research Advisory Group (RAG), consisting of representatives from Consumer Scotland, Scottish Water as well as the Independent Customer Group. This has included gathering customer perspectives on all aspects of our investment programme (see Customer Research Technical Appendix). The ICG helps us to make informed investment decisions, ensuring that funds are allocated effectively to meet customer and stakeholder's priorities.

# 3 Long-Term Strategy

A key expectation of the Commissioning Letter, WICS Methodology and the Ministerial Objectives is that Scottish Water plans in the context of the longer term.

Within the Minister's Letter to WICS to commission the Strategic Review of Charges process, Ministers stated that they would set their Objectives "*in the context of the water industry vision describing the longer-term nature of the industry and what it can achieve*". Their expectation being that the industry makes clear and demonstrable progress towards these outcomes.

This is reflected in the Final Methodology where WICS has set the key principles of for the strategic review period. These are flexibility, evidence and analysis, accountability and long-term context. These principles are set around the Principles of EBP&R and the customer voice. The WICS recognised that SR21 adopted a long-term planning approach, which "*recognised the importance of looking beyond the regulatory period, given the long-term nature of the water industry*"[4]. WICS expects this period to maintain this focus and expects that Scottish Water should "*set out what it plans to deliver over the 2027-33 regulatory period as a step towards achieving the longer-term sector vision*."

Scottish Water has a considerable mix of short to long life assets – from IT equipment that may become obsolete after only a couple of years, right through to dams and sewers that are expected to last well over 100 years (considered to be "in perpetuity"). This means that we must plan over a range of different time horizons, including the long term (see Figure 1).

The SR27 Business Plan deals with the near-term to 2033 and sets out our plans and investments for the first of four significant steps (Strategic Review periods) towards our Long-Term Strategy planning horizon of 2050. We must consider this SR27 plan in the context of the longer term to ensure we build towards a sustainable future.

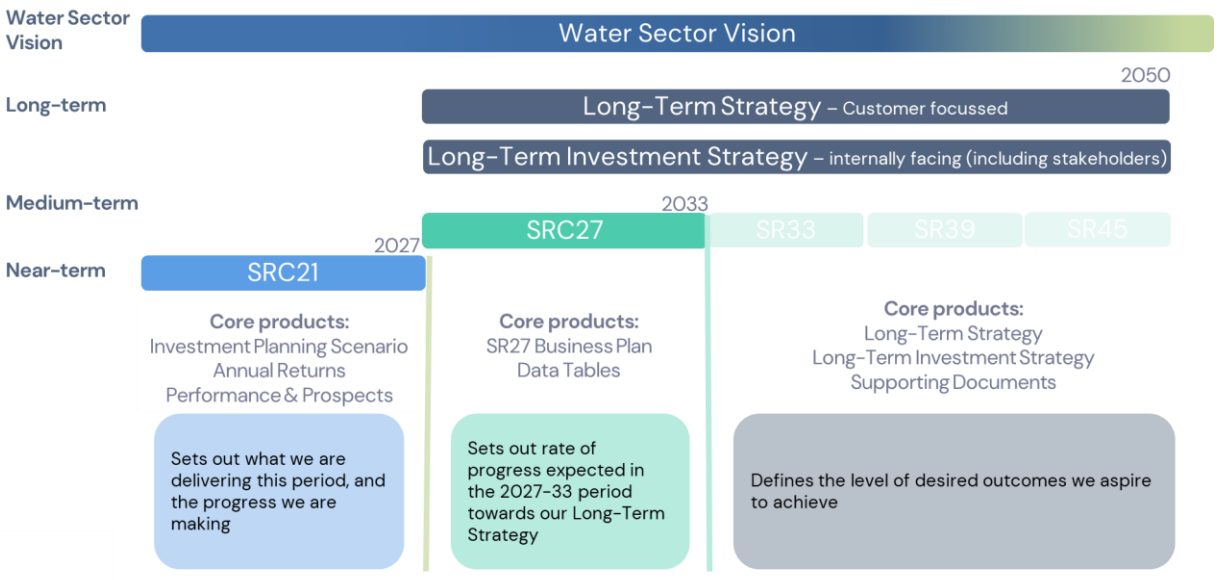



*Figure 1: Overview of our planning horizons, with SR27 as the next step on the way to 2050, and the Long-Term Investment Strategy underpinning the Long-Term Strategy*

[4] SRC27-Final-Methodology.pdf

## 3.1 Water Sector Vision

The Water Sector Vision[5] was collaboratively developed and agreed between the principle water sector stakeholders, reflecting our sector's long-term aspirations for delivering vital services to customers while leading the way in responding to the climate emergency.

## 3.2 Long-Term Strategy (LTS)

In May 2025 we published our Long-Term Strategy[6] outlining how we will deliver our part in making the sector vision a reality. The three main challenges (see Figure 2) that will impact our ability to meet our LTS; The Climate Crisis, Population Change, and Ageing Assets.

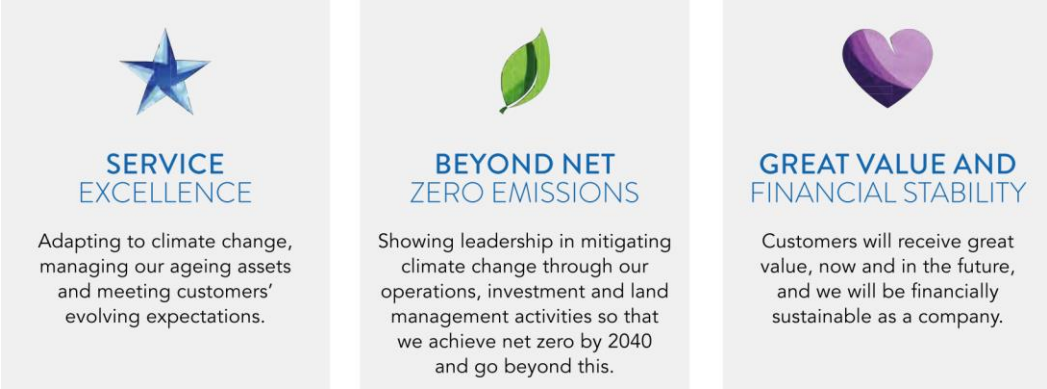



*Figure 2: The Long-Term Strategy is underpinned by these three strategic ambitions*

These ambitions require us to find and deliver solutions that always balance service, climate and cost for the benefit of customers, communities and the environment.

The high-level goals this strategy sets are to ensure:

- Scotland's tap water remains a source of national pride, and is valued as a precious resource.
- The quality of our rivers and seas has improved, and our communities are protected from flooding, through collaboration with others.
- Scottish Water has played a key role in enabling Scotland's sustainable economic and housing growth.

## 3.3 Long-Term Investment Strategy (LTIS)

Our Long-Term Investment Strategy (LTIS) is the detailed evidence base and investment forecasts that underpins the Long-Term Strategy. The LTIS is a more detailed and quantified strategy than we have produced before and it draws together all internal strategies under one coherent umbrella structure. This Strategy provides the context for SR27 planning. This strategy will be reviewed periodically to ensure we reflect the most up to date evidence.

Our analysis and documentation is designed to support effective engagement with stakeholders. However, to fulfil its purpose, it does contain a level of detail and technical explanation. This

[5] Water Sector Vision
[6] Our Sustainable Future Together: Scottish Water Draft Long Term Strategy

includes demand analysis, approaches to meet the demands, cost, carbon, interdependencies, uncertainties, and areas for improvement.

### 3.3.1 The investment required to deliver our long-term strategy

As part of our Long-Term Strategy, we undertook a broad ranging and comprehensive review of the risks and opportunities across the next 25 years. The investment we have identified will secure our essential services by maintaining our existing asset base, allow us to adapt to climate change and meet our legislative requirements. Without major changes to how we currently operate the water and waste water system and given the projected impact of climate change, we are currently forecasting that the funding needed to deliver sustainable services will need to almost double over the next 25 years.

Planning for this extended period amidst increasingly complex factors including climate change, population growth, raw water deterioration, improving abstraction and discharge compliance and new legislation, is inherently uncertain and there are both opportunities and risks ahead. We estimate that we will need to invest ~£50bn to support our long-term strategy over the next 25 years (SR27, 33, 39, and 45). Of this, ~£26bn will be invested in Asset Repair, Refurb and Replacement (AR3), and ~£24bn will be invested in Enhancements. We anticipate that both AR3 and Enhancement average annual investment will increase over time. AR3 will grow incrementally. Enhancement will be increasing at a faster rate due to the need to invest to meet changing legislative and tightening regulatory expectations, continually improve the quality and technical sophistication of the infrastructure to ensure that the same, or increasing, service levels are attained.

As an indicator of potential impact on customer charges, investment of £50bn over the next 4 investment periods could equate to an annual increase in customer charges of ~CPI+3.3% per annum for the next 25 years if we assume a steady increase in charging profile and the same level of government borrowing. There are many uncertainties in this figure and how we would raise the necessary revenue over such a long time period, but this provides a useful indicator when considering the first step in the long-term journey.

### 3.3.2 Application for SR27

It must be noted that the strategy does not define or set the customer charge level at this stage, that is done on a 6 yearly basis as part of the strategic review of charges process. The LTIS has been created to set out the potential future outcomes expected such that the progress being made in the SR27 period can be put into the context of the long term to determine if we are progressing at a reasonable rate, too fast or too slow in relation to what our current understanding of the long term indicates.

The expected profiles of expenditure, outputs and outcomes are included in the relevant Tables and Commentary. Whilst SR27 Data Tables are typically broken into annual forecasts for each of the 6 years in the period, the forecasts beyond 2033 are broken into 6-year forecasts for the end of SR33, SR39 and SR45 on the assumption that the 6-year regulatory period is retained.

# 4 Investment Planning and Prioritisation Framework

## 4.1 The Framework

During the preparations for the last investment period, a joint working group was established with our sector stakeholders to co-create a new Investment Planning and Prioritisation Framework (IPPF). The overall process is owned by the Scottish Government as it required a significant governance interface with Scottish ministers.

This approach featured a dynamic, rolling investment planning process which allows the sector to continually incorporate the latest evidence into our decision-making and to collaborate with stakeholders to ensure the costs and benefits of competing investment priorities are balanced appropriately.

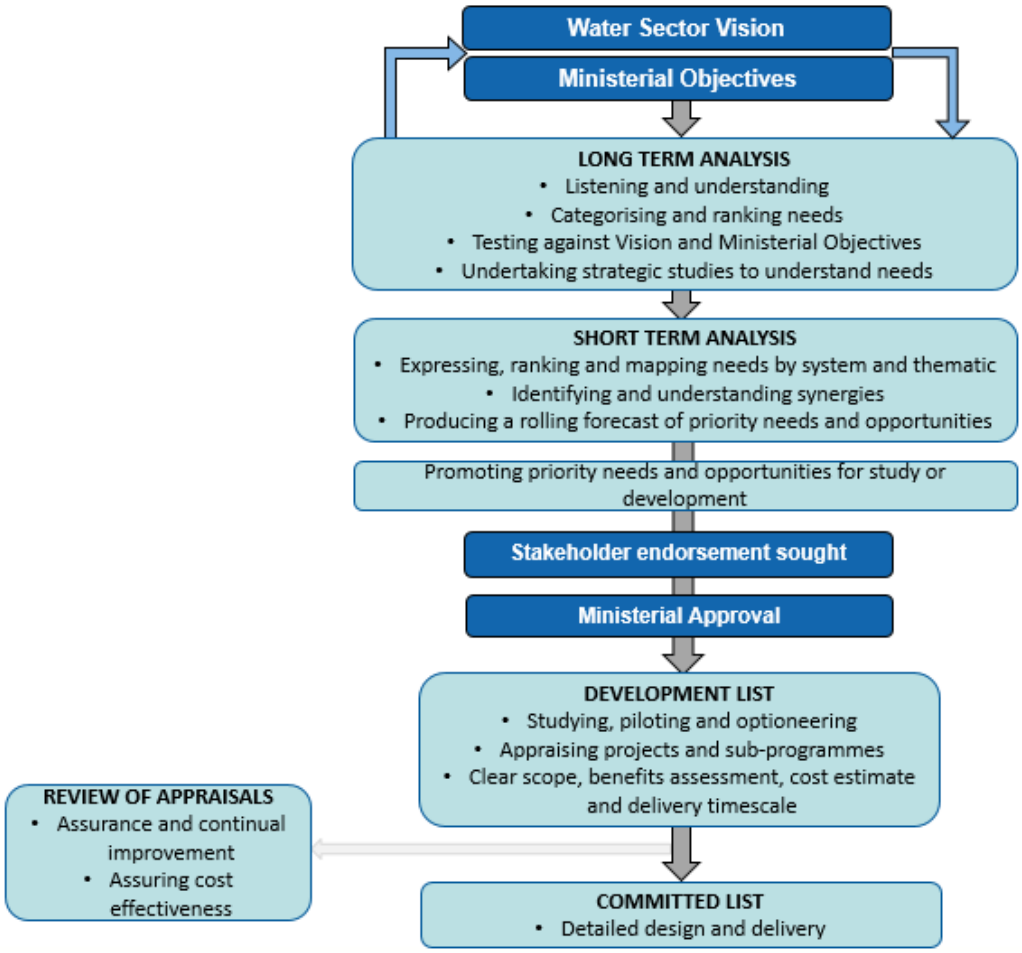



*Figure 3: Overview of the Investment Planning and Prioritisation Framework*

The Objectives of the IPPF are to "create a framework that builds trust and engagement in decision making to maximise the benefits of investment". Scottish Water and its stakeholders agreed that the aims of the IPPF are;

- **To be transparent; provide visibility of the whole programme** – so we make clear how decisions are made to invest resources in all types of investment, whether studies, enhancement, growth, planned repair and refurbishment, or planned or responsive replacement;

- **To be flexible and dynamic** – so we ensure that, through dynamic monitoring, we can adjust our investment plan to deal with change, for example cost or demand shocks[7], or new legislation, or changing financial circumstances;
- **To be balanced** – we will ensure that our investment programme will deliver the Ministerial Objectives, and be appropriately set in the longer-term context;
- **To ensure a shared understanding of risk and opportunities** – we will make clear how risks and opportunities inform our decisions;
- **To ensure our customers and communities are engaged** early in our decision making to maximise value;
- **To increase innovation** – we will monitor and drive-up innovation, not just technology and engineering, but how we go about all aspects of our service provision;
- **To fully consider supply chain impacts** – we will create a lean process that enables efficiency, continuity and flexibility of the supply chain;
- **To ensure appropriate levels of governance** – we will ensure that our governance arrangements are sufficient to maintain control, whilst avoiding unnecessary delay.

Scottish Water operates a transparent dynamic investment planning process whereby the Investment Planning Scenario is formally updated and reported out to the Stakeholder Group (Water Industry Investment Group) every 6 months. The Scottish Government is leading a review with Scottish Water and the sector stakeholders to review and further improve IPPF before the end of SR21, to ensure it continues to work well in SR27.

## 4.2 Rolling Investment Portfolio

Scottish Water operates a rolling investment portfolio as shown in Figure 4 below. This is a more dynamic approach than used in the period before SR21. It allows us to continually incorporate the latest evidence into our decision-making and ensures greater visibility and collaboration with stakeholders to ensure the costs and benefits of competing investment priorities are balanced appropriately.

Through this improved portfolio approach:

- Potential Needs are identified on a rolling basis.
- Investment proposals to address those Needs are developed through a stage & gate process tailored to the complexity of the need and the potential cost of the investment.
- The investment itself is sanctioned by officers authorised by Scottish Water's Board through an approved schema for Delegated Level of Authority.
- These decisions are guided either through policy criteria defined in Management Approaches, or through the creation and consideration of Project Investment Appraisals.
- Control is maintained through the ongoing monitoring of an Investment Planning Scenario (IPS), which forecasts expenditure toward each Need against proposed allocations which, collectively, are affordable within the parameters of the relevant charge settlement.

The following figure illustrates the concept of the dynamic rolling programme. For SR21, the IPS is made up of demand that is either at the intervention development stage (pre-Gate 30) or the project initiation stage (post Gate 30). To define the SR27 IPS, a process of Approach to SR27 Demand Forecasting is conducted which assesses the current live & committed investment demand and project the new demand that is pre-Gate 30. At the point of the draft SR27 plan, we have a Reference IPS which will continue to be monitored to capture any live variations as a result of changes to the SR21 period.

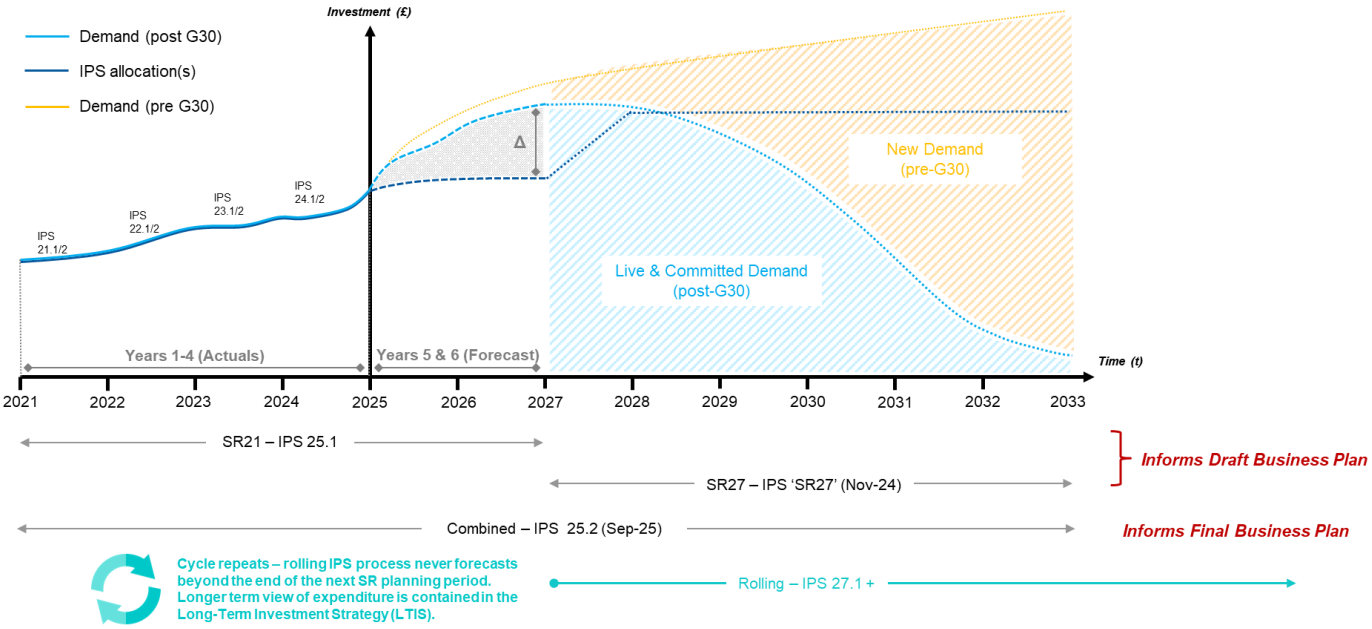



*Figure 4: Illustration of the dynamic rolling Investment Planning Scenario (IPS)*

In its SR27 Final Methodology, as shown in Figure 5 below, the WICS recognises the continuing importance of the flexibility afforded by this approach, noting the implication for establishing an Investment Baseline for SRC27 as the Investment Proposal contained within it will be at varying levels of maturity and so be uncertain.

> *"we built additional flexibility into the investment planning process during SRC21 to allow Scottish Water to respond effectively to changes in investment priorities during the regulatory period.... Flexibility will remain important [in the SRC27 period] as the Scottish Government's policy development work concludes and impacts investment, including climate adaptation and mitigation, over the 2027-33 regulatory period and beyond"*
>
> **SRC27 Final Methodology – Section 14.2, WICS, 12th December 2024**
>
> *"Scottish Water currently defines its investment proposals on a rolling basis through the Scottish Government chaired stakeholder group for monitoring the delivery of Scottish Water's investment programme (known as the Scottish Government Investment Group, SGIG). Our approach for... the 2027-33 regulatory period recognises that when Scottish Water publishes its business plan in February 2026, Scottish Water's investment proposals will be at different stages of maturity... As such, there will be inherent uncertainty in Scottish Water's proposed investment programme"*
>
> **SRC27 Final Methodology – Section 14.3, WICS, 12th December 2024**
>
> *"The Baseline will then provide the reference point for investment that progresses through the revised Scottish Government Investment Group (SGIG) governance process to define the investment programme on a rolling basis"*
>
> **Strategic Review of Charges 2027-2033: Final Methodology Appendices – Appendix 4, WICS, 12th December 2024**

*Figure 5: The relevant clauses from WICS' SRC27 Final Methodology*

## 4.3 Investment Planning Scenario

As set out in the previous section the key documents that have guided our activity are the Commissioning Letter, the WICS Methodology and the draft Ministerial Objectives. Our plan must meet the requirements of the draft Ministerial Objectives, command the support of customers (including affordability considerations), ensure that it represents good value and is efficient and that the investment programme is deliverable (recognising the capacity within the supply chain).

To enable us to do this we have set out our Investment Planning Scenario (IPS) which is a key component of the overall Business Plan. WICS considers that it is in customers' interests for Scottish Water to have sufficient flexibility to plan and prioritise investment on a rolling basis, recognising that changes in risk or additional evidence impact investment priorities. WICS requires Scottish Water to set out what it plans to deliver over the period in terms of investment and outcomes.

If investment priorities change within the SR27 time frame (2027 to 2033), WICS expects Scottish Water to explain and document the changes through the industry governance arrangements, to ensure that Scottish Water remains fully accountable for its performance during the regulatory period. The size and make-up of the IPS has a significant effect on the customer charges and the borrowing we require to achieve the outcomes we are proposing in the draft Business Plan. The Figure 6 below sets out the proposed funding and expenditure for the 2027 – 2033 period.

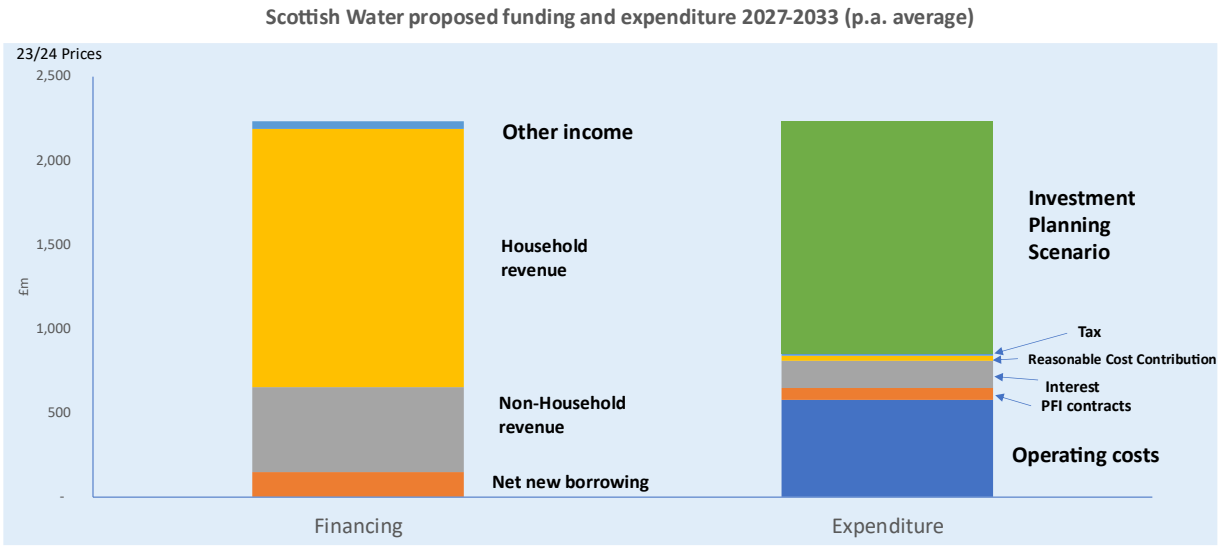



*Figure 6: Scottish Water's proposed funding and expenditure 2027 – 2033*

The following sections of this technical appendix focus on how the Investment Planning Scenario has been built up and tested to ensure it meets the requirements of the WICS Methodology and the draft Ministerial Objectives.

## 4.4 Improving our Sustainable Investment Decision-Making

Before SR21, Scottish Water operated in line with good asset management principles as defined by the Institute of Asset Management (IAM) and captured in our ISO55001 certification. However, we recognised we should continue to improve the way we manage our assets. Our programme aspirations are to ensure we continue to manage our current assets effectively by planning for the optimal use and investment of customers' money and to make smarter investment decisions

by using the best available data and analytics, whilst also ensuring their resilience and maintenance for future generations to inherit.

Our Sustainable Investment Decision Making Transformation Programme launched in 2021.

Since 2021 we have:

- Developed a consistent **benefits categories framework** that focusses on customer communities and the environment and is applied for strategic planning and project level decision making.
- Improved our **customers & community centricity** through improved intelligence and analysis of customer contacts and undertaken further Customer research generally and also specifically for SR27 planning.
- Fully embraced our EBP&R principles of transparency and openness with our **sector Stakeholders** ensuring they are actively engaged across the different layers of decision making. This covers all stages, from long-term strategies, to SR27 business planning to in-period investment prioritisation, and onto to individual project investment appraisals that are either novel, contentious or above a certain investment threshold.
- Created **Long Term Service Outcomes** – Providing an overall structure to our strategic framework and describing the service that we expect to be able to achieve by 2050. This utilised our new approach to **Strategic Cost Benefits Assessment.** This provided the substance and evidence behind our Long-Term Strategy which is being published following a period of public consultation in May 25.
- Improved our **portfolio management systems** – Commencing the implementation of a world leading asset investment planning tool (Copperleaf) to support the prioritisation of investment allocations for the 2027-33 period, which are focussed on optimising the outcomes we want to achieve for customers, communities and the environment.
- Improved our **approaches to whole life cost project investment appraisal, and to the whole life cost assessment of asset repair, refurbishment, and replacement (AR3 Management Approaches)** – Delivering >£100m of cost avoidance by making better informed project decisions through the introduction of our project investment appraisals and from efficiency associated with improved policy led decision making.
- Improved the accuracy and quality of evidence supporting data-driven decision-making through our **data and analytics improvements**.
- Improved our **understanding of asset health** – recognising this is a longer maturity journey working with WICS and the wider UK water industry to develop standards and consistency in this measure.
- Refreshed our **Asset Management Policy** which plays a key role in creating an overall ‘line of sight’ between how we manage our assets and the achievement of our three Strategic Ambitions set out in our Long-Term Strategy; Delivering Service Excellence, Beyond Net-Zero Emissions, Great Value and Financial Sustainability.

These improved capabilities underpin our transparent and evidence-based SR27 business plan. We are proud of the progress we have made, and our approaches have been recognised by external parties as follows:

- Our external assessment report[8] in 2023/24 stated 'we are 'clearly positioning [Scottish Water] as a leader in asset management across the UK' and the 2024/25 report further stated 'as Scottish Water prepares its submission for SR27, it has demonstrated that it has matured significantly as an infrastructure management organisation'
- Presentations at the Institute of Asset Management (IAM) UK conference to showcase our asset management transformation.
- Two academic articles published in the Journal of Infrastructure Management (January 2025 and May 2025) to share our asset management transformation journey to date.
- Scottish Water representation on the National Engineering Policy Centre (NEPC) ageing infrastructure project. This project launched in late 2024 by the Royal Academy of Engineering aims to make the maintenance, renewal, and enhancement of the UK's existing infrastructure a strategic priority for government policy.

## 4.5 Further Capability Improvements for SR27

We have an ongoing improvement plan to further improve the data and knowledge gaps in its asset condition reporting and forecasting. Our draft future improvement plan is included in Annex A: Further Capability Improvements for SR27.

As set out in the Commissioning Letter, Scottish Ministers have requested that work is taken forward jointly by Scottish Water and the Water Industry Commission for Scotland: "*With the advice from the Investment Group, Ministers expect a suitable governance structure be developed which identifies, on a rolling basis, the outputs necessary to deliver their Objectives. Scottish Ministers request that the Commission work with Scottish Water to establish a monitoring framework and process to review the delivery against these Objectives during the Regulatory Period*." This will form preparatory work to support SR27.

[8] Completed by Professor Bryan Adey, of the Institute of Construction and Infrastructure Management at the Eidgenössische Technische Hochschule Zürich (Swiss Federal Institute of Technology Zurich)

# 5 Approach to SR27 Demand Forecasting

This section will describe what drives our demand forecasts and how we structure, forecast and hold the detailed demand forecasts to enable us to prepare the business plan and utilise the same data as we transition into delivery during the SR27 period.

## 5.1 Drivers of Demand

### *5.1.1 Long-Term Strategy*

Underpinned by our purpose and ambitions, and framed by Scotland's Water Sector Vision, the LTS identifies three big challenges facing the water industry as: The climate crisis, population change, and ageing assets. These then influence the high-level outcomes of our LTS which are to ensure:

- Scotland's tap water remains a source of national pride and is valued as a precious resource.
- The quality of our rivers and seas has improved, and our communities are protected from flooding, through collaboration with others.
- Scottish Water has played a key role in enabling Scotland's sustainable economic and housing growth

These goals are instrumental in the assessment our demand forecasts for both long- and near-term horizons.

### *5.1.2 Draft Ministerial Objectives for SR27*

The draft Ministerial Objectives outline what is expected of Scottish Water during the SR27 period. These are converted into demand forecasts to ensure we can put forward a draft Business Plan.

These have been developed over various previous strategic review periods and therefore have been influenced by significant input from sector stakeholders, customer research and government priorities. These are therefore considered to be a critical basis for planning. These come under the same categories as those in Table 1.

## 5.2 Grouping of Demand

As explained earlier, the Investment Planning Scenario is one part of expenditure / investment alongside the operational (Tier 1 / opex) components of demand.

The Investment Planning Scenario that we develop and recommend will include all the capex associated with:

- Asset Maintenance – Asset Repair, Refurb and Replacement (AR3),
- Enhancement – Regulatory Compliance and commitments to communities
- Enhancement – Further service choices (including Sewer Flooding)
- Growth – providing services for new customers

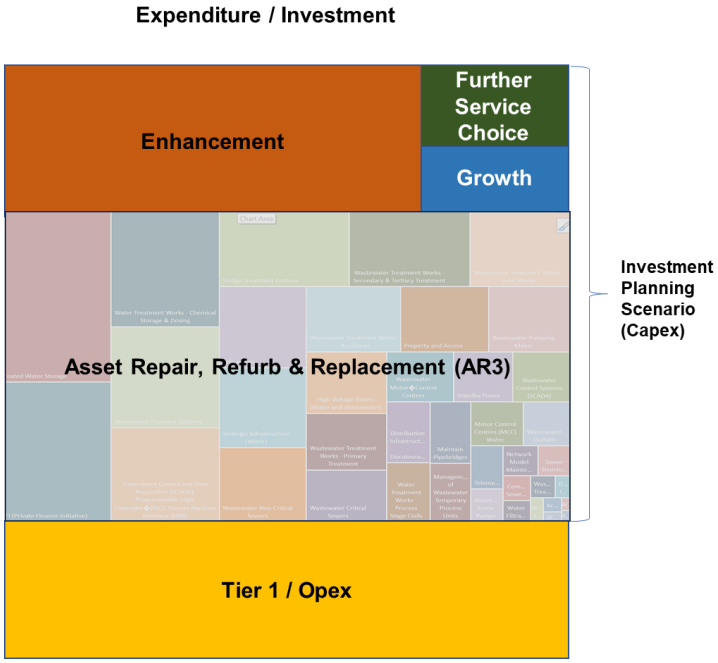



*Figure 7: Overview of investment categories included in the investment planning scenarios*

### 5.2.1 Asset Maintenance – Asset Repair, Refurb and Replacement (AR3)

We have a diverse range of assets with different lifespans, from pipes, sewers and treatment works to office buildings, vehicles and IT infrastructure.

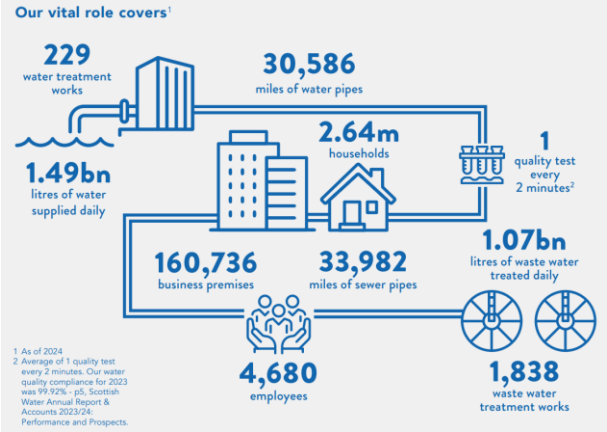



*Figure 8: An overview of our existing asset base*

Our assets need maintaining and then repairing or replacing when they are no longer able fit for purpose. Failure to effectively manage our assets results in an increased risk of process or equipment failure which may impact on the service we provide to our customers or the environment.

The cost of operational activities to maintain our assets is covered under Tier 1 expenditure. This includes operation, calibration, completing task schedules (greasing, changing fan belts, electrical and physical safety checks), chemical, sludge disposal and electricity costs etc. All maintenance activities are conducted to minimise disruptions and maintain the reliability of the assets.

The activities required to manage our existing assets to maintain service levels when their condition deteriorates or fails is referred to as Asset Repair, Refurbishment and Replacement –

or “AR3”. These activities are either conducted in a planned or responsive way (Table 2 and Table 3). The following investment categories funded (from Tier 2) collectively encompass the breadth of AR3:

- Asset replacement,
- Asset repair and refurbishment,
- Returned assets from PFI contracts, and
- Support services

*Table 2: Scottish Water Definitions for Intervention Approaches*

| Intervention Approach | Definition |
|---|---|
| **Responsive** | The intervention is responsive when an asset has failed and is impacting service provision and/or we identify that an immediate, no-choice intervention is required. |
| **Planned** | The intervention is planned when an asset has a historic service failure, or we identify that an intervention is required, at our choice, to reduce the risk of asset failure. |

*Table 3: Scottish Water Definitions for Intervention Types*

| Intervention Type | Description |
|---|---|
| **Investigation** | Activities focused on gathering asset information which is required in the decision-making process prior to one of the other asset intervention types. This includes inspection programmes to identify the condition of our assets. |
| **Operational and Maintenance Activities** | Responsive or planned processes and practices that support an asset to continue to operate and achieve its expected operational life that do not modify the asset itself. |
| **Repair** | Fixing an asset to ensure it can continue to operate and achieve its expected operational asset life (this includes replacement of component parts) |
| **Refurbish** | Renovation / overhaul of older or damaged equipment or replacement of parts of the asset to bring the asset back to a workable condition to extend the expected life of the asset |
| **Replace** | Replacement of an asset (equipment, unit, or process) when it is at the end of its serviceable life, or the asset has failed and cannot be repaired or refurbished (or it is not economic to do so), or when a change in performance or capacity is required. |

The large existing asset base (modern equivalent asset replacement value of ~£120bn) means that a significant part of our current capital investment each year ~65% is spent on the repair, refurbishment and replacement of our assets. Underinvestment could lead to a higher proportion of assets operating beyond their expected lifespan leading to a higher likelihood of impacting service to customers and the environment.

**Investment Case – Management Approaches**

We have improved our investment demand decision making by standardising the way we look at the most economical approach to manage the repair, refurbishment and replacement of our assets making sure we are delivering the best value to our customers. This standard approach has resulted in the production of our *Management Approaches* covered in more detail in *Annex B: Management Approaches for AR3.*

To support our SR27 Business Plan submission, we have been refreshing our Asset Management Approaches, to develop a version 2 set (MAv2). These are the basis of the AR3 forecasts for the SR27 Investment Planning Scenarios by AR3 Programme Type.

The Management Approaches (particularly for Asset Repair, Refurbishment and Replacement (AR3)) support policy-led investment decision-making in Scottish Water. These have been instrumental for how we run the business and have allowed us to become more efficient and consistent in how we promote work for delivery. The Management Approaches look at the costs of assets categories over their whole life, including operating costs, to find the optimal intervention strategy.

As has been highlighted in discussions with WICS, there are some structural differences between the regulatory submission data reporting structure and the way we run our business through Management Approaches (as written in our Technical Appendices by our subject matter experts). There is a risk that this can cause confusion between SW and WICS. However, we are confident that analysis at the "need identification" level enables us to service both the business requirements and the regulatory reporting requirements.

### 5.2.2 Enhancement – Delivering compliance and improvements for today's customers

Where outputs and service outcomes need to improve, or where there are additional external factors, such as increasing regulatory drivers or climate change, there may need to be investment into associated assets. Enhancement is the process by which we improve the capacity and capability of our asset base to ensure maintaining or improving service levels for our existing customers[9]. Conversely, asset repair, refurbish and replacement (AR3) covers the maintenance and replacement of assets to enable them to continue operating at the same level in the face of a changing climate.

The requirements for enhancement investment during SR27 originate from a range of confirmed needs relating to non-compliance, or a high risk to compliance, with regulatory standards, which may have been escalated through regulatory enforcement or commitment to be addressed within an agreed timeframe.

Scottish Water has a duty to provide services as set out the **Water (Scotland) Act 1980** in addition to the duties included in the **Water Industry (Scotland) Act 2002**[10]. The latter includes ensuring that its resources are used economically, efficiently and effectively. To meet these requirements, it is important that our assets perform the functions they are designed to do.

In addition, some investment requirements are associated with our policy positions to reduce risk or improve service where the current status is considered unacceptable from a customer service perspective, or where progress is required to achieve Long-Term Strategy objectives. Please

[9] "relates to the incremental improvements in levels of service" WICS Methodology p109
[10] Water Industry (Scotland) Act 2002

refer to the relevant Water and Waste water Technical Appendices for further details on the specific relevant legislation for each area of investment.

**Specific Exclusions**

We have taken the approach of excluding future potential legislative changes that have not yet come into force (i.e. are not within our current known legislative framework). We are aware of significant amounts of future policy work that is under development within various stakeholder groups led by the Scottish Government. This could require significant investment to ensure Scottish Water is compliant if they come into force. If we were to account for future legislation it would require us to make provisions within the Investment Planning Scenarios and request additional funding through customer charges or additional Government borrowing. At this stage, investment for delivery of such future demands have been excluded from this draft plan as it is unclear if all aspects will achieve legislative status. If new legislation does come into force during SR27, it will be addressed within the dynamic IPPF process and be discussed and then prioritised against the existing Investment Planning Scenario in full transparency and discussion with sector stakeholders.

There are three main examples where there is currently no, or limited, specific planned enhancement investment:

- PFAS remediation and removal
- New (recast) Urban Waste Water Treatment Directive (UWWTD)
- Climate Change Policy

It is likely that these will be drivers of future enhancement investment so we have made provision for study / scoping work to understand the impact of this requirement.

### *5.2.3 Enhancement – Further Service Choices linked to Customer Expectations*

Given the scale of needs within our IPS there is virtually no scope for choices in the previous 3 components of our investment demand. We must maintain our assets; we must comply with legislation and regulatory requirements, and we must continue to support new housing and business connections to support a prosperous Scotland. These basic requirements are all inherently in the interests of customers, communities and the environment and tend to utilise the vast amount of available investment in most scenarios.

We are also aware of a number of service areas that might not have the same level of regulatory overview and clear legislative protection as areas such as water quality or environmental standards. Therefore, these areas are deemed to have a higher degree of choice around them in terms of how far and fast progress should be made in any regulatory period. These investment areas include items such as sewer flooding (internal and external), drought resilience, long term surface water management progress, support of other initiatives to enable a flourishing Scotland (e.g. top up taps in public places, youth swimming programmes etc).

### *5.2.4 Growth – Providing services for new customers*

The enabling sustainable and economic growth service outcome covers the provision of services, domestic and the domestic component of commercial development, for a growing and changing population. This service outcome is focussed on ensuring water treatment works and waste water treatment works (Part 4) capability and capacity for new customers and connections.

Our LTS long-term outcome is to support development and sustainable economic growth across Scotland whilst maintaining our level of service to existing customers and to the environment. Scottish Water will contribute to a prosperous and growing economy and continue to protect and support the water environment.

A key aspect of our strategy is to provide sustainable treatment capacity for all new domestic properties. We will support new housing and business growth whilst achieving our net zero emissions commitment through making the most of existing assets. We will encourage development where we have available capacity by influencing decision makers in government, local authorities and developers. This will support the most cost-effective solution for customers.

Our water supply systems are assessed against a defined list of hazards to identify and prioritise improvements to resilience. Capacity for the provision of water services will be achieved through reducing water demand where appropriate and economical, managing rainwater and then providing additional capacity as required. We will develop schemes for new strategic capacity where it is highly likely that capacity expansion will be required.

We will work with the industrial sector to facilitate the provision of water treatment works capacity for new non-domestic customers. This will maintain our level of service to existing customers and allow domestic development to proceed and contribute to a prosperous and inclusive economy.

Please refer to the Enabling Growth Technical Appendix for further details on the planned levels of investment in SR27.

Please refer to the relevant water and waste water Technical Appendices for further details on the specific relevant legislation for each area of investment. It is important to note that the Technical Appendices have been written and owned by the subject matter experts from across our business and therefore, the evidence within the Technical Appendices usually refers to the data structures that align to how the business is run – i.e. Management Approaches broken down to Needs identifiers. We then use Table X (which will be made available to WICS) to map the Needs identifiers up to the various data structures and definitions required for the regulatory submission to WICS to meet the Methodology and Guidance within the Data Tables.

## 5.3 Unconstrained Demand Estimate

Initial work to establish an unconstrained view of the demand estimate (completed during the summer of 2024) used a combination of high level top down methods to estimate AR3, run rate estimates of growth investment and a combination of known and more speculative initial estimates of enhancement requirements for water and waste water legislative and regulatory expectations (as is the aways the case at this stage in the process, the estimates had varying degrees of detailed analysis available).

The estimates have been systematically improved to create more rigorous estimates of demand and cost estimates as the objectives and scenarios have been developed and refined over the last nine months.

For example:

- the high-level methods for forecasting AR3 investment requirements have been replaced with individual estimates derived from Management Approaches development work (MAv2) that combine improved forecasts with known needs that already exist today.
- Initial growth run rates have been replaced with more granular named schemes and direct alignment to domestic property connection estimates.
- Further work with DWQR and SEPA has helped establish high priority regulatory and legislative compliance expectations which have in turn created improved bottom-up estimates of demand.

This activity has helped refine the "unconstrained" demand and associated investment estimates which then fed into the prioritisation exercise explained in Section 6 below.

## 5.4 Demand Forecast Maturity

Our approach to evidencing the total investment demand likely to arise in the SRC27 period has three categories of demand maturity:

- **Committed Demand:** This is where both the Need and the solution are already well understood, and commitment to delivery has already been given. This means it is beyond Gate 90 approval and is on the Committed List.
- **Known Demand:** This is where the Need is confirmed according to agreed organisational policies with options to address it under development, and so no commitment to delivery has yet been given.
- **Future Demand:** This is where the Need does not yet exist, but an allowance is made for expected future needs reasonably expected to materialise within the SRC27 period, according to agreed organisational policies.

These categories of demand maturity are assessed in an unconstrained approach. This means that the demand assessment includes for the cost of all Committed and Known needs that meet the policy criteria in the Management Approaches (specifically, the cost of the current preferred option of needs subject to investment appraisal), and the level of allocation for Future Demand best judged to keep pace with these same policy criteria whilst making reasonable progress toward the Long-Term Strategy.

Each of these categories of demand maturity may exist across every programme area and, for the purposes of consistency and so later prioritisation of which needs to address, are assessed according to common principles and methods.

### *5.4.1 Assessment of committed demand*

This is where both the Need and the solution are already well understood, and commitment to delivery has already been given.

*In our "Plan, Prepare, Deliver" stage & gate process for need development, these are the projects which have passed through Gate 90.*

The estimated cost of these investment proposals is normally subject to a contract for delivery.

As only the largest projects which are already committed for delivery will result in expenditure falling after 31 March 2027, all proposed investments at this level of maturity have a Project Investment Appraisal (PIA) documenting the decision-making process, and the evidence upon which it was based.

### *5.4.2 Assessment of known demand*

This is where the Need is confirmed according to agreed organisational policies with options to address it under development, and so no commitment to delivery has yet been given.

*In our "Plan, Prepare, Deliver" stage & gate process for need development, these are the projects which have passed through Gate 30, but which have not yet passed through Gate 90.*

As such, there can be expected to be a diversity of investments in this category both in terms of maturity and scale, i.e. from those with little definition of scope to those where a detailed design has already been developed; relatively low-cost needs not prioritised for delivery in SR21; and, individual projects costing >£100m.

These Needs will be following one of the existing 2, 3, or 5 step delivery runways which tailor the development effort to the complexity of the need and the potential cost of the investment. There is also a 1- step runway for the most standard of projects, which transitions directly from Future Demand to Committed demand. The maturity of the estimated cost of these investments proposals is dependent upon the gate through which the project has most recently passed

### *5.4.3 Assessment of future demand*

This is where the Need does not yet exist, but an allowance is made for expected future needs reasonably expected to materialise within the SRC27 period, according to agreed organisational policies.

*In our "Plan, Prepare, Deliver" stage & gate process for need development, these Needs are not yet classified as projects and are known as pre-Gate 30.*

Most commonly this demand will represent high-volume, low-value maintenance investment proposals that would follow the "1-step" delivery runway directly to commitment, and for which there is a significant recorded investment. On less frequent occasions, it may represent individually significant but uncertain future needs, for example the future need to enhance one additional Water Treatment Works to meet water quality standards, on basis that analysis of historic performance information supports the expectation that it is likely in the period to from 2027 to 2033 that at least one of these will emerge.

The assessment of Future Demand will ordinarily be based directly upon an assessment of these historic run-rates, or indirectly through a more sophisticated form of analysis.

Where a **run-rate** approach is used, evidence recorded will include:

- The source and scope of historic information used to inform the assessment

- Commentary on the completeness and quality of historic records
- Commentary on any factors that reasonably suggest future trends should differ from historic trends.
- A complete record of quantitative adjustments made to the level and/or trend in historic investment demand used to make the forward assessment of investment demand for the Allocation in the period 2027-2033.

Where a **more sophisticated form of analysis** is used, evidence recorded will include:

- A summary methodological document outlining the approach to the analysis, its intended purpose and limitations and references to artefacts that would allow a suitably skilled and experienced analyst to recreate the analysis.
- Documentation of the data required for the demand analysis (including model parameters where relevant).
- Copies of the data used in the analysis (including model parameters where relevant).
- Information, where available, to support an assessment of the calibration of the analysis to real-world observation.

## 5.5 Project Investment Appraisals

In the last regulatory period, we have transformed our approach to project investment appraisal (PIA), based on industry benchmarking completed in 2020. Our project investment appraisals have standardised our approach to making our investment case which covers whole life cost and value-based decision making for our most complex projects with a financial cost >£6m. These appraisals provide transparency to our people and stakeholders on the decisions being taken and have driven improved cost and (qualitative) benefit decisions over the longer term. We make more consistent decisions between projects, based on the same application of asset and cost data, analytics and understanding of qualitative benefits.

*Annex C: Investment Case Evidence* contains links to the PIA's submitted as part of the evidence base for Draft Business Plan submission.

## 5.6 Capturing Investment Demand

We use Copperleaf, our portfolio management system, to record, track and develop the emerging SR27 investment demand[11]. Any new investments enter Scottish Water's systems through Copperleaf first. Downstream of Copperleaf is another system, P3M, that we use to track existing live investments, i.e. those investments that have already been promoted into Scottish Water's Gateway Process. Annex D: Systems for Holding Demand Assessments provides further details of the approach to build up our bottom-up demand.

[11] Currently most of the investment in Copperleaf is SR27 demand. The system can also accommodate Long-tern investment demand and follow similar processes. As we further integrate the system we will use these wider capabilities.

# 6 Establishing the SR27 Investment Baseline

This section outlines how we have undertaken the investment prioritisation activities to create the Reference Investment Planning Scenario and two Alternative Scenarios as required by the Final Methodology.

## 6.1 Investment Planning Scenario Expectations

The WICS Final Methodology outlines the methodology for setting charge caps and evaluating investment proposals. This also sets out the requirements for developing a range of charging scenarios.

There is a requirement that Scottish Water is expected to provide a range of potential charge paths for both household and non-household customers. These charge paths should be designed to reflect different scenarios for meeting the Ministerial Objectives and make progress towards the sector vision outcomes.

In the Business Plan, WICS expects Scottish Water to outline how its charge paths will meet the objectives of Scottish Ministers.

For each charge path Scottish Water is required to:

- show proposed investment levels and associated risks;
- detail the impact on future service levels; and,
- compare sustainable economic depreciation with actual replacement expenditure cumulatively.

As set out in the Methodology to determine the charge path scenarios the following requirements are to be met;

- that the charge path scenarios should have one **Reference Scenario**, with Scottish Water identifying the projects or programmes of work that would be subtracted and/or added to the reference scenario in each of the other charge path scenarios, to allow WICS to set a baseline on any of the charge paths; and,
- that other analysis may be required on alternative charge and investment scenarios to help inform the development of the Objectives of the Scottish Ministers through the SRC27 Future Investment Group; however, WICS would not expect that these would form the request for charge paths set out in the Commissioning letter[12].

To do this Scottish Water is required to segment investment proposals into categories such as asset maintenance, enhancement, and growth investment. For each category, Scottish Water must provide;

- assumptions for indicative costings and outputs;
- forecast costs and outputs for projects in different stages of development;

[12] SRC27-Final-Methodology.pdf, page 122

- details on the proposed number of maintenance interventions, unit costs, and overall expenditure; and,
- measures of asset condition and the impact of maintenance activities.

Scottish Water should propose an efficiency challenge using established benchmarking techniques (please refer to the Efficiency Technical Appendix for details). The approach should include:

- benchmarking against UK water companies using Ofwat's models;
- adjustments for differences in capital maintenance and PFI contracts; and,
- an internal review of the scope for further efficiency improvements.

Work to identify and develop scenarios has been conducted in collaboration between WICS, Scottish Water and the Scottish Government to ensure the charge paths align with Ministers' expectations. Additionally, engagement has been conducted with other industry stakeholders, DWQR, SEPA and Consumer Scotland. This has enabled early transparent sharing of the range of investment scenarios as they evolved in a series of meetings and at the stakeholder joint group (FIG) from October 24 through to May 25.

## 6.2 Approach to Developing the Investment Planning Scenarios

The main steps are outlined below (Figure 9) but it is important to note that they were not linear. We revisited each of these steps to ensure all elements were rigorously tested and documented ahead of the Draft Business Plan submission.

*Figure 9: Investment Planning Scenario Development Process*

## 6.3 Reviewing a Broad Range of Investment Planning Scenarios (IPS)

During the initial stages of planning and discussions with stakeholders, we established a broad set of investment planning scenarios so we could ascertain levels of internal and external appetite for these at a high level.

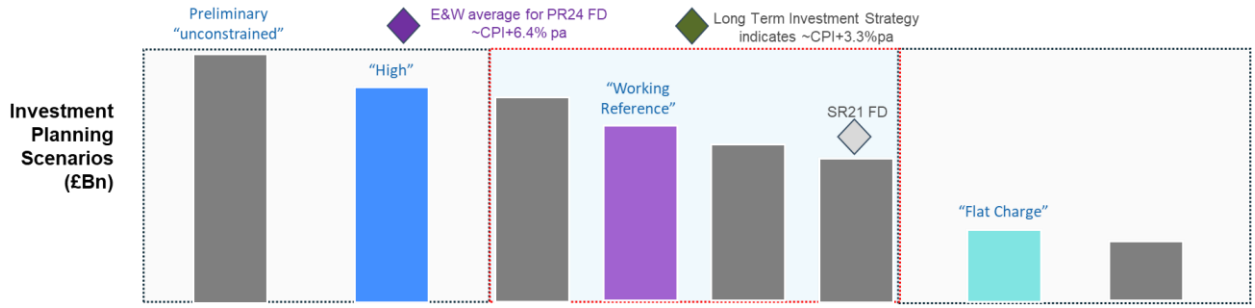
The three main scenarios at this stage were labelled:

Scenario A: "**High**" Scenario – our initial estimates of what would be required to meet Ministerial Objectives and make good progress against our Long-Term Strategy

Scenario C: "**Working Reference**" Scenario – a mid-range scenario above the previous SR21 Final Determination but lower than the High Scenario

Scenario E: "**Flat Charge**" Scenario that considered available investment and progress if customer charges were limited to inflationary-only increases on an annual basis

Other scenarios were also considered but these were the primary focus for engagement with stakeholders (see Figure 10 below).




| | Higher Scenarios | | Zone of Potential Acceptability | | | | Lower Scenarios | |
|---|---|---|---|---|---|---|---|---|
| Available investment (IPS) 23/24 price base (inc. efficiency) | | £9.5bn | | £8.5bn | | £7.7bn | £7.0bn | |
| Annual Customer Charge increase | [CPI+10%] | [CPI+6.5%] | [CPI+5%] | [CPI+4%] | [CPI+3%] | [CPI+2%] | Flat (CPI +0%) | Frozen |

*Figure 10: Range of Investment Planning Scenarios considered*

### 6.3.1 Establishing a Potential Zone of Acceptability

These broad scenarios and the high-level analysis enabled us to identify upper and lower bounds of *the potential zone of acceptability* to ensure that what we recommend for SR27 is **Feasible**, **Affordable** and **Deliverable**.

We considered a range of external and internal factors including:

- The ability and capacity of our supply chain to deliver planned projects and programmes efficiently. This included any known supply chain constraints and other infrastructure schemes in other sectors that may compete for supply chain capacity. This enabled us to understand the upper limit of the supply chain's ability to deliver efficiently.
- The impact of changing customer charges and the associated customer acceptance of the differing levels of charges. We considered factors such as cost of living and what available analysis indicated regarding the effect of potential customer charge profiles have on available investment.
- The balance of intergenerational equity.
- The varying levels investment versus our ability to plan for, mitigate and successfully keep pace with climate change. We identified a likely level of investment below which we can no longer do this effectively.
- Our ability to maintain our assets (AR3).
- Our ability to meet legislative, statutory, regulatory obligations and other documented commitments (including Ministerial Objectives (MOs) against proposed investment levels.
- The investment required to be able to make progress in areas of service choices, considering what (if any) level of reduction would be acceptable.

### 6.3.2 Establishing the "Working Reference" Scenario

To meet our SR27 draft business plan submission deadlines the "Working Reference" Scenario was required by February 2025. At this point the Working Reference Scenario equated to investment of £8.5bn (post-efficient in 23/24 prices), resulting in an increase in customer charges of Consumer Prices Index (CPI) + 4% per annum assuming an equal annual charge increase profile across the SR27 period.

The key data points on Figure 10 above were:

- "**Working Reference**" Scenario meets the MOs and will be critical as it forms the basis of the investment component of the SR27 Draft Business Plan submission.
- "**High**" Scenario - An upward drive in investment to reduce the risk of not meeting the MO's and making more progress towards the Long-Term Strategy goals (equivalent to **CPI+6.5%** pa).
- Scottish Water's Long-Term Strategy indication that the investment forecast required would result in a customer charge increase of **CPI+3.3%** per annum until 2050 (assuming the same balance of borrowing to customer charges and a steady smooth escalating increase).
- Ofwat's Final Determination for PR24 (equivalent to **CPI+6.4%** per annum for 5 years with significant Year 1 initial adjustments.
- Internal and external discussions on acceptable price increases (equivalent to **CPI+2 to 4%**). This is being validated through further customer research.
- The SR21 Final Determination long-term projection of **CPI+2%** although a number of factors changed since SR21 was assessed including a better understanding of PFI returns, higher Regulatory / legislative compliance requirements, specific acceleration of AC mains replacements.
- "**Flat Charges**" Scenario – **CPI+0%** - developed on request from Scottish Government to enable ministers to assess a wide range of options.

### 6.3.3 Selecting the Priority Needs for the Scenarios

As an initial step, we utilised our Investment Hierarchy that we use within the current investment period (SR21) as a useful tool to develop a balanced investment portfolio. It is not designed to be followed linearly or precisely, it provides a broad ruleset to start the process and guide the rationale for the initial stages of decision making, based on our objectives, customer expectations, stakeholder needs and available funding. Table 4 below sets out the categories within the hierarchy and the following sections unpack what each of these entails.

*Table 4: Our Existing SR21 Investment Hierarchy*

| | Customer & performance centric investment needs | Description | Investment allocation approach | Mapping to FD | |
|---|---|---|---|---|---|
| Deliver for existing customers | 1 Maintain core service performance for existing customers | Essential works to maintain existing asset performance, customer experience and health & safety | Minimum needed to maintain service. Already prioritised significantly so budget reduced as a last resort, after all other non-discretionary expenditure reduced to minimum levels | AR3 – asset category 1,2&3 | Core expenditure |
| | 2 Meet current regulatory & community commitments | Meet legislative (RBMP3), regulatory (water quality), (IUW) community (e.g., Seafield odour) and progress Net Zero by 2040 | SR15 and matched funding<br>Then allocated portion of Enhancement funding | Enhancement (incl. matched funding )<br>SR15 | |
| | 3A Improve service for existing customers | Investing in asset enhancement to strengthen resilience, reliability and sustainability of service | No ring-fenced allowance. Absorbed within Enhancement<br>Allocated portion of Enhancement to support internal flooding and low pressure | Enhancement<br>Incl. ring-fenced allowance | Remaining allocation prioritised within these areas |
| Support new connections | 3B Provide a service for new customers | New development and connections, including temporary works | Currently £100m committed and known sites like Bertha Park are advancing | Enhancement | |
| Consider future customers | 3C Replace long-life assets for future customers | Proactively replacing aging assets to tackle back log and underlying issues; water mains (Asbestos cement pipes), civil infrastructure with lifetime of 40-60 years). Aim to prevent unsustainable costs being passed on to future customers | Consequential allocation as there is high demand from existing assets that impact current service. FD & investment scenarios do specify investing in long-life asset replacement. Future customer needs re-prioritised | AR3 – category 2 Civils and water mains, pressurised sewers | |

Match funding Income received that is allocated for Part 3 infrastructure improvements to support new connections. In addition, service relocation allocation is required to move our assets when required by a 3rd party (part funded from external sources)

As a minimum, customers expect us to maintain service levels, so our first priority is to maintain our assets through AR3 to protect core service performance for existing customers. This **Category 1** investment accounts for the majority ~60% of our proposed investment in SR27 Reference Scenario, at £4.96bn.

Within the Methodology WICS has highlighted an area of improvement for Scottish Water is to provide more detailed bottom-up evidence on future asset replacement which would complement the top-down analysis conducted for SR21. *Annex E: AR3 Overview* sets out the approach taken to analyse the AR3 demand for use in the Reference Scenario.

As part of the planning for SR21, WICS recognised underspend on the maintenance and replacement of existing assets, potential implications for intergenerational fairness and the need for gradual increases to a long-term sustainable level of investment over time. Scottish Water and WICS conducted joint analysis to support this view which was a key factor in the SR21 Final Determination, setting an above inflationary charge cap of CPI+2%. During SR21, Scottish Water has continued to develop and evidence the AR3 need through improvements from asset inspection, asset data capture and analytical modelling to revise the appraisals within our AR3 Management Approaches. Figure 11 shows actual and forecast maintenance investments by regulatory period from SR15 to SR45.

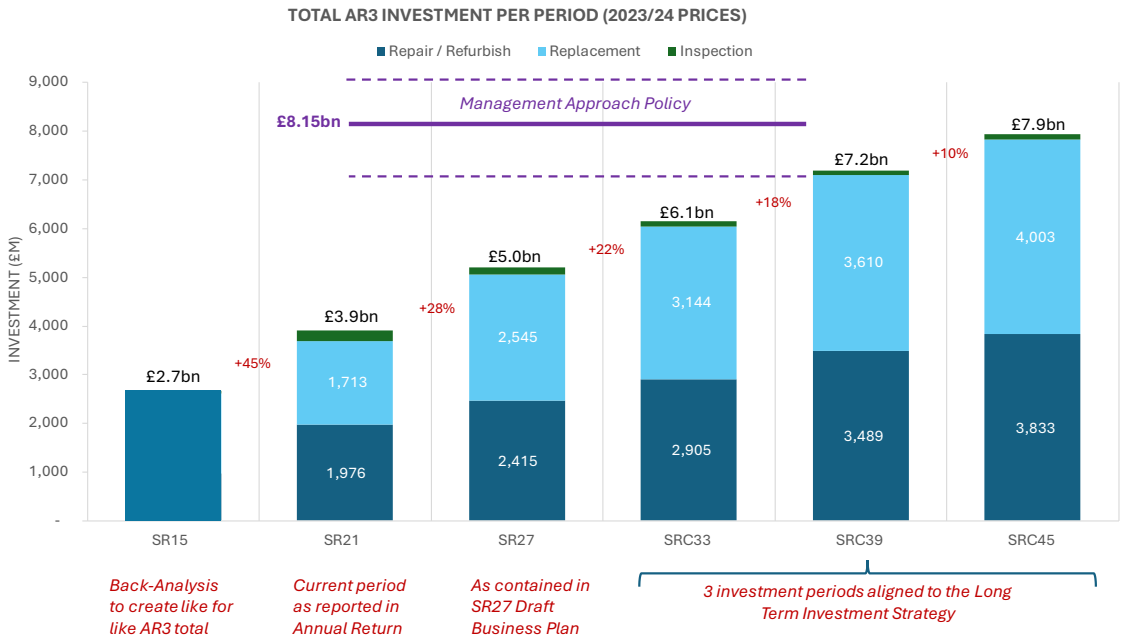



*Figure 11: Total AR3 Investment Per Period*

- The projected investment in SR27 for AR3 represents an increase of ~28% compared to SR21.
- Strategic decisions were taken about the scale of AR3 investment within the Reference Scenario for the SR27 period. Choices were taken on the preliminary allocations for each of the Management Approaches through:
    - review of recent investment run rates in SR21;
    - full Management Approaches policy estimates; and,
    - the views of subject matter experts to determine where to take more or less risk across the individual Management Approaches

**Category 2** investment is what we invest to deliver legislative and regulatory compliance and meet the expectations of DWQR and SEPA. This includes adapting to meet new legislative requirements or responding to enforcement notices or commitments and making progress on regulatory expectations that are otherwise likely to be enforced. Regulatory driven investment is based on meeting international standards or responding to localised customers issues. This investment accounts for ~27% of the SR27 IPS.

**Category 3** investment is for service choices. This is ~13% of proposed SR27 IPS and includes improving service for existing customers (**Category 3a**); providing assets to enable growth (**Category 3b**); and replacing long life assets to protect service levels for future customers (**Category 3c**). The allocation of this investment is informed by a number of factors including our customer research programmes.

We are developing a balanced investment portfolio, so while the Investment Hierarchy is a valuable tool, there will always be multiple factors and priorities that we consider when making investment decision.

### 6.3.4 Systemising the Scenarios

Having undertaken the initial investment planning exercise and established the Reference Scenario, we then went back into the detail of identifying the specific projects and programmes to take forward in each of them. Ensuring we have the right selection of specific investments within the right overall scenario demonstrates that we have successfully balanced the needs of (and challenges faced by) customers, and communities, and performance of current and future assets and challenges.

The three main steps we followed were:

1. **Translate an overall financial constraint into draft Need level allocations.** Working in Copperleaf with our Service Planners and other investment reviewers to set up the scenarios and input the capital expenditure constraints as we move from our initial and preferred scenarios to the Reference and Alternative scenarios. This involved splitting the investment across all the different funding Needs. This step synthesised information from the existing rolling investment portfolio and LTIS, and as such addressed issues of deliverability and customer value.

2. **Identify an initial set of priority projects and programmes to be delivered for the proposed allocations from an assessment of total investment demand**. Informed by Management Approach owners and the detailed knowledge of stakeholder preferences held by SW people accountable for these stakeholder relationships to "tag" investments in Copperleaf to different scenarios. (i.e. which investments in a particular Management Approach would include if £x versus £y were available).

3. **Undertake a single adjustment of these selected projects and programmes, subject to executive approval, to form the SR27 Investment Baseline.** This step accounted for the differences between known project and programme costs and those assumed in the LTIS, along with any known material risks and opportunities. It also considered the potential collective impact of the scheduling of individual large projects and programmes.

This workstream delivered a dataset recorded in Copperleaf representing:

- A baseline scenario of the Investment Demand that is planned to be satisfied in case of the Reference Scenario (the "SR27 Investment Baseline"),
- Changes to that baseline that represented what more or less investment was available to create the alternative scenarios.

### 6.3.5 Checking for Overlaps

A number of features of the process followed to generate the SR27 Investment Baseline contribute to reducing the potential for it to include scope overlaps, notably:

- Many of the known and committed investment proposals represent significant levels of expenditure, so attract the requirement for Project Investment Appraisal. This process allows for the identification of the full scope of need at the site in question, and for this to be accounted for in the appraised project options.
- Where investment proposals relate to projects already recorded in our project delivery system (P3M), we have used information from it to form the cost estimates in the Investment Baseline. Within P6, a facility exists to associate each project with a site level asset. This allows for a

review of projects at the same asset to avoid planning clashes and, by the same measure, scope duplication. Where this is the case, the projects can be combined and reported with "split drivers" e.g. where some of the expenditure is forecast as AR3 demand, and others to different needs. This is particularly common in the case of investment to enable new connections to waste water treatment works already at capacity – commonly these upgrades also deliver asset maintenance benefits and are recorded as such.

- Through the process of excluding ~30% of the forecast AR3 demand required to meet the selected policy positions in our Management Approaches (Annex B: Management Approaches for AR3) – much of which resulted in the exclusion of lower priority planned investment needs – the proportion of future demand (both planned and responsive) is increased, and so the potential for overlaps in known demand automatically reduced.

Prior to the submission of Scottish Water's final, a full review of all known and committed demand is planned to further optimise use of the overall allocation within the SR27 Investment Baseline.

### *6.3.6 Profiling Investment*

Profiling is the process of splitting and spreading the forecasted SR27 investment over the six years of the period. In doing this, it is important that we consider a number of factors in order to forecast an accurate and acceptable profile that aims to deliver the planned work in an efficient and economic manner, within various constraints. Factors taken into consideration include:

- **Customer charging / billing profile:** Overall investment is profiled in line with the customer charge profile, with capital expenditure mirroring the steady growth of charges across the period and availability of funding. For our maintenance AR3 programmes we have profiled investment for each Management Approach to match the available funding profile
- **Legislative commitments**: Our profiling of certain projects and programmes has been driven by the need to ensure achievement of legislative compliance dates (e.g. RBMP3) or commitment dates (e.g. DWQR Enforcements), wherever possible.
- **Cash flow and deliverability:** An initial attempt has been made to take account of supply chain efficiency and sustainability considerations by smoothing investment levels within programmes to support efficient resourcing of delivery. At Draft Business Plan stage this has been conducted at a strategic level. This will be developed further in our Final Business Plan and Delivery Plan when we will have been able to engage our SR27 delivery partners.
- **Major project programmes:** The investment levels associated with some of our major projects such as West Central Bioresource, Juniper House replacement and the Water of Leith UID projects have meant that we have had to reprioritise a number of smaller projects from current live reported date to remain balance annual investment levels.

### 6.3.7 Outputs from the Analysis of the Broad Range of Scenarios

The following figure represents balance of investments[13] across three categories for the broad range of investment scenarios.

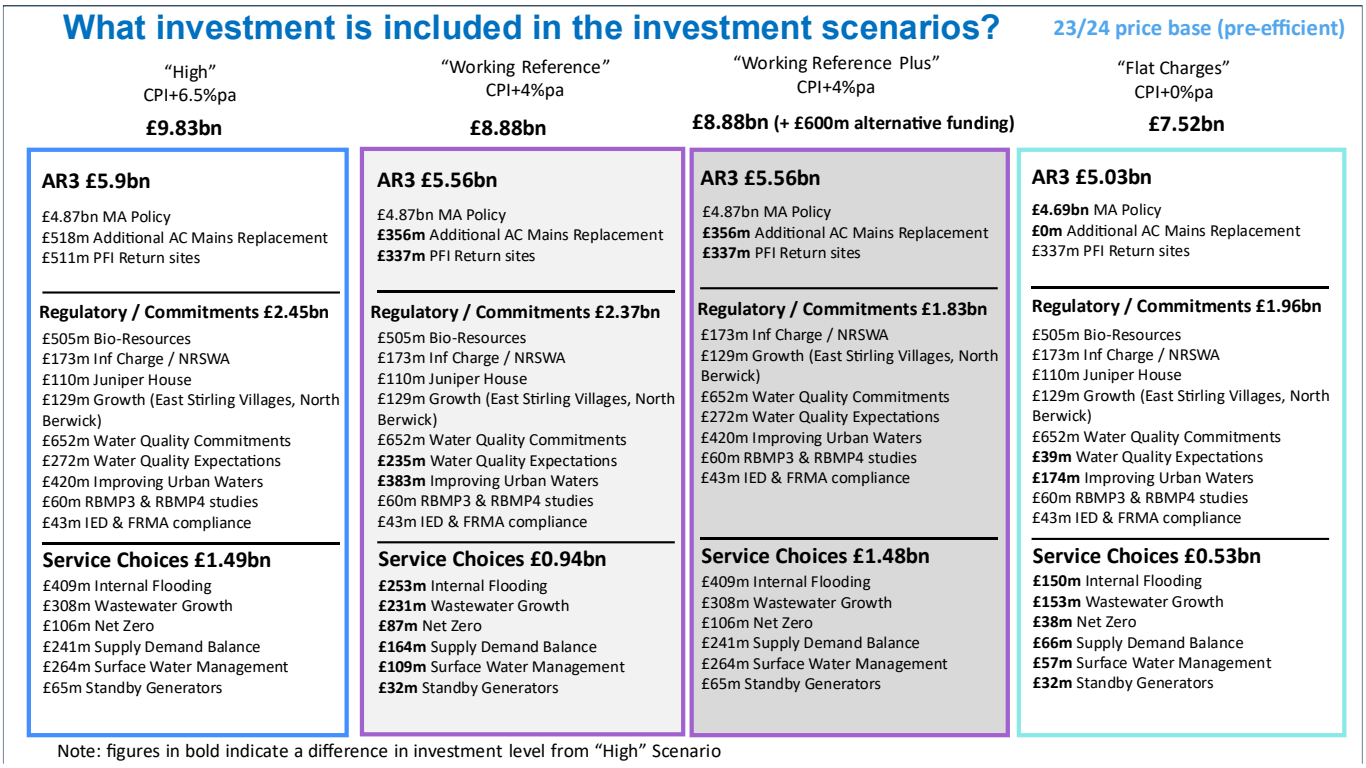


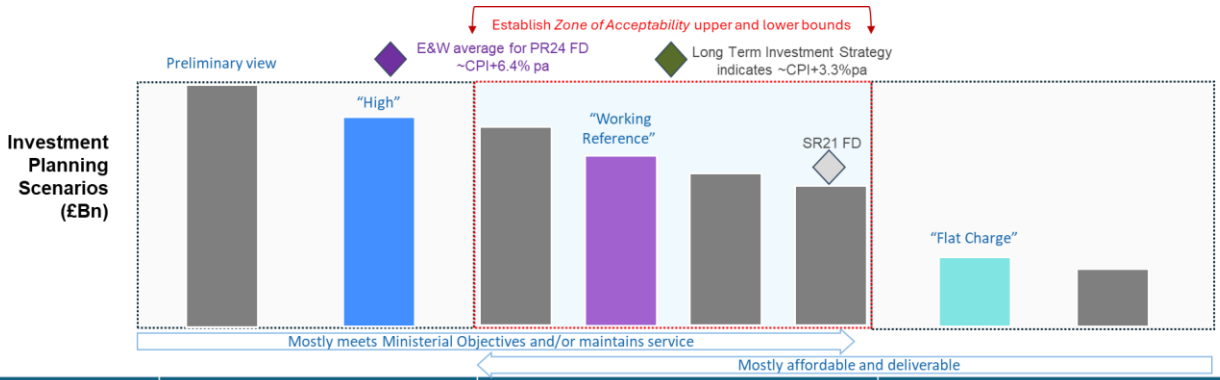

*Figure 12: Balance of investments across the scenarios (during development, February 2025)*

The "Working Reference" Scenario in Figure 12 assumes an available investment planning envelope using a customer charge cap at CPI+4% pa with Government borrowing as laid out in the Commissioning Letter. There are some large one-off investments such as the West Central Bioresources (Daldowie) and the replacement of Juniper House laboratory facility contained within this funding envelope. There were significant reductions in investment levels (shown in bold) for certain line items compared to the "High" Scenario. These reductions create either an increase in risk or a reduction in service or outputs.

To illustrate the potential impact of alternative funding opportunities we have included an additional Scenario (labelled "Working Reference Plus"). This scenario includes an assumption that the ~£600m for West Central Bioresources (Daldowie) and Juniper House is funded from additional borrowing or other form of financial arrangement (e.g. new PFI schemes). This results in less reductions to other investment lines and the outcomes associated with the "Working Reference Plus" Scenario are more closely matched to the "High" Scenario.

The potential for additional borrowing or other financial arrangements has not been included ahead of the draft Business Plan submission but further consideration of these options is intended ahead of Final Business Plan submission in February 2026.

[13] Note: Figures quoted here are "pre-efficiency" – we apply a working assumption for the top-down efficiency factor to be applied to create the "post-efficient" investment. Therefore, when considering the reference scenario, £8.88bn equates to £8.5bn in post-efficient terms.




| | | Higher Scenarios | | Reference Scenario and Variations | | | | Lower Scenarios | |
|---|---|---|---|---|---|---|---|---|---|
| **Assessment Criteria** | | | | | | | | | |
| Available investment (IPS) 23/24 price base (inc efficiency) | | | £9.5bn | | £8.5bn | | £7.7bn | £7.0bn | |
| **Service** | Meeting Legal duties | | ✓ | | ✓ | | | ? | X |
| | Progress to Ministerial Objectives | | ✓ | | ? | | | X | X |
| | Stakeholder / Customer priorities | | ✓ | | ? | | | X | X |
| **External Factors** | Supply Chain | | ? | | ✓ | ✓ | | ? | ? |
| | Annual Customer Charge increase | [CPI+10%] | [CPI+6.5%] | [CPI+5%] | [CPI+4%] | [CPI+3%] | [CPI+2%] | Flat (CPI +0%) | Frozen |

*Figure 13: Overview of initial review of broad scenarios to understand what might be feasible, affordable, and deliverable*

In Figure 13, the High Scenario would be feasible but could be impacted by the supply chain's capacity to deliver, and were assessed as likely to be found unaffordable or unacceptable by customers.

Scenario E "Flat charge" would likely be more affordable to customers but would be unfeasible as it would not maintain services or meet ministerial objectives.

As the overall investment envelope decreases from left to right in, so the risk to services increases, and the ability to meet Ministerial Objectives and maintain services decreases.

Our objective is to determine the scale of the feasible and affordable scenarios; quantifying the full investment envelope and then prioritising those investment Needs from the bottom-up exercise that should be included within the scenario to deliver the optimal service outcomes within the "zone of acceptability".

### 6.3.8 Stakeholder Engagement

In parallel to careful consideration of these factors, we undertook significant engagement with internal and external stakeholders and continued our programme of customer research. We presented detailed materials on the range of investment scenarios and their associated the outputs and outcomes to joint stakeholder sessions (Future Investment Group), the Independent Customer Group and to the Scottish Water Board in December 2024 and February 2025. In addition, there were specific meetings with DWQR and SEPA to better understand the expectations for progress for SR27. Stakeholders appreciated the transparency of sharing this position and the dilemmas at this stage of the SR27 process.

These scenarios were used to inform the programme of ongoing customer research – both through direct research and the deliberative research group of informed customers. This is further explained in the Customer Research Technical Appendix.

### *6.3.9 Customer Voice*

Scottish Water's programme for SR27 customer research (as detailed in the Customer Research Technical Appendix) has been central to the development of the Reference IPS. For SR27 we have for the first time involved customers in the development of investment planning scenarios from the earliest stages, being transparent about the impact of various levels of investment on the outcomes that Scottish Water will be able to deliver, and bill impact. All research undertaken with current household customers on this subject for SR27 has provided them with personalised information which reflects their own Council Tax Band, and the level of discount that they receive.

We first engaged with household and business customers on investment planning scenarios in early 2025, sharing outcomes that might be offered at three different levels of charging (increasing by CPI +2%, +4% and +6.5% per annum). Customers gave detailed feedback on choice areas and their comparative preference between scenarios. Their understanding and acceptance of the challenges presented by Scottish Water and their positive sentiment towards Scottish Water, led to customers wanting to protect both the company and its infrastructure, and generally accepting the need to pay more due to challenges and future-proofing efforts. However, none of the scenarios presented offered enough value for wholehearted endorsement from customers. This led to a recommendation to review the scenarios to offer more value – in terms of the outcomes on offer, and in how outcomes are communicated.

A rebalanced, high-level investment scenario representing bill increases of CPI+4% (on a incremental increase basis), with outcomes aligned with Scottish Waters thinking in the last stages of the development of the Draft Business Plan, was presented in early April 2025 to reconvened panel of customers who had participated in the earlier investment scenario research. In the context of their priorities and increased understanding of the investment areas, participants generally felt that the rebalanced investment scenario was well-balanced and offered clear, tangible outcomes. When invited to consider re-prioritising expenditure across investment areas, participants generally maintained the allocations presented in the rebalanced scenario. Where changes were suggested, they typically involved diverting funds to choice areas perceived to benefit a greater number of customers and deliver broader impact. In the post-group feedback, most participants agreed that Scottish Water listened to their feedback from the original research when designing the rebalanced investment scenario.

This extended research methodology enabled customers to give considered views of Scottish Water's plans, and created a 'you said we did' engagement process. As a result, customers involved in these research activities developed an informed view of Scottish Water's operations, our long-term ambitions and strategy, and the challenges that Scottish Water faces. We could expect that a typical customer might hold a less well-informed view. In recognition of this, further research directed towards building a nationally representative view is planned for late summer 2025, to be used in the development of the Final Business Plan.

## 6.4 Refining the Reference Investment Planning Scenario

The previous sections outlined the work up to the end of February 2024 to consider a broad range of scenarios and home in on a "Working Reference" Scenario. The focus was then put on maturing and refining the "Working Refence" Scenario into a "Reference" Scenario.

The first step was to refine the available budget associated with a CPI+4% pa customer charge profile. The Financial Model was re-run using the latest modelling assumptions and the application of the most up to date top-down global efficiency factors to be applied. Working back from this figure resulted in a new "Reference" Scenario budget being set of £8.75bn (2023/24 price base before SR27 efficiency adjustments are applied). This equates to a £8.3bn post-efficiency budget.

The refinement process incorporated feedback from sector stakeholders, clarification of Regulator requirements, customer research feedback and further considering the requirements of the draft Ministerial Objectives. We excluded the use of additional government borrowing or alternative financing options (PFI or equivalent) or front-loading the customer bill profile as this requires further exploration with stakeholders that will not be concluded in time for incorporation into the Draft Business Plan. Further efficiency was also excluded at this point as we have already built in a significant stretch to achieve the frontier efficiency challenge. These options will be explored further ahead of the Final Business Plan submission. Decisions were required to navigate these limitations while ensuring a balanced investment plan.

Several strategic options were considered to manage budgetary constraints and investment reallocation. These included potential further removal of demand in the AR3 programme areas or reduce outcomes where there is service choice. Service choice areas were reviewed, including allocations for internal flooding, waste water growth, net zero, supply-demand balance, and surface water management.

Upward adjustments included an additional allocation for carbon capture (woodland creation and peatland restoration) to achieve net zero emissions targets. A focus on environmental compliance resulted in increased allocations for regulatory requirements following clarifications of SEPA minimum expectations. Further allocations were targeted towards leakage reduction and non-domestic smart metering programme to improve the resilience in our water supply demand balance. Waste water growth allocations were also increased to ensure compliance risk can be managed whilst enabling all new domestic connections.

Downward adjustments included reductions in asset replacement allocations against the Management Approach policy estimates, PFI returns and reduction in how much additional AC Mains Replacement we are planning. There were opportunities to reduce the allocation for Water Quality investment allocation due to improved estimates.

## 6.5 Recommended Reference Scenario A

This Technical Appendix has outlined the stages we have undertaken to enable us to create a single Reference Investment Planning Scenario for the draft Business Plan.

This scenario represents a carefully considered, balanced set of investment needs that:

- Meets the draft Ministerial Objectives;
- Represents delivery against (established via engagement with SEPA and DWQR), the minimum levels of investment to meet our statutory and regulatory obligations in respect of drinking water quality and the environment. This includes improvements in core areas of water quality compliance and risk, and significant progress in delivering improvements to storm overflows from sewers assessed by SEPA as high priority;

- Has been adjusted to reflect the latest customer research available at this point (further research to be undertaken);
- Allows us to maintain the existing high levels of service that customers across Scotland enjoy in the face of climate change and for customers affected by internal sewer flooding (we note that this will be challenging given increasing volatility both from the weather and our aging assets);
- Allows us to play our part in addressing the causes of climate change by maintaining confidence in our target to reach Net Zero carbon by 2040;
- Considers the future (aligned with our Long-Term Strategy), making sure that we put future generations in a good position through investment in climate adaptation, replacing the parts of our drinking water network which are deteriorating the fastest, and ensuring we maintain understanding of the condition of asset base for future decision making; and,
- Has been developed with EBP&R principles of transparency with our sector stakeholders throughout the process.

### 6.5.1 Key Investments

Figure 14 sets out the key investments included within the proposed Reference Scenario, noting the adjustments made from the draft Reference Scenario laid out in February 25.

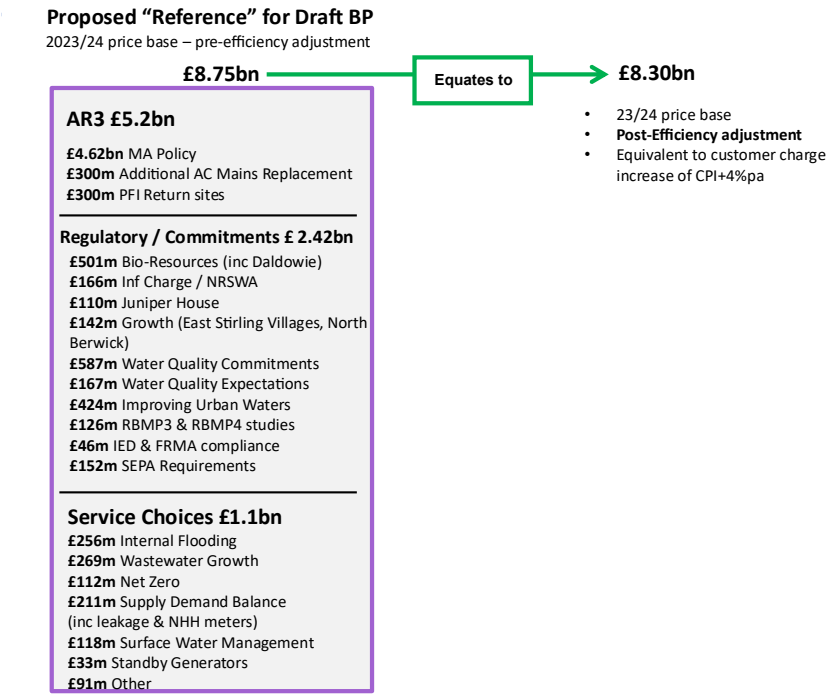



*Figure 14: What investment is included in the Reference Investment Scenarios*

### 6.5.2 Key Outcomes

The outcomes associated with the Reference Scenario are forecast in the Table 1 of the Data Tables in line with the WICS Guidance and definitions. These are further described in the Monitoring Technical Appendix. These are split into "existing measures" that are familiar to Scottish Water which helps build confidence in outcome realisation. There are also a series of "new measures" which have been developed and work is ongoing to ensure we can fully report these measures with confidence and understand the implications outcome realisation.

## Customer Service Outcomes

| | Metric description | Baseline | 2032/33 | Rounded %change |
|---|---|---|---|---|
| Existing | Developer customer experience measure | 81.99 | 83.04 | **6%** |
| | Non-household customer experience measure | 88.78 | 89.43 | **6%** |
| | Household customer experience measure | 87.78 | 88.49 | **6%** |
| New | R-MeX (wholesale service) | UQ | UQ | - |
| | UKCSI | > average | > average | - |
| | Asset health | In development | | - |
| | Communities measure | not available | | - |

Note: Positive % change indicate improvement.

## Water Service Outcomes

| | Metric description | Baseline | 2032/33 | Rounded %change |
|---|---|---|---|---|
| Existing | Total leakage | 455.9 | 411 | **10%** |
| | Low pressure register | 30 | 26 | **13%** |
| | Unplanned interruptions greater than 6 hours | 6750 | 6750 | **0%** |
| | Total drinking water compliance | 99.93% | 99.95% | **29%** |
| New | Leakage in zones with supply demand deficit | 233 | 203 | **13%** |
| | Consumption of non-household premises | 371.5 | 311.4 | **16%** |
| | Per capita consumption (PCC) | 177.3 | 174.3 | **2%** |
| | Average minutes lost | 15 | 15 | **0%** |
| | Repeat interruptions to supply | 240 | 200 | **17%** |
| | Population at risk at worst historic drought | 2,940,760 | 2,328,000 | **21%** |
| | Population at risk at peak demand (very provisional) | 654,860 | 346,000 | **47%** |
| | Taste & odour contacts | 0.51 | 0.53 | **-4%** |
| | Discoloration contacts | 2.11 | 2.08 | **2%** |
| | Lead SW networks | 45,550 | 27,550 | **39%** |
| | Lead customer supply pipes | 98.01 | 98.15 | **7%** |
| | Water risk assessment planning | 7,975 | 6,465 | **19%** |
| | DWQR reported incidents | 30 | 25 | **16%** |

Note: Positive % change indicate improvement. Leakage and NHH consumption figures quoted in Ml/d terms for clarity but reported as a percentage reduction in Data Table 1 and related documents to reflect WICS Guidance requirements.

## Environment / Waste water Service Outcomes

| | Metric description | Baseline | 2032/33 | Rounded %change |
|---|---|---|---|---|
| Existing | Annual internal sewer flooding | 1.57 | 1.48 | **6%** |
| | WwTW discharge compliance | 96.37% | 96.37% | **0%** |
| | Serious pollution (EPI Cat 1/2) | 8 | 5 | **38%** |
| | Total pollution (all categories) | 34.8 | 34.8 | **0%** |
| | Sludge compliance | 0 | 0 | **0%** |
| New | Internal sewer flooding register | 1.51 | 1.51 | **0%** |
| | Annual external sewer flooding | 10.50 | 11.24 | **-7%** |
| | External sewer flooding register | 11.35 | 11.88 | **-5%** |
| | Unsatisfactory intermittent discharges (UIDs) | 873 | 748 | **14%** |
| | River water quality | not available | | - |

Note: Positive % change indicate improvement.

## Net Zero Emissions and Biodiversity

| | Metric description | Baseline | 2032/33 | Rounded %change |
|---|---|---|---|---|
| Existing | Net Zero Emissions | 259,257 | 84,994 | **67%** |
| | Operational emissions (W) | 62,882 | 2,314 | **96%** |
| | Operational emissions (WW) | 102,219 | 35,717 | **65%** |
| | Baseline emissions | 35.74% | 8.23% | **77%** |
| New | Operational emissions (net) | 156,908 | 14,461 | **91%** |
| | Embodied carbon | 102,349 | 70,533 | **31%** |
| | Carbon capture/sequestration | -8,193 | -23,569 | **188%** |
| | Biodiversity land-use | 0 | 4,500 | - |
| | Biodiversity outcomes | In development | | - |
| | Resource recovery | In development | | - |

Note: Positive % change indicates improvement

### *6.5.3 Testing against the Ministerial Objectives*

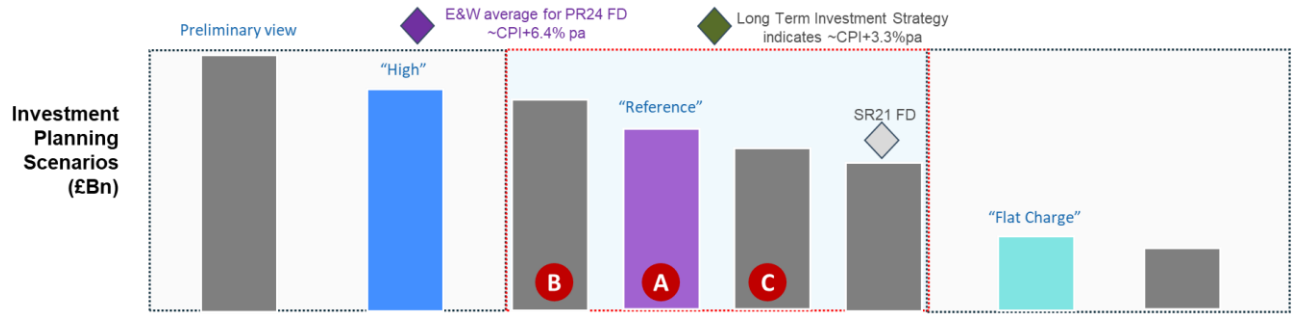
Following the adjustments and refinements made to the Reference Scenario, we can confirm that the recommended Reference Scenario meets the draft Ministerial Objectives. As the Reference Scenario was refined there was analysis conducted as to what would be achieved in each of the Ministerial Objectives. This is set out in *Annex F: High Level Analysis of Broad Scenarios against MO's (Feb 25).*

*Annex G: Analysis of the recommended Reference Scenario against the draft Ministerial Objectives* gives a view of what is proposed within the Reference Scenario against the draft Ministerial Objectives.

## 6.6 Alternative Scenarios

In addition to providing a central "Reference Scenario" for our SR27 Business Plan submission, we are required to consider the impact on water and waste water services of alternative charge paths.

Following discussions with stakeholders, it was agreed that an incremental step of £400m was deemed to be a reasonable step when considering Alternative Scenarios for the Business Plan and Data Tables. It was considered that a larger increment risked undermining the principles of the SR27 Business Plan. This would require a comprehensive revision for each alternative. Conversely, a much smaller was unlikely to make any material differences to the outcome measures. This was equivalent to a CPI + 1% per annum increment on customer charges. This is pictorially represented in Figure 15.




| | Higher Scenarios | | Reference Scenario and Variations | | | | Lower Scenarios | |
|---|---|---|---|---|---|---|---|---|
| **Assessment Criteria** | | | | | | | | |
| Available investment (IPS) 23/24 price base (inc efficiency) | | | £8.7bn | £8.3bn | £7.9bn | | | |
| Annual Customer Charge increase | [CPI+10%] | [CPI+6.5%] | [CPI+5%] | [CPI+4%] | [CPI+3%] | [CPI+2%] | Flat (CPI +0%) | Frozen |

*Figure 15: Reference Scenario (A) and Two Alternative Scenarios (B & C)*

The two alternative scenarios are pictorially summarised below in Figure 16. The following sections go on to describe each of these alternatives in more detail.

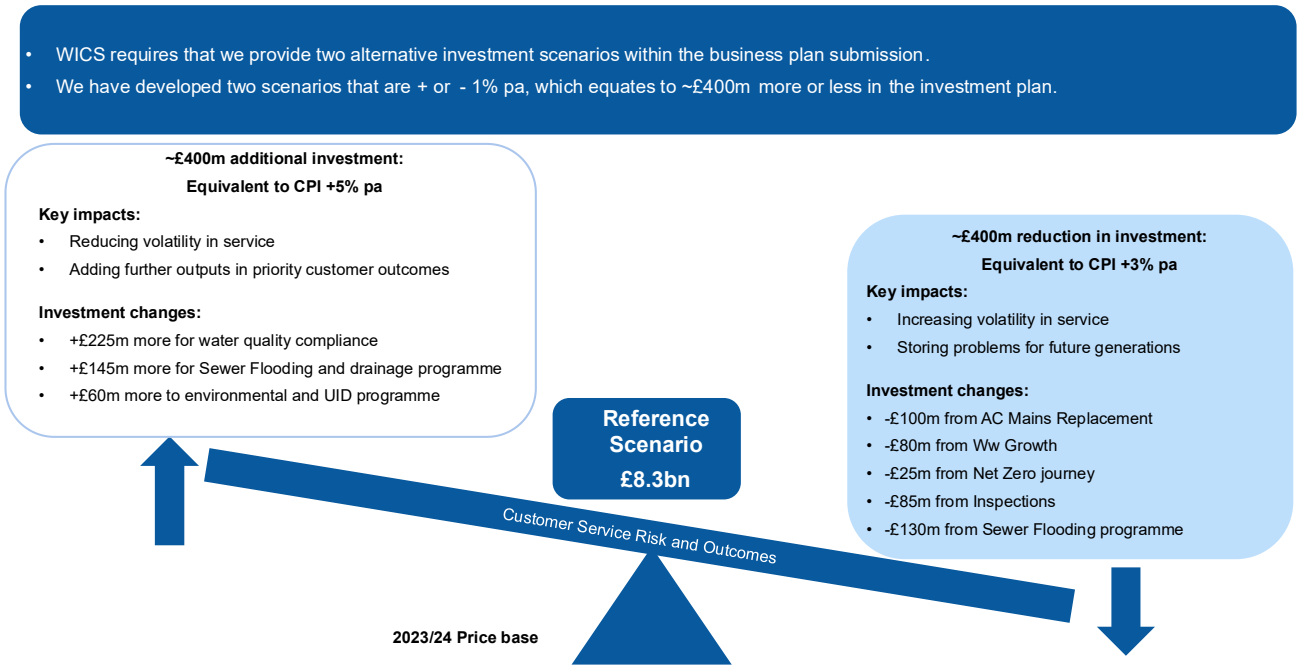



*Figure 16: View of the two alternative scenarios*

### 6.6.1 Alternative Scenario B – Delivering More for Customers

This scenario would enable ~£430m additional investment in water and waste-water services when compared to the Reference Scenario.

We forecast that his would enable;

- **A reduction in variation of water quality performance, securing safe, great-tasting water 24/7.** The additional investment available in this scenario would allow us to:
  - Upgrade an aging water treatment works supplying drinking water to 62,000 customers.
  - Accelerate programmes to modernise chemical dosing, monitoring, and control equipment at water treatment works across Scotland to reduce the number of problems we respond to - in turn reducing the number which escalate into customer events and regulatory incidents.
  - Replace aging water mains which result in customers receiving persistently discoloured water.
- **Better support for communities affected when our sewers are overloaded by rainwater.** The additional investment available in this scenario would allow us to:
  - Invest alongside communities, initially at a modest scale, to co-create schemes designed to keep rainwater on the surface. We would do this working with Local Authorities, establishing a "community fund" to promote community driven, place-based initiatives.
  - Allocate more money to directly resolve the pinch-points in our sewers that leave some customers vulnerable to internal sewer flooding. We expect that this would see our register of such customers start to reduce during the SR27 period as we get ahead of the early impacts of our changed climate.
- **Acceleration of investment to protect the health of our rivers, where it is impacted from storm overflows.** We are proposing in our Reference Scenario to invest three times more than SR21 to address overflows from sewers assessed by SEPA as high priority. The additional investment available in this scenario would allow us to begin work on similar, but lower priority, issues where these are shown to have an environmental impact.

| Recommendation | £430m | |
|---|---|---|
| Secure Water Quality compliance<br>(including Water NIS compliance risk) | £225m | • AR3 expenditure on critical chemical dosing & control equipment and network interventions to avoid discoloration.<br>• Replacement of Castle Moffatt WTW: AR3, HAA, and Disinfection needs<br>• Improved water quality monitoring at WTW to improve assurance manage operational problems. |
| Protect internal sewer flooding performance in a changing climate | £80m | •Investment to de-risk central output profile and move messaging from “maintain” to “reduce”. |
| Promote community-driven, place-based schemes that keep rainwater on the surface | £65m | •Community fund to seed partnership work, (inc. with Local Authorities).<br>•Strong alignment with LTS outcomes and steps. |
| Further progress on UIDs with environmental impact | £60m | •Begin to deliver some improvements to medium priority UIDs. |

*Figure 17: Alternative Scenario B: Delivering more for customers into the future (23/24 price base, pre-SR27 efficiency adjustment)*

### 6.6.2 Alternative Scenario C – Address the Problems that we can today

This scenario removes c£420m of proposed investment in water and waste-water services compared to the Reference Scenario.

In this scenario, we would expect to be faced with particularly difficult choices.

It is our judgement that following the work to produce the Reference Scenario, no further reductions could be made regarding the delivery of our regulatory duties, including the level of maintenance expenditure require to maintain essential services.

In this instance we would forecast a need to address today's concerns over the factors that we know will impact customers in the future (this creating a bias regarding the burden on each generation of bill payers);

In this scenario we forecast:

- ***A material increase [~200 properties] on the internal sewer flooding register.*** We would likely accept that the current approach always to provide underground pipes and tanks to be unsustainable even in the short term. Instead, our focus would shift to providing property-level mitigations (e.g. one-way valves to prevent sewage entering a property) and developing "traditional" solutions only where there was a high cost-benefit and no prospect of a catchment-wide solution in the long-run.
- ***A route to NZ by 2040 totally reliant on considerable investment in SR33.*** We would be relying on additional investment in renewable power after 2033. We are one of Scotland's biggest electricity users but would have to rely only on the results of others to create a "green" electricity supply.
- ***An upward trend in burst rates water supply interruptions.*** We would reduce the planned rate of water mains replacement by circa 20%. Without off-setting this reduction with additional investment in future years, this will result in a significant increase in customers experiencing repeated supply interruptions in the late-2030s.
- ***A higher risk of non-compliance with environmental discharge permits.*** Beyond the current list of known sites, we would continue to rely on temporary chemical dosing units to support emerging connections. These present a higher risk of failure compared to more permanent installations and also require consent from SEPA.
- ***A weaker evidence base for decision making.*** We would reduce by 50% our planned investment in asset inspections, expecting limited capacity to deliver proactive maintenance strategies in the SR27 period, pausing some work until the mid-point of the period to support planning for SR33.

| Recommendation | -£420m | |
|---|---|---|
| Delay addressing the causes of problems for future customers, introducing more volatility into today's service levels | -£100m | Reduce distribution mains renewal to 250km/yr<br>• Full AC replacement extended by 5 years.<br>• Recurring Customer Interruptions stable, not reducing.<br>• ITS & burst rates volatile and continuing to trend upward. |
| | -£80m | No allocation for emerging demand on WWTW from future connections<br>• Requires higher WLC temporary operational solutions or putting at risk future Environmental Compliance |
| | -£25m | No expenditure on new renewables<br>• Requires significant investment in SR33 to hit Net Zero by 2040 |
| Pause investment in intelligence for good - practice asset management | -£85m | Circa 50% reduction in planned non-statutory inspections<br>• Weaker evidence base for future planning – remaining inspections later in the period.<br>• Potential to miss some low-probability high-impact issues. |
| Different approach to internal sewer flooding | -£130m | Provide property-level mitigations, prioritising traditional solutions only where there is a high cost-benefit and no prospect of a strategic solution (inc. rainwater management).<br>• Flooding register likely to rise by 200+ properties during SR27 |

*Figure 18: Alternative Scenario C: Address the problems that we can today (23/24 price base, pre-SR27 efficiency adjustment*

# 7 Conclusions

Through the business planning process, we have taken both internal and external stakeholders on a deliberate and structured journey. Beginning with a broad spectrum of potential investment needs rooted in our long-term strategic objectives, we have iteratively refined these into an affordable and balanced Reference Investment Planning Scenario, complemented by two alternative scenarios. This approach has been designed to meet the diverse and intersecting requirements of Scottish Water's customers, communities, and the environment, alongside Ministerial Objectives, sector stakeholders, and the capacity of our supply chain.

The result is a comprehensive plan that aligns with the WICS Methodology, ensuring robust decision-making founded on evidence and best practices. By addressing immediate challenges while keeping sight of long-term sustainability goals such as our net-zero ambitions, the scenarios reflect a careful balance between cost-effectiveness and the delivery of value to all stakeholders.

It is important to note that this document represents a draft stage in our business planning process, providing the foundation for further discussions and refinements as we move towards the Final Business Plan submission in February 2026. The engagement and insights gathered through this iterative process will guide us in delivering a plan that is financially sustainable, operationally resilient, and reflective of the shared ambitions of all parties involved.

# Annex A: Further Capability Improvements for SR27

## A1 Improving our data and analytical capabilities to support investment decision making

Our data and analytical capabilities are critical to achieving asset management excellence and enabling Scottish Water's ambitions. They are what allow us to monitor, measure, analyse, forecast, optimise and gain insights into our asset base which is worth nearly £120 billion. High quality data and analytics allows us to understand our assets so that we can operate them effectively and efficiently and deliver best value for our customers, now and into the future, and build confidence in the evidence supporting our investment decision making.

## Scottish Water historic asset data context

Scottish Water's asset data has a long and complex history; initially managed in Local Authorities, then three independent water authorities and ultimately merged into Scottish Water post 2002. A significant amount of information on our assets was held in paper format in area offices or on site in logbooks. Post merger, there was a focus on standardising the inherited data, identification of key improvements and on establishing consistent collection processes, with the technology available that was available at that time.

What followed was a phase of extensive improvement in our digital landscape with the development of new solutions to drive our operations, collect our data and enable insights.

Since 2014 Scottish Water has successfully:

- Transformed its digital landscape ensuring we had fit for the future solutions to deliver our operations, capture our data and provide insights (e.g. SharePoint Information Management, our Data & Analytics Cloud Platform (a central repository for the data that drives insights through connecting data from multiple sources, such as telemetry data and weather data; the platform hosts a range of analytics products such as Flow Sense, our leakage monitoring and reporting solution)).
- Significantly grown our in-house skills and capabilities for data architecture, data analysis, business analysis, data science and data engineering.
- Increased our confidence in our data and improved our Annual Return capabilities and commentary, evidenced in the AR24 response where it was noted by WICS *'Following our review of the information, we are pleased to observe a continued improvement in the quality of information reported in the tables and accompanying commentaries'.*

We have made significant inroads into the quality of the old data alongside the capturing of new data to inform our investment decisions. The journey continues with the digital systems refresh of our asset management capability (IBM Maximo), our investment decision capability (Copperleaf) and our geospatial (mapping) capability (GIS). Alongside this we are moving to the next generation of analytical technologies (Data Lakehouse) and better data management at scale (Data Catalogue, Quality Measurement and Lineage). Together this landscape lays a solid foundation for the next generation of data improvement, covered in Section 6.4.1.

The last 10 years has seen data grow by an estimated 1,400%, and there have been rapid shifts in technology, machine learning and Artificial Intelligence (AI). We have a strong foundation to build on; we have developed a data management environment and in-house analytics capability that guides and can support and improve our decision-making.

The next section explains some of the improvements made in the last regulatory period; and how these have resulted in improved investment decisions for SR27.

## Improvements in our data and analytics capabilities which have allowed us to make better investment decisions in SR21

Data improvements will be a continuous process for us. However, during the SR21 period we have undertaken the following actions:

- **Improved the completeness and accuracy of our Combined Sewer Overflow (CSO) inventory** – through the Waste water Intermittent Discharge Project increasing survey activity across Scotland, and improved cost models.
- **Improved the completeness and accuracy of the inventory for our above ground water and waste water functions** – through proactive surveys carried out on our main above ground function types over 80 sites.
- **Improved the association of surface classification to water and waste water pipes –** by moving away from our previous risk averse classification approach to a more specific and exact method, improving how we plan for the wise use and investment of our customers' money.
- **Improved the accuracy of condition grades for civil assets** – by better use of the condition data collected from inspections of 7,600 assets to improve and target proactive maintenance, and reduce long-term intervention costs.
- **Improved the yardstick[14] data for pumps –** through prioritised use of multiple offline pump data sources, where their data was found to be more accurate than the corporate system.

With reference to our analytical capabilities, we have:

- **Improved the age profile estimates for our assets** - through enhancements to our approaches on how we infill missing data.
- **Improved the understanding of asset failure behaviour and its representation in our analysis** - by enhancement of the deterioration curves and models, and improved benchmarking activities.
- **Begun to understand the impact of changing climate on critical infrastructure** – improving our intervention choices and decisions.
- **Updated our cost models** - providing greater confidence in investment need projections.
- **Completed a range of methodological improvements in our modelling approach** - that enhances confidence in outputs and allows alignment with the next versions of our Management Approaches.

[14] Yardstick – This is the maximum output rate of an asset e.g., kW rating of a pump. The yardstick is used within a cost model to estimate it's MEAV.

## A2 Improving our understanding of asset health

Our ability to understand and respond to the health of our assets is central to maintaining or improving the service we provide. With an ageing asset base, monitoring the health of our assets and integrating it as a metric within our decision-making processes is important as it allows us to be able to describe how the money we spend on maintaining our assets under our Management Approaches efficiently improves the overall health of our assets and therefore their likelihood of failure and potential impact on service to customers.

Monitoring the health of our assets allows us to:

- For the next regulatory period (the next six years):
- Demonstrate the impact of investment under selected priority Management Approaches for different asset types where asse age is material to the policy decision being made.
    - Compare asset health projections between selected Management Approaches
    - Be able to articulate how our maintenance investment reduces the risk of service disruption where asset health is an improving metric. This may only be possible, at least initially, for a limited type of assets as we further our understanding of our data availability.
- Over 25 years (to align with the aspirations set out in our Long-Term Strategy) project different investment or asset health scenarios to inform discussions and deliver best value decisions for a resilient service for future generations.

## Our measure of asset health

The Water Industry Commission for Scotland (WICS) methodology sets out that Scottish Water should, as far as possible, be able to translate the impact of our maintenance activities on asset condition into tangible consequences that customers will understand.

Scottish Water has proposed to capture this using its **Equipment Health Index (EHI) measure**. This measure is at an early stage of maturity and requires further development during the SR27 period, so we have committed to the inclusion of an improvement plan (further described in Section A5) to address the data and knowledge gaps in its asset health reporting and forecasting for SR27.

## A3 Improving our view of risks and benefits through Strategic Cost Benefit Assessment

Long-term strategic investment planning involves an understanding of the potential risks to services over twenty years or more. The risks can be categorised by the impact of adverse incidents on customers, communities and the environment. These risks might change over time from external factors that are outside a company's direct control such as a changing climate and the macro-economic conditions. Investment in assets can mitigate the risk of these impacts, form better expected outcomes and benefit wider society.

Scottish Water, and other utilities, have typically used several asset management frameworks to prioritise investments. Two of these are the Risk Management Framework, which encourages an organisation to develop a corporate risk appetite to understand its risks and categorises the levels

of those risks, and the MoSCoW[15] framework used to prioritise and categorise investments. These techniques were fully utilised in the planning of the SR21 period.

These frameworks can help an organisation better manage its risks, aligning planning towards compliance, and improving society through its investments and services. However, each has limitations when seeking to address how to identify and form the best strategic outcomes to include within long-term strategic investment planning. In addition, these frameworks do not directly take account of the benefits and value to society, customers, communities and environment. They tend to focus on what is known and well-evidenced, which tends to be nearer term and less toward a more uncertain future.

Therefore, to ensure we are using the most effective approach for our customers, assets and decision making, and recognising the limitations of above approaches, we have adopted Strategic Cost-Benefit Assessment as the means of estimating the resource costs and benefits over the long term. Cost benefit analyses of this kind came to prominence in economics in the 1950s and has evolved into the Green Book reports of governments, to inform public sector expenditure of large projects.

## Main principles

The strategic cost-benefit assessment has been developed through a set of principles. These principles have grounded and shaped its application.

- Use available reporting frameworks that are familiar and applicable to wide audiences and all sectors, including the water sector, to inform the reporting of results and structure for the strategic cost-benefit analysis.
- Have an integrated, multilevel and well-evidenced strategic planning process across the organisation centred on a thorough understanding of the investments and their costs.
- Have representation of customers' values, preferences and priorities at the heart of the organisation's strategic investment planning, through a thorough understanding and application of the impacts of the investments on society and their societal benefits.
- Manage the information and data flows through to a comparative evaluation of the investments and enable the other three principles to be met and enhanced through its well-evidenced, transparent and consistent application.

## Use of strategic cost benefit assessment

We use this type of assessment to inform long term strategic investments, bringing together inputs from both the supply side and customer side to form a cost-benefit ranking of the investments and enable the formation of investment plans that maximise societal benefits. Through this process there are inputs that are well-evidenced, additional assumptions that can be informed and estimated, and further assumptions that are less well informed and more subjective. By making these elements transparent and consistent there is less bias and greater scope for engagement and improvement to strive towards informed strategies and decision making that benefits all.

[15] The acronym MoSCoW represents four categories of initiatives: **M**ust-do, **S**hould-do, **C**ould-do, and **W**on't-do, or Won't do right now.

## A4 Improving our data and analytics capabilities to allow us to make better investment decisions in the future

We realise that we can always do more to improve the evidence we base our investment decisions on to provide confidence to our customers we are making the right decisions at the right time.

## Data improvements in SR27

Some of the key improvement areas for our data capabilities which will improve our decision making in SR27 are:

- Improve our services and improve our maintenance and investment forecast through increasing the coverage of an Intelligent Network[16], and aligning with our Inventory Data[17], providing improvements to the monitoring of asset performance.
- Improve our climate mitigation investment decisions through improved access to carbon data at the level of granularity for analytical modelling.
- Further improve our Management Approach policy decisions by ensuring condition data, degradation rates and impact of repairs on the expected asset life is easy to access and at the level of granularity for operational and strategic decision making.
- Facilitate more accurate repair project management and spending decisions through improving the accuracy of repair data. We will develop processes and technologies to enable the easy capture of asset repairs and make this data available within the Analytics suite
- Development of an improved capability in our Management Approaches by improving the completeness and accuracy of cost of failure data to inform planned or responsive intervention options within our optioneering stage of policy development.

The above data improvement areas are based on what we know today about the improvements which are material to investment decisions in the future. However, we are mindful of the fast-paced development of AI. To fully utilise AI capabilities, we need to make sure we have our data ready. This may require us to adjust from the areas identified above to where we identify greater value from an AI opportunity. These opportunities will be identified through research and collaboration with partners and other organisations.

## Analytics Improvements in SR27

Some of the key improvement areas for our analytics capabilities into SR27 are:

- Increasing the effectiveness of investment decisions by updating and augmenting the insights into the service impact of bursts on our water distribution network and exploring ways to extend this analysis to other assets.
- Review, and better integration and consolidation of the analytical models used across a management approaches, Copperleaf and other tools that support our long-term strategy.
- Linking operational and strategic/tactical decisions is crucial for effective asset management. Operational decisions focus on the day-to-day management of assets; however, without alignment with strategic and tactical goals, these decisions may not support long-term

[16] Please refer to the Water and Waste water Technical Appendices for further details on the planned levels of investment in intelligent networks in SR27.
[17] Inventory data – this is static data about the characteristics of an asset e.g. Description, Type, Yardstick.

objectives. Vice-versa, strategic decisions may change depending on how we interact with assets in the short-term and how our assets are operated.

- Linking operational and strategic/tactical decisions in our analytical processes through initiatives like ICC to ROC and by leveraging our Cloud Data & Analytics platform, to drive effective asset management.
- Explore methods to incorporate carbon impact in our analytical models, informing our Management Approach policies aim to identify the optimal economic option for the repair, refurbishment or replacement of our assets.
- Enhance the efficiency and effectiveness of asset management through AI, by automating the cleansing of field data to extract insights more effectively, optimising decision-making, enhancing predictive capabilities, and identifying cost-efficient solutions to maintain infrastructure resilience.

## A5 Further improving how we understand the health of our assets

Understanding the health of our assets (such as our treated water storage tanks or sewer pipes) means we need to understand the age, condition and degradation of our assets, how well they are performing and the risk they present to the service we provide to customers and the environment.

As of 2024, we have developed 'basic' Equipment Health Index (EHI) metric which utilises asset calendar age (based on the date of install) for MEICA, (mechanical, electrical, instrument and control assets), civil structures, and water infrastructure and waste water infrastructure types. This provides us with an initial view of the remaining useful life of these assets.

We are proposing a series of EHI deliverables and improvements leading up to, and during SR27. To develop the EHI measure for reporting in the SR27 period by April 2027 we commit to:

1. Applying the base EHI metric to the top 10 Management Approaches by investment spend profile for SR27. The proposed MAs are included in Annex B: Management Approaches for AR3
2. Forecasting the base EHI score for the top 10 Management Approaches for the end of the SR27 period in 2033, associated with planned investment spend in 2027-2033.
3. Set up and shadow report asset health condition aligned to OFWAT current requirements in England and Wales to allow comparison of service levels for water bursts and sewer collapse.
4. Explore the data available to develop an unplanned outage table for Water Treatment and develop a proof-of-concept table for future discussions with WICS ahead of SR27.
5. Maturing our EHI measure to include both age and asset condition (generally obtained by inspections, and performance information and maintenance records as an indicator of condition) for the top 10 Management Approaches by investment spend profile, where asset age and condition are material to the policy decisions being made.
6. Improve the data available in our asset inventory, the knowledge we have on asset age and the existing condition of our assets.
7. Continue to work with other utilities and the UKWIR lead Steering group on the Asset Health improvement project to allow comparisons to England and Wales.

Within the SR27 period we will continue to apply the EHI measures as above and will broaden their use to a wider set of Management Approaches (and thus the asset categories included in Business Plan Table 3b) where asset age and condition are material to the policy decisions being made and we have the data available to do so.

## A6 Further improving our asset management platforms

We are making changes to our asset management planning platform which will lead to better functionality and provide a better platform for improving the corporate understanding of our assets to improve decision making at various levels. Notably, we are replacing our legacy “Ellipse” asset management system with IBM’s established “Maximo” platform. One of the benefits is that this cloud-based system supports improved tracking & reporting of maintenance expenditure against the asset inventory aligned to our Management Approach policies. Alongside this is the first-time implementation of dedicated investment planning & management system “Copperleaf”, which will support the management of our rolling investment portfolio providing improved visibility of value-based decision making over time.

# Annex B: Management Approaches for AR3

Management Approaches were established in 2020/21 to improve policy led investment decision making in Scottish Water and have allowed us to be more efficient in how we promote work for delivery. They are policies setting out the criteria under which interventions (actions required to maintain our level of service) can be 'triggered' and the cost of this policy approach. They look at the costs of these assets over their whole life, including operating costs, to find the optimal intervention strategy.

The combination of all our Management Approaches provides us with a ruleset which tells us how we should invest in our repair, refurbishment and replacement activities. They provide a consistent, policy led investment demand for all asset types in Scottish Water. This informs the bottom-up build-up of our investment demand and is a key input into our Investment Planning Scenarios[18] and demonstrates an improved capability from SR15 and the beginning of SR21.

## What Do The Management Approaches Consider?

The policies in the Management Approaches consider a number of aspects:

- The Ministerial Objectives set by the Scottish Government
- Our three Strategic Ambitions
- Legislative requirements (what we must do)
- Our Board risk appetite
- The age, condition and deterioration profiles of our assets (understanding both the age and condition of our assets and how the materials are degrading over time is becoming an important factor in understanding when we need to act). This can be informed by our inspection data and modelling techniques.
- The criticality of the assets and the impact on the service we provide
- How a changing climate might affect our assets and when we need to act
- Views of our customers; informed by our Customer Research programme
- An assessment of options as to how to manage our assets informed by cost-benefit analysis
- The data and modelling required to evidence the decisions.

The types of policy choices we consider could be that we fix an asset when it comes to the end of its theoretical lifetime, we fix only when an asset fails, or we fix proactively ahead of any failures and potential impacts on our service. The costs of the different options, plus the risk to service are all different; so, it's important that these are assessed using the best available data and analytical modelling.

Our management approaches include two primary considerations:

- **When to intervene** – this considers the point in an asset's life when an intervention should occur. This includes whether to intervene after failure (responsively) or on a planned basis before failure, and if planned, at what stage to intervene to maximise the useful life of the asset

[18] The build-up of our Investment Planning Scenarios is covered in Section 5.

while minimising the chance of failure. A definition of each intervention approach is provided in Table 5 below.

- **How to intervene** – this considers what intervention is used to restore asset condition / performance. This includes options for investigations and repairs, decisions on whether to refurbish or replace. Decisions on whether to enhance or improve the resilience of an asset when it is being refurbished or replaced are considered as part of a sub-outcome approach and made on a case-by-case basis as part of systems planning. Table 6 below.

*Table 5: Scottish Water Definitions for Intervention Approaches*

| Intervention Approach | Definition |
|---|---|
| **Responsive** | The intervention is responsive when an asset has failed and is impacting service provision and/or we identify that an immediate, no-choice intervention is required. |
| **Planned** | The intervention is planned when an asset has a historic service failure, or we identify that an intervention is required, at our choice, to reduce the risk of asset failure. |

*Table 6: Scottish Water Definitions for Intervention Types*

| Intervention Type | Description |
|---|---|
| **Investigation** | Activities focused on gathering asset information which is required in the decision-making process prior to one of the other asset intervention types. This includes inspection programmes to identify the condition of our assets. |
| **Operational and Maintenance Activities** | Responsive or planned processes and practices that support an asset to continue to operate and achieve its expected operational life that do not modify the asset itself. |
| **Repair** | Fixing an asset to ensure it can continue to operate and achieve its expected operational asset life (this includes replacement of component parts) |
| **Refurbish** | Renovation / overhaul of older or damaged equipment or replacement of parts of the asset to bring the asset back to a workable condition to extend the expected life of the asset |
| **Replace** | Replacement of an asset (equipment, unit, or process) when it is at the end of its serviceable life, or the asset has failed and cannot be repaired or refurbished (or it is not economic to do so), or when a change in performance or capacity is required. |

The investment needs for asset maintenance have been developed primarily from a combination of analytical models (used to predict the overall level of investment required for a particular asset type) together with Management Approaches (used to identify the site / asset specific needs in line with policy criteria). In addition, some investment requirements are associated with routine inspection and maintenance programmes, with others developed from historical run-rates of ongoing activities.

Analytical models which consider previous maintenance requirements to predict future requirements are utilised to inform investment requirements and plans at an asset type level.

Both original Management Approaches and those developed to economic appraisals have been used inform the criteria on which specific assets shall be identified for intervention, with appropriate adjustments to further improve performance or ensure affordability. The criticality of assets and impact to service is also considered in policy option selection.

## Continuing Development

In our SR27 Draft Business Plan we forecast to increase the spend on our asset repair, refurbishment and replacement c 28% compared to the last regulatory period. To make sure we are investing this money to deliver the best value, we recognise we can always do more to mature the way we create policies for repair, refurbishment and replacement of our assets. Our Management Approaches are periodically updated and refreshed as we learn more about our assets, their condition and how critical they are to our service and incorporate refreshed priorities and views from our customer research programme. Material data and analytical priorities for future development are identified and will be prioritised for action in SR27.

## B1 Management Approaches

*Individual Management Approach documents available within the SR27 Draft Business Plan submission folder*

*Table 7 Management Approach summary*

| Portfolio | MA No | MA Descriptor | Policy change from v1 |
|---|---|---|---|
| **Management Approaches that cover waste water assets are grouped below** | | | |
| Waste water | MA003 | Waste water Pipebridge | No |
| Waste water | MA011 | Waste water MCC's | No |
| Waste water | MA012 | Waste water Pumping Mains | Yes |
| Waste water | MA013 | Waste water Control Systems - SCADA | No |
| Waste water | MA017 | Waste water Treatment Works - Inlet Works | No |
| Waste water | MA023 | Waste water Pumping Stations | No |
| Waste water | MA024 | Waste water Bioresource Treatment and De-watering Centres | No |
| Waste water | MA035 | Waste water Outfalls | No |
| Waste water | MA036 | Waste water Screw Pumps | No |
| Waste water | MA039 | Combined Sewer Overflows (CSO) | No |
| Waste water | MA042 | Waste water Treatment Works - Primary Treatment | No |
| Waste water | MA043 | Waste water Treatment Works - Secondary & Tertiary Treatment | No |
| Waste water | MA049 | Waste water Treatment Odour Equipment | No |
| Waste water | MA057 | Waste water Treatment Works - Ancillaries | No |
| Waste water | MA062 | Sewer Structures | No |
| Waste water | MA113 | Waste water Gravity Sewers | No |
| **Management Approaches that cover water assets are grouped below** | | | |
| Water | MA004 | Water Reservoir Safety | No |
| Water | MA016 | Distribution Infrastructure - Discolouration | No |
| Water | MA022 | Water SCADA PLC HMI | No |
| *Water* | *MA028* | *Catchment Management* | *tbc* |
| Water | MA033 | Water Filtration (Membranes, Granular Activated Carbon (GAC) and Sand Filters) | No |
| Water | MA052 | Water Treatment Works - Sludge and Washwater Handling | No |
| Water | MA058 | Water Pumping Stations | Yes |
| Water | MA060 | Water Distribution Infrastructure - Network Valves | No |
| *Water* | *MA063* | *Water Resources Environmental Monitoring & Compliance* | *tbc* |
| *Water* | *MA073* | *Water Distribution Infrastructure - Metering and Flow Monitoring* | *tbc* |
| Water | MA080 | Boreholes | No |
| Water | MA081 | Sample Points | No |

| | | | |
|---|---|---|---|
| *Water* | *MA089* | *Security* | *tbc* |
| Water | MA093 | Water Treatment Works - Process Stage Civils | No |
| Water | MA094 | Water Treatment Works - Process Stages Mechanical and Electrical | No |
| Water | MA095 | Water Treatment Works - Water Quality Instrumentation | No |
| *Water* | *MA098* | *Emergency Response* | No |
| Water | MA111 | Water Distribution Mains | Yes |
| Water | MA114 | Water Chemical Storage and Dosing | No |
| Water | MA115 | Water Pipebridges | No |
| Water | MA116 | Water Strategic Infrastructure (Raw Water Mains, Sub Seas, Aqueducts, Tunnels & Trunk Mains) | No |
| Water | MA117 | Raw Water Intake and Storage | No |
| Water | MA118 | Water Low Voltage Electrical Systems | No |
| Water | MA119 | Treated Water Storage and Chlorine Contact Tanks | No |
| **Management Approaches that cover similar assets across water and wastewater are grouped and shown below.** | | | |
| Water; Waste water | MA018 | Ironworks | No |
| Water; Waste water | MA034 | Customer Meters | No |
| Water; Waste water | MA044 | Telemetry | No |
| *Water; Waste water* | *MA054* | *Network Model Maintenance* | *tbc* |
| *Water; Waste water* | *MA068* | *Statutory and Planned Maintenance* | *tbc* |
| Water; Waste water | MA091 | High Voltage Assets (Water and Waste water) | No |
| *Water; Waste water* | *MA120* | *Site Buildings and Asset Access* | *tbc* |
| **Management Approaches that support the Business delivery of water and wastewater services are grouped below** | | | |
| Support Services | MA029 | Property and Estates | Yes |
| Support Services | MA053 | Scientific Instrument Replacement | No |
| Support Services | MA056 | Renewable Energy Asset Maintenance | No |
| Support Services | MA066 | Digital Policy | Yes |
| Support Services | MA071 | Logistics (Vehicles) | No |

# Annex C: Investment Case Evidence

The WICS Final Methodology details that for all investments post Scottish Water internal 'Gate 50', Scottish Water should provide information relating to the investment case, examining factors such as:

- Forecast costs;
- Forecast outputs; and
- Details of the "investment case".

Information requested relating to investment proposals not yet having achieved Gate 50 is limited to assumptions for indicative costings and outputs applied at a programme level.[19]

**Composition of the SR27 Investment Baseline**

Of the total £8.3bn[20] cost of the SR27 Investment Baseline, £1.23bn (15%) represents investments that have reached at least Gate 50 as of the end of December 2024, which is the reference point used across Scottish Water's Draft Business Plan submission.

Figure 19 below sets out graphically how this £8.3bn spend is split between investment in Asset Repair, Refurbishment, and Replacement (AR3) relative to other types of investment.

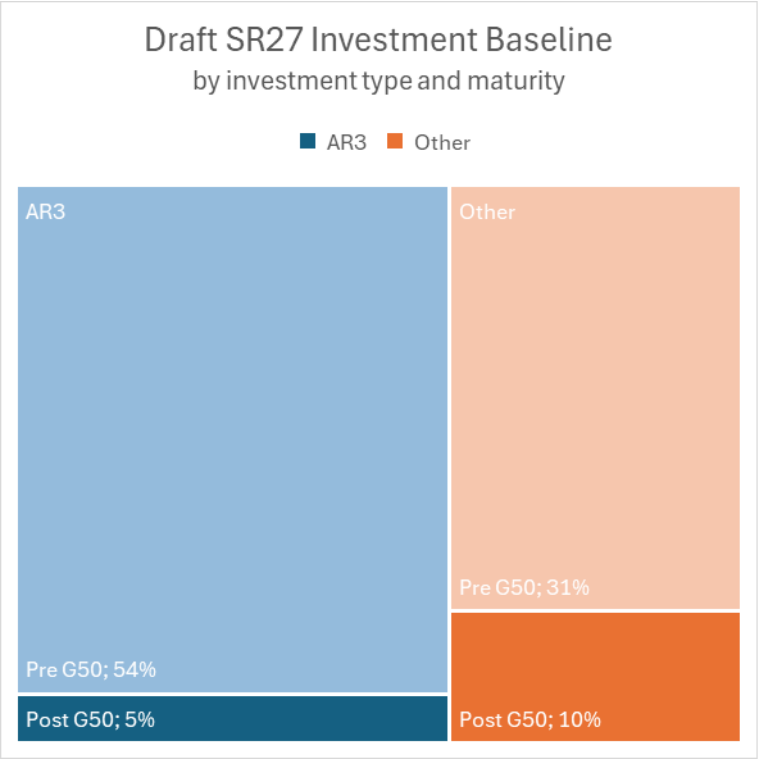



*Figure 19: Draft SR27 Investment Baseline by investment type and maturity*

[19] WIC (2024) Final Methodology, Table 8
[20] 23/24 price base after adjustments for efficiency

Of the £1.23bn having achieved Gate 50 by the end of December 2024, £0.99bn (80%) is related to 72 projects each with a total LBE of at least £6m that are forecasting at least £600k expenditure into the SR27 period.[21]

As we approach the beginning of the SR27 period, the proportion of more mature projects will naturally rise. At the time of submission of the full Business Plan, Scottish Water expects the maturity of the proposed SR27 Investment Baseline to have increased, such that the proportion of investment proposals reported to have achieved Gate 50 to be greater than 15%.

**Investment that has not yet reached Gate 50**

Information on the indicative costings and outputs is included in Table 5 of the Draft Business Plan submission.

In the case of AR3 investment, this information will be further supported by the governing Management Approaches (MAs), which are provided as supplementary evidence in support of the draft Business Plan.

**Investment that is at Gate 50 or beyond**

Forecast costs, outputs, and (for projects only) date of commitment are included in Table 5 of the Draft Business Plan submission.

To avoid the need to duplicate (or largely duplicate) information that already existing within existing internal governance or management documentation, Scottish Water plans to satisfy the requirement to supply investment case evidence by providing either:

a. A Project Investment Appraisal (PIA) where Scottish Waters extant investment governance process requires one.
b. The governing Management Approach for programmes of work, and projects without a Project Investment Appraisal.

*PIA Evidence*

Scottish Water has conducted a review of existing PIA documentation to assess whether the standard information requested by WICS was appropriately represented in each case. Currently, this process has been completed for 13 of the most significant investment proposals, representing approximately £0.60bn or ~60% of the projects identified in the £0.99bn above. As a result of this review, these specific PIAs may have been updated. We expect this process to have provided clarifications and improved visibility of evidence, and not to have materially changed the rationale or evidence base behind any investment case. Costs described in these PIAs will reflect estimates at the time that a project was subject to the applicable investment governance stage or gate. Updated estimates may have been reflected in other elements off the Draft Business Plan, including in data tables.

In addition, we have included information relating to the investment case for one project that had not yet achieved Gate 50 at the end of December 2024 (Eastern Stirling Villages Growth), given it is a large project within SR27.

[21] The £6m and £600k thresholds have been applied to out-turn costs and so yield a larger list of projects than would be the case using a 23/24 price base after adjustments for efficiency.

This results in a total of 14 projects forming part of the SR27 Investment Baseline with a total forecast expenditure of £648m.[22] The currently available projects are scheduled in Table 8 and the PIAs are available within the SR27 Draft Business Plan submission folder.

Between DBP and FBP, Scottish Water will continue the process of checking that PIA documentation meets WICS evidence requirements and will make the remaining PIAs, plus PIAs for investments that reach Gate 50 prior to submission of the FBP, available as part of our FBP submission.

West Central Bioresource is a major project that has not yet reached Gate 50. We are in an ongoing process of engagement with WICS in relation to this project. Given the scale and importance of this project, we intend to share information relating to this investment on an ongoing basis rather than at the FBP stage.

If helpful to WICS and any investment case review it would like to conduct ahead of FBP submission, we may also be able to share the remaining PIAs in advance of February 2026. We would be happy to engage further with WICS to facilitate any early sharing of the full evidence base.

*Management Approach (MA) evidence*

Programmes of work or projects that are Gate 50 onwards (but less than the £6m threshold identified by WICS in the Final Methodology), will not necessarily have an accompanying PIA under current Scottish Water governance processes. Supporting evidence for these investment cases are included in Scottish Water's MAs.

*Table 8: Projects with PIAs submitted as business case evidence in the DBP*

| Project Name | Total in SRC27 (23/24 Post Eff) £m |
|---|---|
| **SR21 Turriff WTW** | 88.769 |
| **North Berwick WwTW – UWWTD Compliance** | 74.609 |
| **SR21-Juniper House Refurbishment** | 74.423 |
| **Mannofield WTW - Ceramic** | 62.515 |
| **East Stirling Villages Growth** | 60.201 |
| **SR21 Glendevon WTW** | 52.647 |
| **SR21 Bradan_WTW Future Plan** | 49.963 |
| **SR21 Stornoway WTW** | 48.881 |
| **Kinning Park WWPS-Capital Maintenance SR15** | 47.056 |

[22] £923m is stated in 23/24 price base after adjustments for efficiency

| Project Name | Total in SRC27 (23/24 Post Eff) £m |
|---|---|
| **SR21 ES Glenfarg WTW upgrade** | 24.141 |
| **Lomond Scheme - Distributed Control System DCS replacement** | 24.058 |
| **Erskine WwTW - Growth** | 19.184 |
| **SR21 ASD - Blairlinnans WTW** | 11.559 |
| **SR21 ES Black Esk WTW** | 9.612 |

# Annex D: Systems for Holding Demand Assessments

We use Copperleaf, our portfolio management system, to record, track and develop the emerging SR27 investment demand[23]. Any new investments enter Scottish Water's systems through Copperleaf first. Downstream of Copperleaf is another system, P3M, that we use to track existing live investments, i.e. those investments that have already been promoted into Scottish Water's Gateway Process. There are ~40,000 investment lines in P3M (projects and programmes of work), with considerable data associated with each investment in the system, ranging from project details (such as primary need, funding need, investment hierarchy, intervention type, delivery vehicle), monthly financials (actual vs forecasted spend), to outputs (actuals, forecasts and date expected).

The steps we followed to build up our bottom-up demand were as follows.

1. Management Approach (MA) owners take the overall demand (committed, known and future, as discussed in 4.5.1 above), and break it down into more granular project/programme lines to be entered into Copperleaf (as bottom-up investment demand).
2. All investment lines were matched to the agreed "Investment Need Codes" already used for all live P3M investments.
3. To help them identify SR27 investment demand, MA owners were also provided a cut of P3M data that included post gate-30 investments that already had SR27 expenditure (indicating these are required during SR27). The MA owners were also required to identify additional SR27 demand that was not yet promoted into P3M (new demand).
4. When identifying and specifying investment lines, MA owners considered;
    a. the cost of the investment (proposed in line with Project Investment Appraisal (PIA)[24] threshold at that time c£3m);
    b. the amount expectations and requirements outlined by regulators and industry stakeholders (e.g. phosphorus removal projects, sanitary tightened permit condition projects, storm overflows projects, or water resources projects);
    c. the type of choices and trade-offs expected to be made in the programme area;
    d. the gate stage of the investment proposal; and,
    e. the maturity of the needs at a site level.
5. Service Planners[25] then entered these bottom-up unconstrained project and programme investment lines into Copperleaf. These were a combination of new demand, and existing P3M demand with SR27 spend, and included the necessary meta data, e.g. investment line, alternatives, draft capital expenditure forecasts, and outputs. This is to create the initial bottom-up investment demand view.
6. With all investment demand in the system, Copperleaf can then be used to optimise investment plans, drive stakeholder engagement and assess alternative investment scenarios.

[23] Currently most of the investment in Copperleaf is SR27 demand. The system can also accommodate Long-tern investment demand and follow similar processes. As we further integrate the system we will use these wider capabilities.
[24] See Annex for further details of Project Investment Appraisals.
[25] Service Planners are a team of colleagues who are responsible for using Copperleaf and getting & managing Investment demand into the system.

# Annex E: AR3 Overview

**E1 Background**

This annex is to provide some further analysis and narrative to support the forecasts for Asset Repair, Refurbishment and Replacement (AR3).

As part of the planning for SR21, WICS recognised underspend regarding the maintenance and replacement of existing assets, potential implications for intergenerational fairness and the need for gradual real increases over time. All whilst ensuring a long-term sustainable level of investment. Scottish Water and WICS conducted joint analysis to support this view which was a key factor in the SR21 Final Determination, setting an above inflationary charge cap of CPI+2%.

This approach has been recognised in the following extract from the recent Water Industry Commission interim report (June 2025) chaired by Sir Jon Cunliffe:

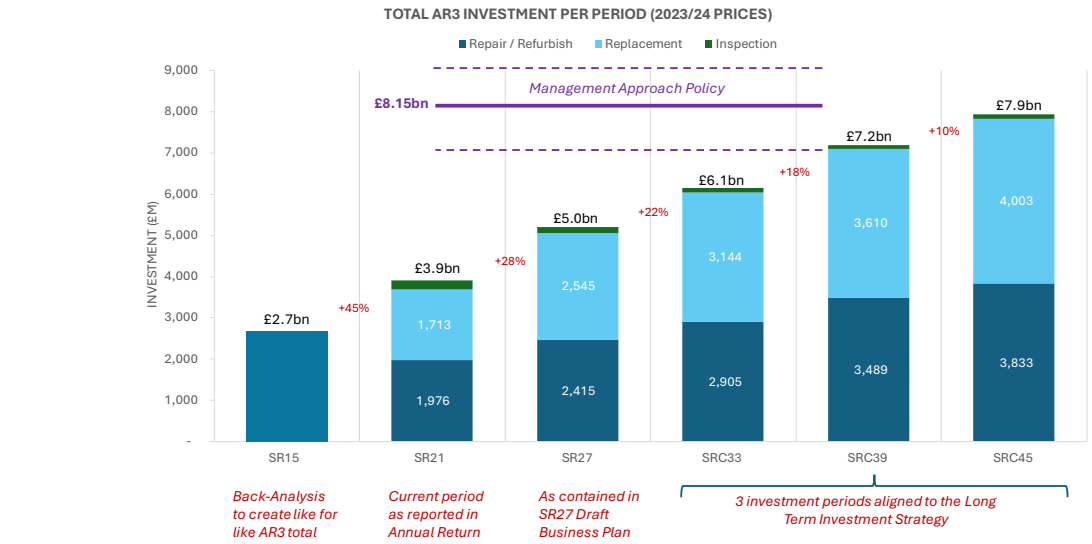
> *In Scotland, the economic regulator (Water Industry Commission for Scotland - WICS) has given priority and made significant progress in establishing an understanding of the sector's infrastructure to support a shift from short-term asset failure performance targets to long-term asset sustainability.*
>
> *Previously, the WICS followed a similar approach to assessing asset health to Ofwat. Approaches, however, have now diverged markedly, with WICS setting a whole-life cost of asset maintenance and replacement in order to fund a sustainable, long-term level of replacement and investment.*
>
> *WICS have observed that their previous backward looking approach – assessing infrastructure through failure performance monitoring – would not reveal 'cliff edges' in asset health. As part of this shift towards improved condition monitoring and understanding of expected lives of assets, Scottish Water is gathering an increasing amount of data.*

During SR21, Scottish Water has continued to develop and evidence the AR3 need through improvements from asset inspection, asset data capture and analytical modelling to revise the appraisals within our AR3 Management Approaches.

**E2: Investment Forecasts in Asset Replacement, Repair and Refurb (AR3)**

Figure 20 provides a view of the AR3 total investment per period.

- For SR15 this is based on actuals (in 2023/24 prices) and is represented by a total sum as there is lower confidence in our ability to back-analyse this data accurately for a set of definitions that break out the components of asset repair, refurb and replacement that were only agreed with stakeholders in 2019.
- For SR21 this is based on actuals for the first 4 years of the period with a forecast applied for the final 2 years of the period as reported in Annual Return.
- For SR27, estimates are based on the work done in Management Approaches which have been constrained to meet the AR3 allocation as part of the overall Reference Scenario planning exercise to stay within the "zone of acceptability".
- Future periods (SR33, SR39 and SR45) align with the LTIS forecasting work.




SW Internal General

*Figure 20: Total AR3 Investment Per Period*

Note for all graphs: We have used the post-efficiency adjusted figures for SR27 to align with draft business plan tables.

The projected investment in SR27 for AR3 represents an increase of ~28% compared to SR21.

In SR21, Scottish Water introduced Management Approaches for key asset groups and service areas which set out the policy of how and when we will intervene to manage assets. Our approach is directed by our long-term outcomes, Ministerial Objectives, current legislative requirements, and Board risk appetite statements which set the performance levels for critical and non-critical assets.

Management Approaches for each asset type have been maturing since 2023. They cover various asset groupings and have been economically appraised to determine the most effective approach to maintain our assets, including an assessment of costs, benefits, risks, and carbon. Impacts of climate change have also been considered, considering a range of climate hazards as identified through the Scottish Water Climate Change Risk Assessment.

These MA's project a demand of c.£8.15bn across a 6-year period. As there is uncertainty in estimating the demand (cost and forecast need), to fully meet our MAs our forecast is in the range of c. £7bn - £9bn. It assumed the solutions we use are the same as we use today.

Strategic decisions were taken about the scale of AR3 investment within the Reference Scenario for the SR27 period. Choices were taken on the preliminary allocations for each of the Management Approaches through:

- review of recent investment run rates in SR21;
- full MA policy estimates; and,
- the views of subject matter experts to determine where to take more or less risk across the individual MA's

A breakdown of each of the SR27 allocations vs the MA policy estimate is provided at the end of this annex and provided within technical appendices, demonstrating the effects of choices made.

We have proposed a stepped increase towards a more sustainable level of asset replacement to manage and balance the maintenance of our asset base for the long term with the effect on intergenerational equity and charges on customers.

The following sections set out further analysis conducted to determine the AR3 investment represented in the Reference Scenario. This is described as two components:

- Asset Replacement
- Asset Repair and Refurbishment.

**E3: Sustainable Investment in Asset Replacement**

In the analysis that supported the SR21 planning process, assets were broken down into 3 categories:

*Table 9 Categories of assets*

| Cat | Asset Type | Examples |
|---|---|---|
| **1** | Very long-life | Dams, Aqueducts, Tunnels and Sewers |
| **2** | Long-life to short-life | Water and Wastewater treatment, pumping stations, water mains |
| **3** | Business Support assets | Vehicles, laptops, offices and depots, renewable energy etc |

It was determined that the Long-Term Sustainable Level of Asset Replacement (which we consider to be equivalent to the *Economic Depreciation* level mentioned in the WICS Final Methodology) for Cat 2&3 assets[26] was in a range £470m – 780m p.a. in 17/18 price base (equivalent to £611m to £1,014m p.a. in 2023/24 price base).

[26] Cat 1 assets were excluded from the analysis and included within the refurbishment & repair assumptions as these assets do not tend to fully replace these extremely long-life assets.

It was recognised that the transition to this level of annual investment would necessitate a gradual progression toward it by the early 2040s due to the impact it could have on customer charges.

In 2023 this analysis was updated using:

- an improved method for uncertainty,
- increased granularity between MEICA and Civil assets and
- updated cost models (version R2309)

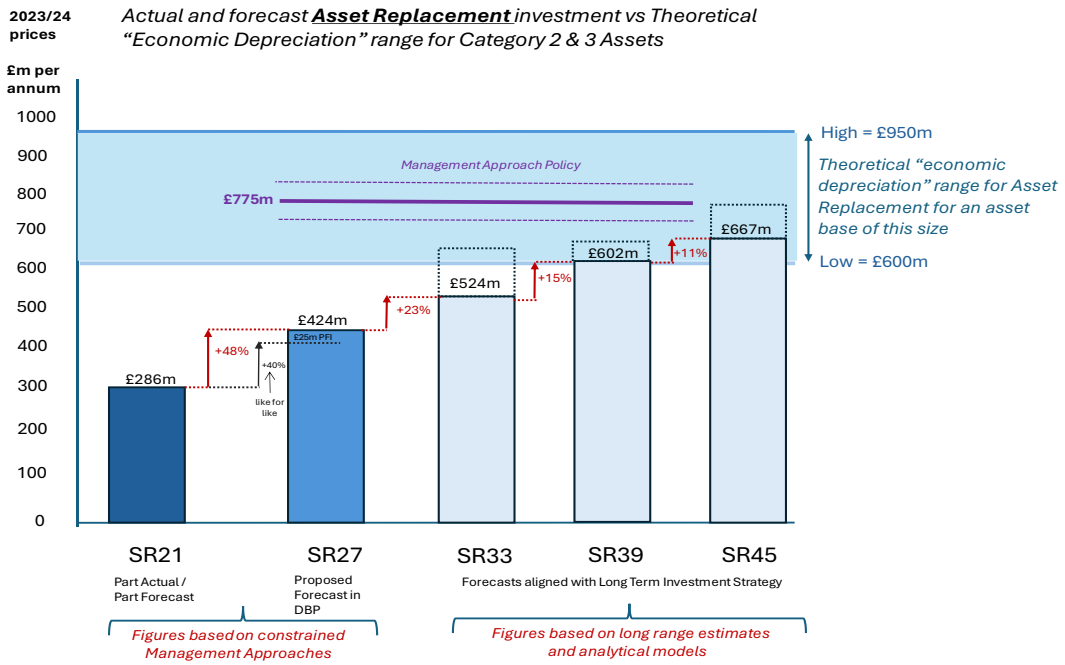
This resulted in an updated range of £465m to £730m p.a. in 2017/18 prices. This equates to a range of **£600m to £950m p.a.** in 2023/24 prices.

The MA policy estimates demand of £775m p.a. Given the uncertainty in estimating this demand (cost and forecast need) we have indicated a range of £700m-£800m p.a.

As can be seen in Figure 21 this aligns with the range created by the high level economic depreciation analysis. Broad correlation between bottom up asset management approaches together with top down economic analysis supports the view that we need to continue on the journey of increasing investment and charging to represent the cost of sustainably maintaining our asset base for now and future generations.

The process to create a Reference Scenario for SR27 resulted in an allocation of £424m p.a. for Asset Replacement.

The annualised Cat 2&3 asset replacement investment per regulatory period is shown below (Figure 21). These annualised long-term projections are represented in the Data Tables provided as part of the SR27 Business Plan submission and prepared in line with WICS Data Tables Guidance.




SW Internal General

*Figure 21: Asset Replacement Investment vs Theoretical "Economic Depreciation" range for Cat 2 & 3 Assets*

**E4 Sustainable Investment in Asset Repair and Refurbishment**

SR21 included Responsive Repair and Refurbishment work of £168m to £194m p.a. (£130m-150m p.a. 17/18 price base) – and additional £50m - £130m p.a. for Planned Repair and Refurbishment work. This results in a total range of £220m - £324m p.a. Further work was required to ensure our data capture processes provided more robust evidence behind the estimates for Repair and Refurbishment. This data capture and evidence has resulted in better confidence of the allocation attributed to Repair and Refurbishment component of AR3.

The latest estimate for SR21 indicates an average annual AR3 investment of £329m p.a. This is based on actual investment reported for the first 4 years of the period with a forecast applied for the final 2 years of the period.

The increase compared with the Final Determination indicative allowance is a result of:

- Water quality failures at treated water storage tanks leading to increase inspection and repair activities.
- Follow on work resulting from the inspection programme in SR15.
- The introduction of management approaches to ensure assets were repaired or replaced to reduce risk of asset failure and improve the resilience of services to customers.
- Improved systems and processes to be able to record the relevant repair / refurbishment information against projects.

Forecasting of the Repair and Refurbishment element is done in several ways within the LTIS and Management Approaches to produce the projected investment ranges:

- Assessment of repairs to MEICA and Civils follow on work from inspections.
- Known run-rate repairs (bursts, sewer collapse, reservoir repairs).

- An assessment of backlog work that may not be completed in SR21.
- Interviews with the subject matter experts to look at what trends, future legislation or issues are expected.
- Analytical modelling utilising historical failure rates for specific asset types.

The MA policy estimates demand of £580m p.a. Given the uncertainty in estimating this demand (cost and forecast need) we have indicated a range of £520m - £650m p.a.

The process to create a Reference Scenario for SR27 resulted in an allocation of £402m p.a. for Asset Repair and Refurbishment.

The annualised Asset Repair and Refurbishment investment per regulatory period is shown below (Figure 22). These long-term projections are represented in the Data Tables provided as part of the SR27 Business Plan submission and prepared in line with WICS Data Tables Guidance.

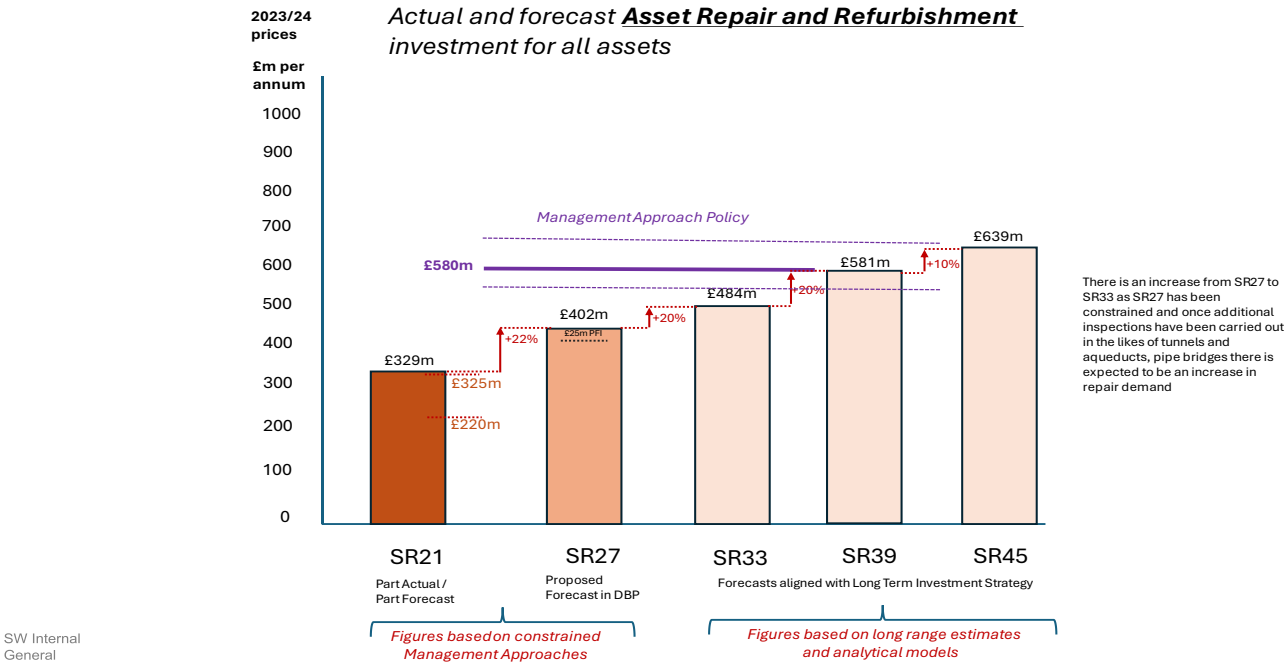



*Figure 22: Actual and Forecast Asset Repair and Refurbishment Investment for All Assets*

### E5 Monitoring our Investment in AR3

We will continue to monitor and improve investment demand and allocations throughout the SR27 period. There may be a requirement to make changes to the investment baseline within the period and this will be managed through the IPPF and the annual Delivery Plan processes. This information will then be fed back into the investment planning process to inform future investment periods.

### E6 Breakdown of SR27 AR3 allocations by Management Approach

As per Figure 21 and Figure 22 forecast asset replacement in SR27 is £424m p.a. and asset repair and refurbishment is £402m p.a. respectively, therefore total forecast AR3 in SR27 is £826m p.a. This therefore equates to the AR3 component of the Reference Investment Planning Scenario of £4.96bn post-efficiency adjustments in 2023/24 price base.

The following Table provides an overview of the total SR27 AR3 estimates by individual Management Approach. It shows the MA policy forecast estimate and the constrained allocation associated with the Reference Scenario for each Management Approach.

As the text above shows we have a gap between the forecasts to fully deliver our AR3 MAs and the allocation we have included in our Reference Scenario of £5bn. To close this gap we have made management adjustments to the MAs based around three key themes:

1. MAs where we have a detailed bottom up build that is linked to a SR21 backlog/deferral (e.g. Matters in the Interest of Safety for the Reservoirs (Scotland) Act 2011)
2. MAs where we have limited the investment to SR21 run rate (e.g. Wastewater Treatment works maintenance) or
3. MAs where we have increased run rate to make progress towards a sustainable level of investment (e.g. SCADA and MCC's).

The numbers contained in the SR27 Investment baseline (Reference Scenario) column in Table 10 are the post-efficiency adjusted figures used for the population of Data Tables 3 – 5.

*Table 10: MA allocations*

| Management Approach | | ALL COSTS SHOWN AS 2023/24 PRICES, POST EFFICIENCY ADJUSTMENT | | | | | | | | | | | | Summary Commentary on Material Variances >£10m and >10% and by exception | TA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Repair & Refurbish | | | | Replace | | | | TOTAL | | | | | |
| | | MA Policy | SR27 Investment Baseline (Reference Scenario) | Variance | | MA Policy | SR27 Investment Baseline (Reference Scenario) | Variance | | MA Policy | SR27 Investment Baseline (Reference Scenario) | Variance | | | |
| | | £m | £m | £m | % | £m | £m | £m | % | £m | £m | £m | % | | |
| MA003 Wastewater Pipebridges | MA003 | 8.768 | 74.407 | 65.639 | 749% | 103.158 | 13.274 | -89.885 | -87% | 111.927 | 87.681 | -24.246 | -22% | Step toward sustainable levels from current expenditure | Wastewater Flows |
| MA004 Reservoir Safety | MA004 | 271.261 | 226.677 | -44.583 | -16% | 0.000 | 68.173 | 68.173 | - | 271.261 | 294.850 | 23.589 | 9% | Delivering to policy with some non-MIOS maintenance backlog | Water Continuity |
| MA011 Wastewater MCCs | MA011 | 2.899 | 1.799 | -1.101 | -38% | 97.369 | 73.862 | -23.506 | -24% | 100.268 | 75.661 | -24.607 | -25% | Step toward sustainable levels from current expenditure | Water Environment |
| MA012 Wastewater Pumping Mains | MA012 | 83.455 | 53.290 | -30.165 | -36% | 194.729 | 87.290 | -107.438 | -55% | 278.184 | 140.580 | -137.604 | -49% | Step toward sustainable levels from current expenditure | Wastewater Flows |
| MA013 Wastewater SCADA | MA013 | 0.934 | 5.787 | 4.853 | 520% | 126.909 | 43.356 | -83.552 | -66% | 127.842 | 49.143 | -78.699 | -62% | Step toward sustainable levels from current expenditure | Water Environment |
| MA016 Distribution Infrastructure - Discolouration | MA016 | 12.407 | 12.407 | 0.000 | 0% | 12.407 | 12.407 | 0.000 | 0% | 24.814 | 24.814 | 0.000 | 0% | Based upon current expenditure run rates | Water Quality |
| MA017 WwTW - Inlet Works | MA017 | 21.951 | 22.657 | 0.706 | 3% | 51.909 | 86.687 | 34.778 | 67% | 73.860 | 109.344 | 35.484 | 48% | Consider WWTW AR3 together: No progress toward sustainable levels from current expenditure | Water Environment |
| MA018 Ironworks | MA018 | 0.000 | 59.861 | 59.861 | - | 69.353 | 0.020 | -69.333 | -100% | 69.353 | 59.881 | -9.472 | -14% | | Wastewater Flows / Water Continuity |
| MA021 Management of Wastewater Temporary Process Units | MA021 | 0.038 | 0.038 | 0.000 | 0% | 23.398 | 23.398 | 0.000 | 0% | 23.436 | 23.436 | 0.000 | 0% | Based upon current expenditure run rates | Water Environment |
| MA022 Water SCADA | MA022 | 1.750 | 18.275 | 16.525 | 944% | 249.267 | 144.947 | -104.319 | -42% | 251.016 | 163.222 | -87.794 | -35% | Significant step toward sustainable levels from current expenditure | Water Continuity |
| MA023 Wastewater Pump Stations | MA023 | 30.623 | 64.593 | 33.969 | 111% | 109.414 | 75.465 | -33.949 | -31% | 140.037 | 140.058 | 0.021 | 0% | | Water Environment |
| MA024 Sludge Treatment Centres (MA024 - Summary Management Approach v2 - Wastewater Bioresource Treatment and De-watering Centres) | MA024 | 58.284 | 36.976 | -21.308 | -37% | 33.670 | 69.705 | 36.035 | 107% | 91.954 | 106.681 | 14.727 | 16% | Expenditure above risk based policy to address backlog of planned work and invasive inspections | Water Environment |
| MA029 Property and Estates | MA029 | 41.318 | 19.895 | -21.423 | -52% | 2.240 | 15.439 | 13.199 | 589% | 43.558 | 35.334 | -8.224 | -19% | | Support Services |
| MA033 Water Filtration | MA033 | 56.406 | 64.959 | 8.553 | 15% | 32.971 | 9.087 | -23.883 | -72% | 89.377 | 74.046 | -15.331 | -17% | SR27 demand suppressed following SR21 investment to address backlog | Water Quality |
| MA034 Customer Meters | MA034 | 0.000 | 0.000 | 0.000 | - | 13.392 | 13.392 | 0.000 | 0% | 13.392 | 13.392 | 0.000 | 0% | Lower AR3 investment compared to SR21 in anticipation of the programme to upgrade to non-household smart meters | Water Continuity |
| MA035 Wastewater Outfalls | MA035 | 70.636 | 10.875 | -59.761 | -85% | 49.243 | 14.173 | -35.070 | -71% | 119.879 | 25.048 | -94.831 | -79% | Limited progress toward sustainable levels from current expenditure | Wastewater Flows |
| MA036 Wastewater Screw Pumps | MA036 | 19.248 | 18.492 | -0.756 | -4% | 46.541 | 6.836 | -39.705 | -85% | 65.789 | 25.328 | -40.461 | -62% | Limited progress toward sustainable levels from current expenditure | Water Environment |
| MA039 Combined Sewer Overflows | MA039 | 64.052 | 6.164 | -57.888 | -90% | 10.379 | 5.559 | -4.821 | -46% | 74.431 | 11.723 | -62.708 | -84% | Limited progress toward sustainable levels from current expenditure | Wastewater Flows |
| MA042 WwTW - Primary Treatment | MA042 | 21.002 | 38.952 | 17.950 | 85% | 33.578 | 34.763 | 1.185 | 4% | 54.580 | 73.715 | 19.135 | 35% | Consider WWTW AR3 together: No progress toward sustainable levels from current expenditure | Water Environment |
| MA043 Secondary & Tertiary | MA043 | 74.369 | 62.048 | -12.321 | -17% | 163.991 | 102.180 | -61.811 | -38% | 238.360 | 164.228 | -74.132 | -31% | Consider WWTW AR3 together: No progress toward sustainable levels from current expenditure | Water Environment |
| MA044 Telemetry | MA044 | 6.684 | 4.228 | -2.456 | -37% | 46.044 | 34.519 | -11.525 | -25% | 52.729 | 38.747 | -13.982 | -27% | Step toward sustainable levels from current expenditure | Water Environment / Water Continuity |

| Management Approach | | ALL COSTS SHOWN AS 2023/24 PRICES, POST EFFICIENCY ADJUSTMENT | | | | | | | | | | | | Summary Commentary on Material Variances >£10m and >10% and by exception | TA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Repair & Refurbish | | | | Replace | | | | TOTAL | | | | | |
| | | MA Policy | SR27 Investment Baseline (Reference Scenario) | Variance | | MA Policy | SR27 Investment Baseline (Reference Scenario) | Variance | | MA Policy | SR27 Investment Baseline (Reference Scenario) | Variance | | | |
| | | £m | £m | £m | % | £m | £m | £m | % | £m | £m | £m | % | | |
| MA049 Wastewater Odour | MA049 | 13.490 | 2.243 | -11.247 | -83% | 19.680 | 5.068 | -14.612 | -74% | 33.170 | 7.311 | -25.859 | -78% | Consider WWTW AR3 together: No progress toward sustainable levels from current expenditure | Water Environment |
| MA052 WTW Sludge and Washwater Handling | MA052 | 17.146 | 14.700 | -2.446 | -14% | 2.000 | 15.327 | 13.326 | 666% | 19.146 | 30.027 | 10.881 | 57% | Expenditure above largely responsive policy to address backlog planned work | Water Continuity |
| MA053 Scientific Instrumentation Replacement | MA053 | 0.000 | 0.000 | 0.000 | - | 6.773 | 8.601 | 1.828 | 27% | 6.773 | 8.601 | 1.828 | 27% | Detailed bottom up programme in SR27 Baseline | Support Services |
| MA054 Network Model Maintenance | MA054 | 30.345 | 30.345 | 0.000 | 0% | 1.597 | 1.597 | 0.000 | 0% | 31.942 | 31.942 | 0.000 | 0% | Based upon current expenditure run rates | Wastewater Flows / Water Continuity |
| MA056 Renewable Energy Asset Maintenance | MA056 | 5.486 | 0.009 | -5.477 | -100% | 0.105 | 22.845 | 22.740 | 21574% | 5.592 | 22.854 | 17.262 | 309% | Detailed bottom up programme in SR27 Baseline | Support Services |
| MA057 WW Ancillaries | MA057 | 26.442 | 60.592 | 34.151 | 129% | 160.016 | 36.591 | -123.426 | -77% | 186.458 | 97.183 | -89.275 | -48% | Consider WWTW AR3 together: No progress toward sustainable levels from current expenditure | Water Environment |
| MA058 Water Pump Stations | MA058 | 64.132 | 12.325 | -51.806 | -81% | 58.563 | 20.320 | -38.243 | -65% | 122.694 | 32.645 | -90.049 | -73% | No progress toward sustainable levels from current expenditure | Water Continuity |
| MA060 Water Distribution Infrastructure - Network Valves | MA060 | 8.243 | 8.243 | 0.000 | 0% | 4.399 | 4.399 | 0.000 | 0% | 12.642 | 12.642 | 0.000 | 0% | Based upon current expenditure run rates | Water Continuity |
| MA062 Sewer Structures | MA062 | 14.154 | 15.319 | 1.164 | 8% | 13.653 | 1.985 | -11.667 | -85% | 27.807 | 17.304 | -10.503 | -38% | Step toward sustainable levels from current expenditure | Wastewater Flows |
| MA063 Water Resources Environmental Monitoring & Compliance | MA063 | 0.496 | 0.614 | 0.118 | 24% | 4.382 | 0.614 | -3.768 | -86% | 4.878 | 1.228 | -3.650 | -75% | | Water Environment |
| MA066 Digital Policy | MA066 | 40.111 | 16.931 | -23.180 | -58% | 205.319 | 86.667 | -118.652 | -58% | 245.430 | 103.598 | -141.832 | -58% | Variance due to accounting change relating Cloud Computing Arrangements | Digital |
| MA068 Statutory and Planned Maintenance | MA068 | 29.280 | 88.048 | 58.768 | 201% | 68.320 | 6.749 | -61.571 | -90% | 97.600 | 94.797 | -2.803 | -3% | | Water Environment / Water Continuity / Wastewater Flows / Water Quality |
| MA071 Logistics (Vehicles) | MA071 | 130.914 | 0.000 | -130.914 | -100% | 305.466 | 126.713 | -178.753 | -59% | 436.380 | 126.713 | -309.667 | -71% | Policy based up on full fleet electrification not included in SR27 Baseline. | Support Services / Climate Mitigation |
| MA073 Metering and flow monitoring | MA073 | 17.477 | 26.979 | 9.502 | 54% | 31.084 | 27.376 | -3.708 | -12% | 48.561 | 54.355 | 5.794 | 12% | | Water Continuity |
| MA080 Boreholes and Springs | MA080 | 26.262 | 3.500 | -22.761 | -87% | 1.290 | 6.665 | 5.375 | 417% | 27.551 | 10.165 | -17.386 | -63% | No progress toward sustainable levels from current expenditure | Water Continuity |
| MA081 Sample Points | MA081 | 0.054 | 0.021 | -0.033 | -61% | 6.100 | 12.265 | 6.165 | 101% | 6.154 | 12.286 | 6.132 | 100% | Detailed bottom-up programme in SR27 Baseline | Water Quality |
| MA089 Security | MA089 | 0.445 | 0.445 | 0.000 | 0% | 6.927 | 6.927 | 0.000 | 0% | 7.372 | 7.372 | 0.000 | 0% | Based upon current expenditure run rates | Water Continuity |
| MA091 High Voltage Assets | MA091 | 1.735 | 27.408 | 25.674 | 1480% | 53.120 | 72.252 | 19.132 | 36% | 54.854 | 99.660 | 44.806 | 82% | Expenditure above policy to address backlog of planned work | Water Environment / Water Continuity |
| MA093 Civil and Process Structures | MA093 | 49.203 | 23.560 | -25.643 | -52% | 0.000 | 4.435 | 4.435 | - | 49.203 | 27.995 | -21.208 | -43% | Step toward sustainable levels from current expenditure | Water Quality |
| MA094 WTW Process M&E | MA094 | 0.437 | 68.050 | 67.614 | 15484% | 23.040 | 29.016 | 5.975 | 26% | 23.477 | 97.066 | 73.589 | 313% | Maintains current expenditure which is largely responsive with no backlog to overcome | Water Quality |
| MA095 Water Quality Instrumentation | MA095 | 28.834 | 3.020 | -25.814 | -90% | 7.225 | 21.200 | 13.975 | 193% | 36.059 | 24.220 | -11.839 | -33% | Step toward sustainable levels from current expenditure | Water Quality |
| MA098 Emergency Response | MA098 | 0.590 | 0.590 | 0.000 | 0% | 0.590 | 0.590 | 0.000 | 0% | 1.179 | 1.179 | 0.000 | 0% | Based upon current expenditure run rates | Water Continuity |

| Management Approach | | ALL COSTS SHOWN AS 2023/24 PRICES, POST EFFICIENCY ADJUSTMENT | | | | | | | | | | | | Summary Commentary on Material Variances >£10m and >10% and by exception | TA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Repair & Refurbish | | | | Replace | | | | TOTAL | | | | | |
| | | MA Policy | SR27 Investment Baseline (Reference Scenario) | Variance | | MA Policy | SR27 Investment Baseline (Reference Scenario) | Variance | | MA Policy | SR27 Investment Baseline (Reference Scenario) | Variance | | | |
| | | £m | £m | £m | % | £m | £m | £m | % | £m | £m | £m | % | | |
| MA111 Distribution Mains | MA111 | 221.390 | 241.269 | 19.879 | 9% | 216.246 | 540.298 | 324.052 | 150% | 437.637 | 781.567 | 343.930 | 79% | Expenditure above policy level to address Recurring Customer Interruptions and additional AC replacement | Water Continuity |
| MA113 WW Sewers | MA113 | 217.584 | 206.279 | -11.305 | -5% | 41.030 | 42.689 | 1.659 | 4% | 258.615 | 248.968 | -9.647 | -4% | | Wastewater Flows |
| MA114 Chemical Storage and Dosing | MA114 | 449.602 | 29.699 | -419.903 | -93% | 317.196 | 150.956 | -166.240 | -52% | 766.798 | 180.655 | -586.143 | -76% | Accept risk on asset life pending inspection: Limited progress toward sustainable levels from current expenditure | Water Quality |
| MA115 Water Pipebridges | MA115 | 24.756 | 23.022 | -1.734 | -7% | 17.135 | 7.210 | -9.925 | -58% | 41.891 | 30.232 | -11.659 | -28% | Step toward sustainable levels from current expenditure | Water Continuity |
| MA116 Water Strategic Infrastructure | MA116 | 818.451 | 124.015 | -694.436 | -85% | 1335.140 | 29.014 | -1306.127 | -98% | 2153.592 | 153.029 | -2000.563 | -93% | Accept risk on asset life pending inspection: No progress toward sustainable levels from current expenditure | Water Continuity |
| MA117 Raw Water Intake and Storage | MA117 | 11.001 | 6.909 | -4.093 | -37% | 5.707 | 6.676 | 0.969 | 17% | 16.709 | 13.585 | -3.124 | -19% | | Water Continuity |
| MA118 Low Voltage Electrical Systems | MA118 | 6.676 | 2.583 | -4.093 | -61% | 122.556 | 35.569 | -86.987 | -71% | 129.232 | 38.152 | -91.080 | -70% | Limited progress toward sustainable levels from current expenditure | Water Environment / Water Continuity |
| MA120 Site Buildings and Asset Access | MA120 | 69.818 | 73.350 | 3.532 | 5% | 19.578 | 48.908 | 29.330 | 150% | 89.396 | 122.258 | 32.862 | 37% | Expenditure above policy level to address backlog of RAAC and WTW site encapsulation | Water Continuity / Water Environment |
| Water Demand Management | MA099 | 0.000 | 26.597 | 26.597 | - | 0.000 | 6.875 | 6.875 | - | 0.000 | 33.472 | 33.472 | - | AR3 expenditure to achieve change in water demand | Water Continuity |
| AR3 PFI Return | MA108 | 142.153 | 142.153 | 0.000 | 0% | 142.153 | 142.153 | 0.000 | 0% | 284.306 | 284.306 | 0.000 | 0% | Demand estimates currently developed separate to core MA process | Water Environment |
| MA119 Treated Water Storage & Chlorine Contact Tanks | MA119 | 166.822 | 333.528 | 166.705 | 100% | 0.000 | 82.235 | 82.235 | - | 166.822 | 415.763 | 248.941 | 149% | Expenditure above policy level to address backlog of cleaning & maintenance | Water Quality |
| Grand Total | | **3484** | **2415** | -1069 | -31% | **4666** | **2545** | -2121 | -45% | **8150** | **4960** | -3189.943 | -39% | | |
| | | | | | | ***Equivalent in 2023/24 prices, before efficiency adjustment*** | | | | ***8579*** | ***5221*** | *-3358* | *-39%* | | |

Note – The figures contained include post-efficiency adjustments and hence the AR3 total is £4,960m.

The pre-efficiency adjustment equivalent for AR3 total is £5,200m

# Annex F: High Level Analysis of Broad Scenarios against MO's (Feb 25)

*Table 11: Analysis of Scenarios against Draft MOs*

| Ministerial Objective | High scenario (CPI + 6.5%) | Working Reference scenario (CPI + 4%) | Flat Charges scenario (CPI + 0%) |
|---|---|---|---|
| **Long-Term Water Sector Vision** | Support for Hydro Nation Chair, customer and community involvement and benefits | Support for Hydro Nation Chair, customer and community involvement and benefits | Support for Hydro Nation Chair, and existing customer and community involvement and benefits |
| **Standards of Service** | Maintain service levels achieved at the exit of SR21 | Maintain service levels achieved at the exit of SR21 – accepting more compliance risk in PFI returns and risk of burst frequency. | Provide reduced service levels compared to exit of SR21 - notable overall service impacts as measured by OPA and CEM |
| **Asset Maintenance (long-term)** | Continue inspection programme for critical assets. 70% of MA[27] demand delivered plus accelerated AC Mains replacement and provision for AR3 PFI returns | Continue inspection programme for critical assets. 70% of MA demand delivered. 70% of AC Mains requirement delivered. 65% of AR3 investment for PFI delivered | Continue inspection programme for critical assets. 65% of MA demand delivered. No accelerated AC Mains replacement delivered. 65% of AR3 investment for PFI delivered |
| **Flooding and Surface Water Management** | Recover to SR15 level of customer internal sewer flood register by removing properties from the flooding register | Maintain intended SR21 exit level of customer internal sewer flood risk performance to by removing properties from the flooding register. | Reduction in performance level leading to significant increase to customer internal sewer flood risk. Flooding register grows to over 600 properties. Policy changes to focus primarily on delivering mitigations and clean up only – limited resolution of hydraulic issues |
| | Make progress on reducing the top 200 external flooding sites of which 50% are blue green solutions. (likely a small proportion of total register) | Make progress on reducing the top 40 external flooding locations – primarily grey solutions | Make progress on reducing the top 20 external flooding locations - all grey infrastructure |
| | Existing 3 strategic drainage partnerships augmented with 5 new partnerships | Existing 3 strategic drainage partnerships augmented with 2 new partnerships | No progress on removing surface water from our networks and have passive role in existing partnerships with no new partnerships created. |
| **Drinking Water** | Address failures at 18 WTW[28] serving c1.45m customers and reduce risk of failures at 4 WTW serving 275k customers | Address failures at 18 WTW serving c1.45m customers and reduce risk of failures at 3 WTW serving 265k customers | Address failures at 18 WTW serving c1.45m customers. HAA[29] compliance risk is not addressed at 4 WTW serving 275k customers |
| | Improved auto shut down / disinfections reliability at priority sites and development of other water quality failure risk sites | Improved auto shut down / disinfections reliability at priority sites and development of other water quality failure risk sites | Only address highest DWQR priority risks only. No development work on HAA and other water quality failure risk sites. Only 15% of required investment available to meet Quality expectations |

[27] Management Approaches (MA)
[28] Water Treatment Works (WTW)
[29] Halo acetic Acid (HAA)

| Ministerial Objective | High scenario (CPI + 6.5%) | Working Reference scenario (CPI + 4%) | Flat Charges scenario (CPI + 0%) |
|---|---|---|---|
| | Ensure 2 water resilience schemes (Dundee & Edinburgh) are delivered | | |
| **Environment** | Achieve RBMP3[30] compliance improving ~360km of waterbody, including 8 WWTW[31] sites covering 290k PE[32]. Monitoring PFF[33] compliance & solution development | Achieve compliance with RBMP3 measures improving ~360km of waterbody – including 8 WWTW sites covering 290k PE. Monitoring PFF compliance | Achieve compliance with a reduced proportion of RBMP3 measures by progressing all development work and delivery of ~8 WWTW and 10 UID enhancements. |
| | Achieve outcomes in Improving Urban Waters Route Map. Delivering remaining 108 High Priority UIDs[34], c57 Clyde UIDs and Almond Valley sites. Progress Water of Leith. Development of Medium Priority UIDs. 1000 new monitors roll out | Achieve outcomes in Improving Urban Waters Route Map. Delivering remaining 108 High Priority UIDs, c57 Clyde UIDs and Almond Valley sites. Progress Water of Leith. Development of Medium Priority UIDs. 1000 new monitors roll out | Do not achieve outcomes in Improving Urban Waters Route Map. Delivering remaining 108 High Priority UIDs only. No Clyde, Almond Valley or Water of Leith UIDs. No development of Medium Priority UIDs. 1000 new monitors roll out |
| | Deliver North Berwick & East Stirling Villages | Deliver North Berwick & East Stirling Villages | Deliver North Berwick & East Stirling Villages |
| | Bioresources – Deliver Daldowie and supporting STC[35] sites by 2031. Deliver IED[36] compliance | Bioresources – Deliver Daldowie and supporting STC sites by 2031. Deliver IED compliance | Bioresources – Deliver Daldowie and supporting STC sites by 2031. Deliver IED compliance |
| | Deliver 9 measures to support compensation flows or fish barriers | | |
| **Supporting Sustainable Economic Growth** | Provide capacity to enable all new domestic property connections, at reduced risk<br>- WWTW confirmed need from SR21, for delivery in SR27,<br>- 3 WTW (Tiree, Kenmore & Balmichael),<br>- Seafield WWTW development, and<br>- £78m emerging demand. | Provide capacity to enable all new domestic property connections, with increased risk<br>- WWTW confirmed need from SR21, for delivery in SR27,<br>- 3 WTW (Tiree, Kenmore & Balmichael),<br>- Seafield WWTW development, and<br>- Higher compliance risk at 14 WWTW | Reduced ability to provide capacity to enable all new domestic property connections<br>- 50% of WWTW confirmed need from SR21, for delivery in SR27, being delivered,<br>- 2 WTW (Tiree & Kenmore),<br>- No investment in Seafield WWTW development,<br>- High compliance risk at 34 WWTW, and<br>- Impacted ability to provide the required capacity for all new domestic connections |

[30] River Basin Management Plans version 3 (RBMP3)
[31] Waste Water Treatment Works
[32] Population Equivalent (PE)
[33] Pass Forward Flow (PFF) the instantaneous upstream flow that a Combined Sewer Overflow (CSO) or pumping station can accept
[34] Unsatisfactory Intermittent Discharges (UIDs)
[35] Sludge Treatment Centre (STC)
[36] Industrial emissions Directive (IED)

| Ministerial Objective | High scenario (CPI + 6.5%) | Working Reference scenario (CPI + 4%) | Flat Charges scenario (CPI + 0%) |
|---|---|---|---|
| **Circular Economy** | 5 Lighthouse Projects – process emissions, blue green infrastructure and resource recovery | 3 Lighthouse Projects will proceed – process emissions and resource recovery | 1 Lighthouse Project will proceed – resource recovery |
| **Security and resilience** | We expect to comply with Government guidelines on cyber security (Networks & Information Systems – NIS) | We expect to comply with Government guidelines on cyber security (Networks & Information Systems – NIS) | We expect to comply with Government guidelines on cyber security (Networks & Information Systems – NIS) |
| **Climate Change, Adaption and Mitigation** | Deliver Net Zero Routemap including reduction of 225 ktCO2 from 2023/24 levels and operational Net Zero by c2032/33 | Reduced progress on delivery of Net Zero Routemap (2050). Reduction of 198 ktCO2 and operational Net Zero moved out to c2040 | Limited progress on delivery of Net Zero Routemap. Reduction of 176 kt CO2 but operational Net Zero cannot be achieved before 2050 |
| **Private Finance Initiative (PFI) funded projects** | £505m allowance has been made for the return of PFIs and maintain compliance at all sites | £337m allowance been made for the return of PFIs. Assumes no investment at Seafield, Almond Valley and Esk PFI (return 2029) in SR27 or unknown risks not identified ahead of site handover | £337m allowance been made for the return of PFIs. Assumes no investment at Seafield, Almond Valley and Esk PFI (return 2029) in SR27 or unknown risks not identified ahead of site handover |

# Annex G: Analysis of the recommended Reference Scenario against the draft Ministerial Objectives

*Table 12: Analysis of recommended Reference Scenario against draft MOs*

| Ministerial Objective | Our investment will |
|---|---|
| Long term water sector vision | Publish our Long-Term Strategy which outlines how we will deliver our part in making the Water Sector Vision a reality.<br>Provide support for Hydro Nation Chair, customer and community involvement and benefits, and introduce a community fund to support small-scale, localised initiatives. |
| Standards of Service | Maintain service levels achieved at the exit of SR21 – accepting more compliance risk in PFI returns and risk of burst frequency. |
| Asset Maintenance (Long Term) | Continue inspection programme for critical assets. Increase maintenance by 15-20%. |
| Flooding & Surface Water Management | Maintaining the number of properties on our Internal Sewer Flooding At Risk register and ensuring that we reduce the number of customers experiencing repeat sewer flooding.<br>Build on our existing three strategic drainage partnerships with two new partnerships. |
| Drinking Water | Address failures at 18 WTW serving c1.35 million customers and reduce risk of failures at three WTW serving c260,000 customers.<br>Continue to remove lead from the Scottish Water network and support customers to remove private lead pipes.<br>Improve auto shut down / disinfections reliability at priority sites and development of solutions for other water quality failure risk sites. |
| Environment | Delivering all remaining RBMP3 objectives to enhance the water environment.<br>Establishing and maintaining our current final effluent and pass forward flow compliance position and developing an improvement plan, where we define and deliver first steps. |
| Supporting Sustainable Economic Growth | Provide capacity for c120,000 new homes and business premises. Deliver North Berwick and East Stirling Villages. |
| Circular Economy | Provision made for innovation “lighthouse” projects. Embedding circular economy principles working with supply chain and developers to better manage rainwater, surface water and waste water. |

| Ministerial Objective | Our investment will |
|---|---|
| Security & Resilience | We expect to comply with Government guidelines on cyber security (Networks & Information Systems – NIS) |
| Climate Change, Adaption and Mitigation | Continued progress of the delivery of Net Zero Routemap. Reduction of 159 ktCO2 and continue to make changes to achieve Net Zero emissions across operational activities, investment and land management by 2040. |
| Private Finance Initiatives (PFIs) | Allowance has been made for the return of 4 PFIs serving a population of c1.7 million. This will allow us to maintain and enhance service from these sites as they return to Scottish Water ownership. |

# Customer Research
## Technical Appendix 009

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# 1 Executive Summary

Customers are at the heart of our business and their opinions are a key factor in our decision-making process. Building these views into our plans is part of our on-going customer research approach that allows us to ensure our customers' needs are at the centre of our service delivery. We also recognise that customers are pivotal to helping us solve some of the most complex challenges we face and so must be involved in our strategies and plans from the outset.

Scottish Water has a strong track record of understanding customers views through customer research. Scottish Water's SR27 research programme has to date engaged with more than 100 household customers and 25 businesses on business planning issues and builds on our Long-Term Strategy research programme which involved more than 5,000 customers. This is underpinned by Scottish Water's synthesis framework and database, which contains ~2,000 insights drawn from more than 50 research projects involving more than 23,000 customers over the past 9 years.

## 1.1 Collaborative research programme

The role of customers in Scottish Water's SR15 and SR21 review processes was strengthened by the role of the Customer Forum, which was a body appointed to agree the Business Plan (SR15) and the Strategic Plan (SR21) with Scottish Water, on behalf of customers, before the Commission made its Final Determination. We are building on this model for SR27, with the introduction of a Memorandum of Understanding, between WICS, Consumer Scotland and Scottish Water, which retains the Independent Customer Group to support and challenge Scottish Water's understanding and incorporation of customers' needs and expectations in its Business Plan. It also defines Consumer Scotland's role leading a longitudinal deliberative research study, which will ask customers' whether the Final Business Plan commands their support and ultimately determine whether the Water Industry Commission for Scotland's Final Determination commands consumers' support.

All SR27 research is fully collaborative and is co-ordinated through Customer Research Co-ordination Group (CRCG), which is chaired by the Chair of the Independent Customer Group. Membership of the CRCG consists of representatives of Scottish Water, the Independent Customer Group, Consumer Scotland, the Drinking Water Quality Regulator, the Scottish Environment Protection Agency, the Water Industry Commission for Scotland, and the Scottish Government. The day to day running of the SR27 research programme is delegated to a Research Advisory Group (RAG) consisting of nominated representatives from Scottish Water, Consumer Scotland and the Independent Customer Group.

## 1.2 Research activities and findings

SR27 is the first step on the journey towards the outcomes set out in Scottish Water' Long-Term Strategy. More than 5,000 customers were directly engaged in the development of the plan (Figure 4: How we built our Long-Term Strategy using insight from our customers

). We found that customers want to see standards across each service area maintained at the very least over the long-term. They would not trade off deterioration in any service area to achieve greater improvements in another. Long-term objectives around ensuring a clean water supply and the local natural environment were seen as the most important, along with making sure the services provided are affordable for customers.

SR27 research commenced in December 2024 with a series of qualitative activities involving household and business customers, to establish customer expectations for Scottish Water over

the course of SR27 and understand customer views and preferences around a set of draft charging and investment scenarios. Scottish Water experts explained Scottish Water, and our performance and long-term challenges and ambitions, customers then gave detailed feedback on the choice areas and their comparative preference between scenarios. As is consistently the case in Scottish Water's customer research, customers entered the research with a positive sentiment towards Scottish Water, and the quality of the drinking water that we provide. The national pride associated with water quality in Scotland plays a significant role in shaping customer expectations, especially in terms of quality, sustainability, and protection of the resource.

Customer's understanding and acceptance of the challenges presented by Scottish Water and their positive sentiment towards Scottish Water, led to customers wanting to protect both the public ownership of the company and its infrastructure, and generally accepting the need to pay more due to challenges and future-proofing efforts. However, customers were seeking improved outcomes in exchange for any price rises, and none of the early scenarios presented offered enough value for money for wholehearted endorsement from customers.

Scottish Water took this feedback on board and prepared a rebalanced investment scenario to share with some research participants who had agreed to continue their involvement. In the context of both their own views and increased understanding of the investment areas, participants generally felt that this new investment scenario was well-balanced and offered clear, tangible outcomes. Most participants agreed that Scottish Water had listened to their feedback from the original research when designing the rebalanced investment scenario.

## 1.3 Future activities

Scottish Water, together with Consumer Scotland and ICG collectively recognise these views might not be representative of our wider customer base, for whom water industry issues might not be top of mind. To make sure that we understand how less informed customers will perceive our plans for SR27, Scottish Water will commission a nationally representative study involving less informed customers to take place between Draft and Final Plan submissions, with findings influencing the Final Plan. This will complement the research conducted to date and Consumer Scotland's longitudinal deliberative research study.

## 1.4 Research synthesis

The SR27 customer research programme aims to understand customer expectations for Scottish Water over the course of SR27. However Scottish Water also has a deep understand of views on service issues from existing and ongoing research. Scottish Water's synthesis database contains ~2,000 insights drawn from more than 50 research projects involving more than 23,000 customers. These insights have been assessed and mapped into topics, and the highest quality insights have been gathered together into Key Insights which have been used to support the development of the Draft Business Plan and Technical Appendices. Our process for applying the Synthesis framework has been independently audited and received positive feedback, with the audit finding a strong, thorough and thoughtful approach to evaluation and synthesis and strong evidence of structured evaluation. We will continue to develop the use of synthesised insights as part of building the Final Business Plan, and in support of broader Scottish Water activities.

# 2 Background

## 2.1 Context

Customers are integral to everything we do, and we aim to place customers at the heart of every decision that we make – including the business planning process.

Scottish Water has a strong track record of commissioning high quality, independent research. In 2024/25 we spoke to 40,000 customers through research (Figure 1). We use the customer insights drawn from this research to inform the way we work and the decisions we take, as well as to inform and shape our SR27 investments.

The full programme of customer research we undertake is ongoing and continuous. We are continually informed by transactional research, which gives us feedback from customers who have been in contact with us about a service issue or experience, and by our ongoing trackers such as such as the nationally representative Perception & Experience survey conducted by YouGov providing insights related to awareness, trust and satisfaction. We gathered views from 23,523 and 8,993 customers respectively in 2024/25 through these approaches. These metrics are further discussed in our Customer and Community Excellence Technical Appendix. For SR27, we are additionally informed by:

- **Our research synthesis,** which gather insights from topical research which inform a range of Scottish Water's activity in all areas. Much of this research is qualitative – and to make best use of the breadth and depth of insight in a robust and reliable way, we have developed a robust and audited 'Research Synthesis' process. This has enabled us to understand where views on topics have changed over time, if different customer groups might agree or diverge on issues – and also to fairly assess where our evidence base is strong, and where it needs strengthening.
- **Strategic** investment research which explores customers views and expectations in the long and short term, informing the Long-Term Strategy and SR27.

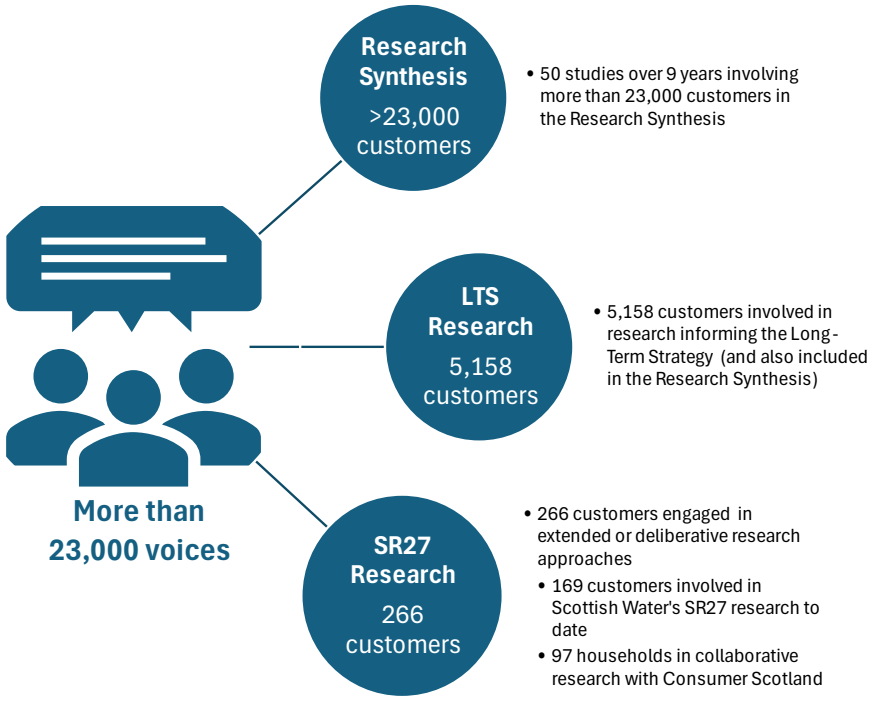


*Figure 1: Customer voices informing the Long-Term Strategy and SR27 Plan.*

All of Scottish Water's customer research is guided by six research principles (Figure 2).

*Figure 2: Scottish Water's principles for customer research*

### Collaborative

The Scottish water industry is more than just Scottish Water. To maximise the value of our research activities, we give all our water industry stakeholders an opportunity to feed in and shape research, and on completion we share our research findings. This co-ordination and collaboration is facilitated by a Customer Research Co-ordination Group (CRCG), which is chaired by the Chair of the Independent Customer Group. Membership of the CRCG consists of representatives of Scottish Water, the Independent Customer Group, Consumer Scotland, the Drinking Water Quality Regulator, the Scottish Environment Protection Agency, the Water Industry Commission for Scotland, and the Scottish Government.

The day to day running of the SR27 research programme is delegated to a Research Advisory Group (RAG) consisting of nominated representatives from Scottish Water, Consumer Scotland and the Independent Customer Group. Establishing the RAG has been essential to reflect fast moving developments in the research programme and for the smooth running and integrity of the programme. Under this arrangement CRCG will retain general oversight of the totality of the customer research programme and continues to receive progress reports at meetings.

### Independent research

Independent agencies are used to conduct research on Scottish Water's behalf to ensure the insights we receive are well-designed, robust, unbiased, inclusive and independent. By providing feedback through independent agencies, customers can more openly share views on the water and waste water services we provide. Scottish Water and all independent research agencies we work alongside are members of the Market Research Society (MRS) - the world's leading research association - and adhere to the MRS Code of Conduct. This ensures all research conducted is transparent, robust and General Data Protection Regulation (GDPR) compliant.

### Engaging and transparent

We leverage our knowledge from past research to continually improve the ways that we communicate with our customers. Additionally, we often pre-test language and research materials with customers, using a range of methods including cognitive testing which aims to capture people's thought processes and understanding when responding to research materials and questions. This is designed into many of our research activities to be carried out independently by our research partners, and we also regularly test materials with our online Water Matters community. Established in 2018, Water Matters is an online community of ~500 members used to gather feedback from customers across Scotland. It is fully moderated by an independent research agency, Explain, and allows Scottish Water to get swift feedback through polls, surveys and posts on the 'social media style' community page.

We recognise that many of our household customers are not aware of how much they pay for water and waste water services, as charges are paid alongside Council Tax. For SR27 we want to be as transparent as we can with customers about the potential bill impacts of our plans for SR27 in every stage of customer research. Whenever we engage with customers about SR27 bill impacts, we will show them as personalised a basis as possible, reflecting their own Council Tax Band or business rates and the level of discount that they receive. This approach will enable customers to give us more fully informed views on charges.

### Inclusive and representative

Our customers are not a single group, and their needs and expectations vary. Scottish Water's research is designed to engage effectively with a wide variety of different customers including those who find themselves in vulnerable circumstances. For national research activities we involve customers across the length and breadth of Scotland, and in any work that we do we ensure that customers that are harder to reach (digitally excluded or remote locations) have opportunities to participate. The broad and representative range of customers that we seek to undertake research with is shown in Figure 3.

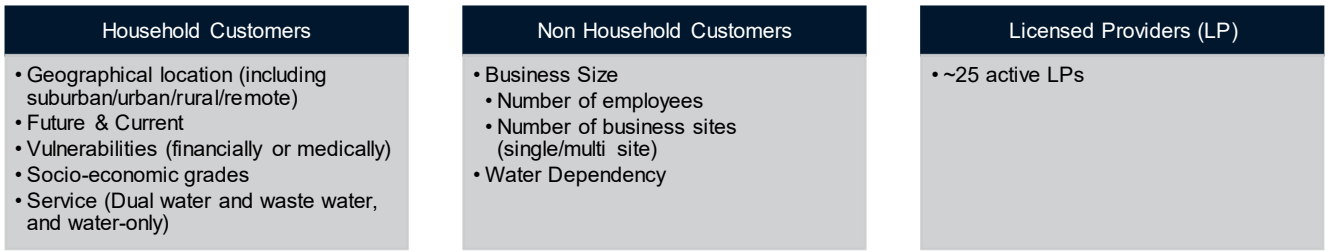


*Figure 3: Customer groups and recruitment demographics*

### Building and learning

Scottish Water has been at the forefront of water industry customer research since SR15. In SR15 Scottish Water led the way in applying the water industry approach to Stated Preference and Willingness to Pay research, using a large-scale quantitative approach to understanding the values that customers placed on different service areas. This methodology was statistically robust but also required customers to think about probabilities of service failures, and to consider quite complex packages of service offerings.

For SR21, Scottish Water again led the way in developing a more engaging Stated Preference approach, this time asking customers to consider the impact of various service issues on their own personal circumstances. This led to a much more engaging research activity, the results of which could be combined with Scottish Water's performance data to understand where service

issues were causing the most impact to customers. This approach was extended in 2023 to understand impacts of service issues on communities.

Strategic issues raised by the Long-Term Strategy require customers to think long into the future, and ask them to consider complex systems by thinking beyond immediate service issues and considering longer-term risk and resilience. To meet this research challenge, for SR27 Scottish Water is making more use of research approaches where customers are engaged in activities over sustained periods of time. These approaches give customers the time, space and information that they need to develop informed views on relevant topics and give deeper insights than can be gained by one-off research activities.

However, the reality is that water and waste water services are not top of mind for most of Scotland's population. This means that insight gathered which is more representative of the general public is also important. Scottish Water's SR27 research programme seeks to balance all of these issues and uses a mixture of approaches which involve both informed and less informed customers.

**Objective driven**

Objective-driven research focuses on clearly defined goals and objectives to guide the research process and helps us to find the most appropriate research methodologies to use, to achieve the aims we have. Qualitative approaches are helpful to give customers the time and opportunity to learn about the subject, so that they can give us a considered view. Quantitative approaches are helpful to give us the chance to reach larger numbers of customers and therefore provide a representative and less-informed view. Online methodologies can help us to reach more customers in geographically isolated areas. We work together with independent research agencies and are guided by the expertise of the Customer Research Coordination Group, Independent Customer Group and Scottish Water's own research expertise to find and develop the right methodologies which best help us to meet research objectives.

## 2.2 Long-Term Strategy

SR27 is the first step on our journey to the delivery of our long-term outcomes set out in our Long-Term Strategy (LTS). Our approach to SR27 business planning research strives to place this near-term investment as part of this long-term context; setting out decisions in the context of the challenges that Scottish Water and the wider water industry is facing over the next 25 years. Sharing this context helps customers give us a balanced perspective on the choices and decisions that Scottish Water has made; balancing the needs of the short term with the demands of the long-term; and ultimately helping to make sure that the contents of the plan are aligned with customer views.

The voice of our customers is woven through the LTS, with over 5,000 customers directly engaged in the development of the plan (Figure 4: How we built our Long-Term Strategy using insight from our customers) and enhanced through a seven-week public consultation with customers, communities and stakeholders.

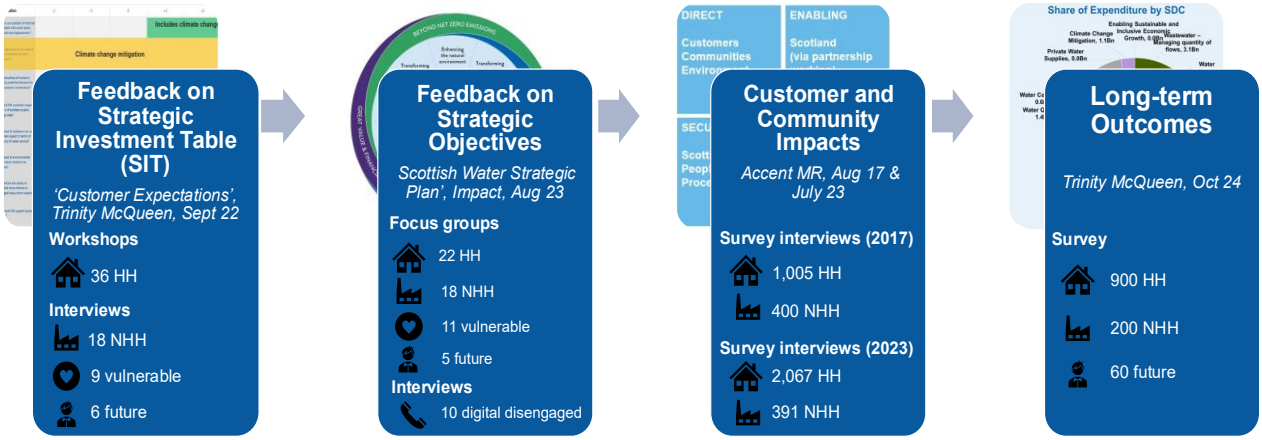


*Figure 4: How we built our Long-Term Strategy using insight from our customers*

The LTS research programme commenced with two qualitative studies which helped us to understand customer views on the role that Scottish Water should play in that future, and to think about the strategic issues that Scottish Water is facing over a 25-year time horizon.

Customers entered these studies with a consistently positive sentiment towards Scottish Water, thinking that Scottish Water provides a high quality, consistent service. Most have little reason to think about their water supply or waste water removal. There is a sense of pride in Scotland's water, and Scottish water is firmly associated with Scotland. Customers tend to trust Scottish Water to deliver and assume they have their best interests at heart. Many believe the water in Scotland is *"the best in the world"* when compared to water in other countries. The main surprise for some customers was simply how big Scottish Water is, and the scale of the service delivered.

We found that customers' general lack of awareness of Scottish Water and its activities meant that customers underestimated the need for future investment. Once exposed to the topic, all could see its relevance, and we heard that customers wanted us to do more to communicate on strategic issues. We also learn valuable lessons on how to communicate to customers on these topics, and the information they were seeking.

As part of our SR21 research programme we commissioned a large scale Stated Preference study in August 2017, which helped us to understand the relative impact of service issues on

customers own personal circumstances. We combined this with our service level data, and customer information such as contact volumes, to understand where service issues had the greatest impact on customers and establish customer priorities for SR21. For the LTS, we extended this 'impact' dataset through commissioning a further Stated Preference study, this time focussing on environmental and community service issues, and understanding the relative impact from a community perspective. We were able to combine these datasets and bring them together with Scottish Water service and cost data, to carry out an analysis of where the pace and direction of strategic long-term investment would hold the most value for customers, bringing customer insights into the heart of our decision making.

We checked the outcomes of this analysis with customers in the final stage of our LTS research programme in October 2024, giving customers an opportunity to feedback, validate and adjust the choices. All of the learning from previous stages of the LTS research programme was used to create a meaningful and accessible coin allocation exercise. Results confirmed that Scottish Water's analysis arrived at outcomes which were broadly consistent with customer's decision making, particularly when investment was constrained at lower levels. Significantly, we found that customers want to see standards across each service area maintained at the very least. They would not trade off deterioration in any service area to achieve greater improvements in another.

The final stage of the LTS conversation with customers took the form of a seven-week public consultation, from 4 February to 23 March 2025. We received 147 responses, 119 from individual respondents, across a mix of age ranges and geographical location, and 28 responding on behalf of an organisation. Overall sentiment towards the LTS was positive with 98% of respondents understanding the challenges we face and over 82% agreeing that they are right for Scottish Water to be focussing on. 82% also agreed with the outcomes we had identified and were supportive of the strategy overall.

Scottish Water's LTS has changed the way we speak to customers about investment, and the outcomes they might expect from that investment over the next 25 years. In previous reviews our focus was on understanding shorter-term customer priorities and expectations. The conversation in SR27 has now changed to become one of understanding how customers expect Scottish Water to respond to the three long-term challenges (Figure 5), to understand where they want to see progress made sooner rather than later, and to understand how Scottish Water should communicate on these topics.

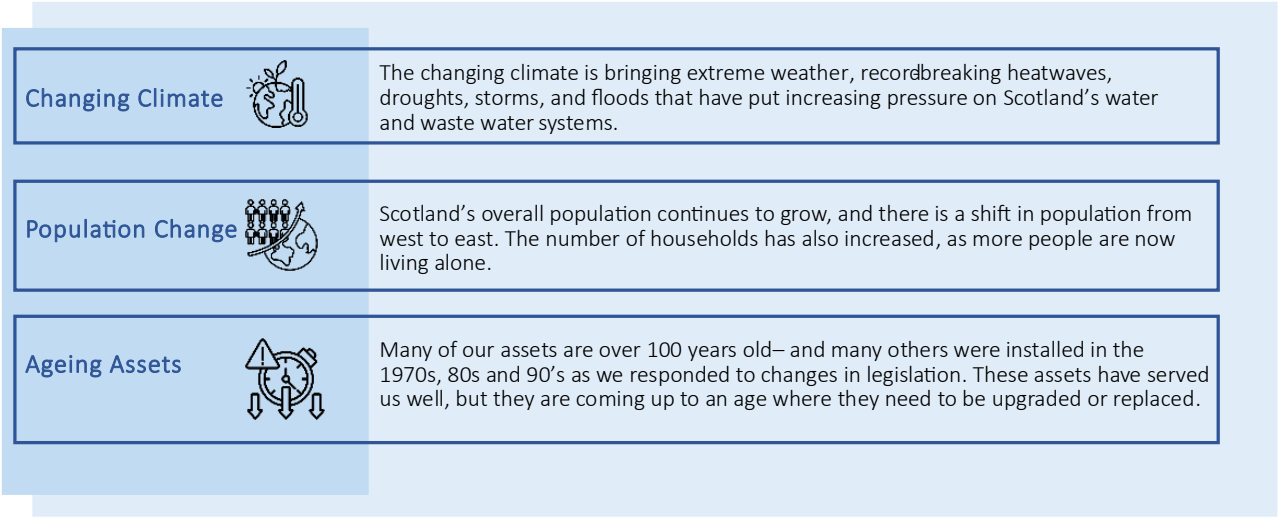


*Figure 5: An example of how we have shaped the LTS challenges as part of our SR27 research*

## 2.3 What has changed since SR21

Consumer Scotland was founded in April 2022 following the Consumer Scotland Act 2020. It is the new statutory, independent body for consumers in Scotland, and has a general function of providing consumer advocacy and advice to reduce harm, increase confidence and increase the extent to which consumer matters are considered.

Section 21 of the Consumer Scotland Act 2020 has introduced a duty ("the consumer duty") which Scottish Water and the Water Industry Commission for Scotland must take account of and evidence, on an annual basis, their clear focus on providing the best possible service and outcomes for consumers (as users of public services). The Consumer Duty aims to put consumer interests at the heart of strategic decision-making and will therefore apply to the SR27 process.

As part of its Commissioning Letter to the Water Industry Commission for Scotland (WICS), the Cabinet Secretary for Wellbeing Economy, Net Zero and Energy set out a requirement that "consumers, communities and the environment are placed at the heart of this [SR27] Review." Ministers also expect that customers are engaged throughout the SR27 process and that the Draft Determination commands customers' support.

To fulfil these requirements and to make sure that their respective statutory duties and obligations relating to customers/consumers will be met, WICS, Consumer Scotland and Scottish Water have signed a Memorandum of Understanding.

Signatories to the Memorandum of Understanding have agreed to build on the models for SR15 and SR21, where the innovative Customer Forum model was adopted to bring the voice of customers into the review. The Customer Forum was a body appointed to agree the Business Plan (SR15) and the Strategic Plan (SR21) with Scottish Water, on behalf of customers, before the Commission made its Final Determination.

In SR27, the Independent Customer Group (ICG) will be retained to challenge Scottish Water as it develops its Business Plan. Utilising its experience and expertise, the ICG will draw upon evidence to challenge Scottish Water's understanding and incorporation of customers' needs and expectations in its Business Plan. It will operate transparently and will report to the Boards of Scottish Water and Consumer Scotland on its independent role in SR27[1]. The ICG will be demonstrably operationally independent of Scottish Water and Consumer Scotland, taking responsibility for its challenge to the company. The ICG is expected to ensure its challenge to Scottish Water reflects the evidence of the customer research and analysis available to it. At the end of the process the ICG will produce an Assurance Report which will be published alongside Scottish Water's Business Plan together with a formal log of the challenges it has made to Scottish Water and the responses it has received. The ICG will also produce an Interim Assurance Report on the Draft Business Plan to be shared with Scottish Water and Consumer Scotland, to help inform the Final Business Plan.

This collaborative approach retains independent oversight of Independent Customer Group and Consumer Scotland.

The Memorandum of Understanding sets out four Principles for Customer Engagement in SR27 (Figure 6) which aim to empower customers and communities, ensure customer research is

[1] As set out in their Special Terms of Reference for SR27

credible and unbiased, foster collaboration among water sector stakeholders, and provide independent challenge to Scottish Water's plans.

They are embedded within three pillars of work (Figure 7) which aim to establish customers' views on issues through collaborative research and analysis, facilitate ICG's role of challenge to Scottish Water, and confirm whether the Final Business Plan commands customer support through longitudinal deliberative research, commissioned by Consumer Scotland.

Building on previous strategic review periods, where the customer voice was brought into the review process, the Confirmation Pillar is a significant innovation from past Strategic Review processes that will provide a direct consumer view on Scottish Water's Business Plan as a whole and be used to inform WICS' Final Determination. Consumer Scotland's longitudinal deliberative research will identify consumers' considered views and understanding of Scottish Water's Long-Term Strategy and their perceptions of Scottish Water's draft and final Business Plan to ascertain whether these meet consumers' needs, priorities and expectations.

Deliberation is an approach to public policy and decision making that allows those taking part the opportunity to consider relevant and often complex or controversial information from multiple points of view. By providing the same group of participants with the time and space to learn about the issues so that they can discuss and debate in detail the issues and options available helps the group(s) to develop their thinking as a collective, before coming to a shared view, taking into account all of the information presented to them and the values and beliefs that inform people's opinions. Consumer Scotland's longitudinal deliberative methodological approach places public participation at the heart of the research process will allow participants to fully understand, explore and discuss the issues and options in detail.

*Figure 6: Four Principles for Customer Engagement in SRC27 as set out in the MOU*

| 1. Evidence | 2. Challenge | 3. Confirmation |
|---|---|---|
| Establish customers' views on issues relating to the Business Plan through a co-ordinated and co-designed programme of research and analysis | Requires the existing Independent Customer Group (ICG) to use evidence to challenge Scottish Water to put customers' needs and expectations at the heart of its Business Plan.<br><br>To facilitate this role Scottish Water and Consumer Scotland will agree a Special Terms of Reference for the ICG for SR27. This will include a set of new asks of the ICG (in addition to their ongoing independent challenge role for Scottish Water) to help fulfil the expectation that both Scottish Water's Business Plan and the Commission's Determination will command customers' support. | Will ask customers' whether the Final Business Plan commands their support, in turn supporting the Commission to meet Ministers' expectations that the Final Determination will command customers' support.<br><br>The Parties have agreed that longitudinal deliberative research will be commissioned by Consumer Scotland for this purpose, with the activity being co-designed with sector stakeholders. |

*Figure 7: The three pillars of work as set out within the MOU*

# 3 Our approach to customer research for SR27

## 3.1 How did we design customer research for SR27?

Customer research for SR27 is fully aligned with the four Principles and three Pillars as set out in the MOU, and all Scottish Water led research is additionally aligned with our general principles for customer research as set out in in Section 2.1.

All research activity is co-ordinated through the CRCG, with day-to-day management of SR27 specific activity delegated to a Research Advisory Group (RAG) consisting of nominated representatives from Scottish Water, Consumer Scotland and the Independent Customer Group.

SR27 customer research has two broad groupings of activities as set out in Figure 8 which helps Scottish Water to make best use of the existing high quality evidence base, and supplements this with activities specific to SR27 choices and decision making:

- A **synthesis of Scottish Water's ongoing research programme**; which gathers together and analyses insights and findings from Scottish Water's wide and rich evidence base to date;
- A **programme of SR27 research**, developed in collaboration with Consumer Scotland and ICG, where Scottish Water and Consumer Scotland have each committed to undertaking specific research projects to inform distinct stages of the SR27 process, reflecting each organisation's unique role within SR27:
    - Research commissioned and led by Scottish Water establishes customers' views on issues relating to the Business Plan, and acts as inputs to the Draft or Final Business Plans, shaping their content, in line with the **Evidence** Pillar of work as set out in the MOU.
    - Consumer Scotland will commission and lead the longitudinal deliberative research that runs throughout the SR27 process and culminates in the **Confirmation** Pillar of work as set out in the MOU.

This approach supports Scottish Water, Consumer Scotland, WICS and ICG in fulfilling their needs and obligations all the way from informing the content of the Draft Business plan, to providing evidence that the Final Business Plan commands customer support ahead of WICS's Draft and Final Determinations.

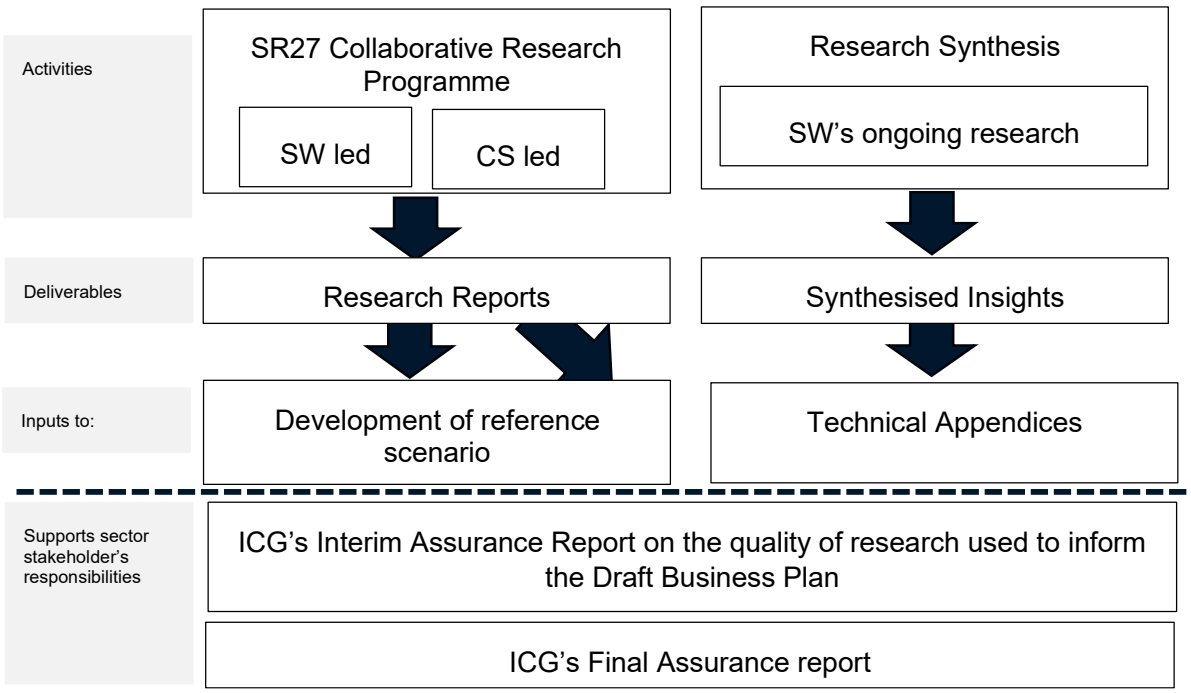


*Figure 8: Approach to SR27 Research*

### *3.1.1 A collaborative SR27 customer research programme*

As set out by the Memorandum of Understanding, the process of agreeing the research programme is an active and collaborative process, with Scottish Water, Consumer Scotland and ICG able to contribute at all stages. The programme is adapted to meet additional research needs as they are identified throughout the process.

The SR27 research programme runs Scottish Water and Consumer Scotland led activities in parallel. Both strands of activity continually build on customer views to date as the programme progresses (Figure 9: Progression of insights

9). Stages marked in dark blue below have been completed ahead of the Draft Business Plan and have been used to inform decisions, including the final reference scenario which the plan is based on, and the price profiling which has been put forward.

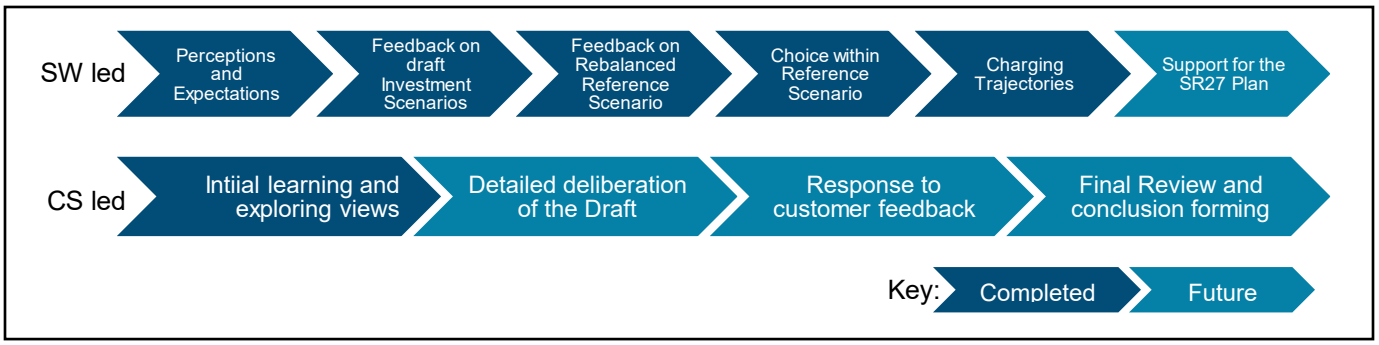


*Figure 9: Progression of insights*

The research activities and objectives which contribute to the programme of research for SR27 are set out in the table below, with detailed methodologies set out in Annex A.

*Table 1: Research activities, objectives and sample*

| Activity | Fieldwork dates | Objectives | Sample |
|---|---|---|---|
| 1. **Customer Expectations: Informing draft business plan scenarios** | ***December 2024 February 2025*** | 1. Establish customer expectations for Scottish Water over the course of SR27<br>2. Understand customer views and preferences around SR27 charging and investment scenarios | 101 Households<br>(incl, 31 vulnerable (financial or medical,<br>17 future,<br>4 water only,<br>6 as part of multigen groups)<br>26 Business (4 water only) |
| 2. **Customer Expectations: Licensed Providers** | ***March/April 2025*** | 1. Understand the needs and expectations of LPs in relation to SR27<br>2. Sense checking business customer research outputs from previous stage<br>3. Understanding LP's own future business plans or areas of focus | 6 Licensed Providers<br>*(all active market participants were invited to take part)* |
| 3. **Reconvened groups: Updated investment scenarios and charging trajectories** | ***Early April 2025*** | 1. Gathering feedback from customers on an updated investment scenario<br>2.Understanding how customers might wish to make further changes to the investment scenarios when presented with choices as trade-offs<br>3. Understanding customer preferences around a front loaded and 'smooth and steady' charging trajectory | 33 Household<br>15 Business<br>6 Future<br>*(Previously participants in Activity 1.)* |
| 4. **Support of investment scenarios** | ***Planned for August/September 2025*** | 1. Support for the outcomes set out in the Draft Plan, in the context of the associated impact on customers' charges.<br>2. Impacts of levels of understanding and how should Scottish Water communicate the plan | TBC: Nationally representative |
| 5. Consumer Scotland's Longitudinal Deliberative Research | ***Phase 1: Jan-March 2025***<br>***Phase 2: April-Aug 2025***<br>***Phase 3: Sept 2025 – May 2026*** | 1. Explore understanding and knowledge of the long-term challenges facing Scotland's water sector and the strategies required to address these;<br>2. Assess the level of consumer support for the proposed draft and final business plans;<br>3. Gauge consumers' collective support for the proposed charging profile and the cumulative impact of price increases on customers' bills; and,<br>4. Understand views, expectations and tolerances for different service levels and/or pace of developments that would be associated with different pricing pathways. | 100 Household<br>40 Business |

| Key | |
|---|---|
| | Scottish Water led |
| | Consumer Scotland led |

### 3.1.2 Our ongoing research synthesis

Scottish Water has been carrying out high quality customer research over the last decade which has amassed a wealth of information across a wide range of topics. Much of this research is qualitive which is rich in insight but can be challenging to manage in ways that enable consistent and transparent use of insights, enabling all users of customer research to draw similar conclusions from the evidence base.

Scottish Water worked with SIA partners in 2023 to develop a Research Synthesis framework (Figure 10) and process, to help us manage and consistently analyse this wealth of information. Our research is now organised and stored in a way that enables us to generate insights transparently and consistently, and to facilitate the sharing of these insights with internal users and external stakeholders. The framework enables us to combine different evidence sources and appropriately identify key insights by weighing up different sources to understand how they contribute to the synthesis process.

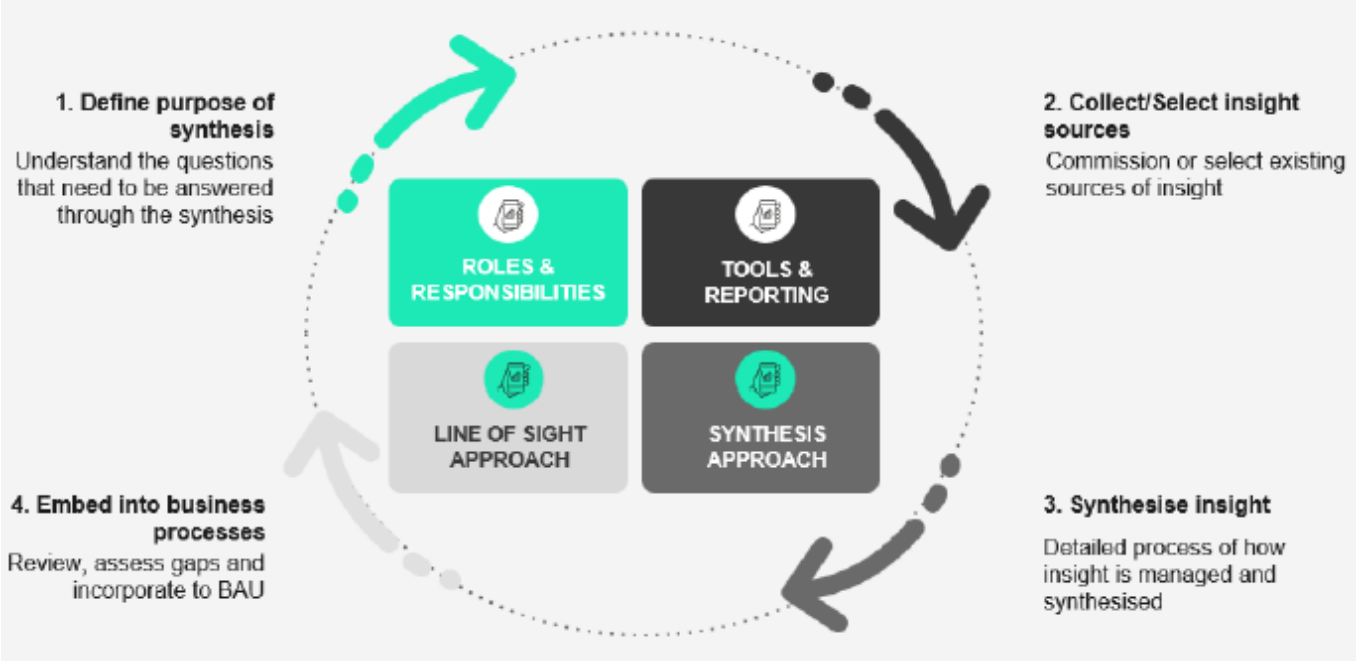


*Figure 10: Synthesis Framework*

The qualitative synthesis methodology is closely aligned with thematic synthesis of qualitative research, which focuses on integrating findings from primary studies to identify recurrent themes in relevant literature. This process involves taking concepts from one study and recognising the same concepts in another study, though they may not be expressed using identical words. This allows us to identify themes, and whether views on those themes are similar or differing across different sources. It also supports us in understanding where and if views have changed over time, identifying agreement or divergence among different customer groups, it also helps us to avoid confirmation bias through a strong weighting and scoring mechanism which enables us to evaluate research insights in a transparent and consistent way (detailed in Annex B). The framework additionally supports a fair assessment where our evidence base is strong, and where it needs strengthening.

~50 sources of ongoing customer research have been reviewed as part of the synthesis process. Studies cover a 9-year period between 2016-2024, involving more than 23,000 customers. The synthesis process is focussed on reviewing mostly qualitative research; engaging customers through methods such as surveys, workshops and focus groups.

Scottish Water has been trialling and testing the Synthesis process and framework for ~18 months, developing our in-house analytic capability, and searching for ways to use and apply synthesised insights. We invited SIA partners back in mid-2025, to review our processes and check that we have been appropriately applying the framework. Their assurance covered 2 core elements:

- Review of whether and how the business has implemented synthesis of customer research evidence, against CCWater's framework and wider best practice; and
- An assessment to establish whether insights have been appropriately recorded and weighted, and whether any insight tensions / divergence between insight sources or segments have been appropriately identified

They found that Scottish Water:

- has demonstrated a strong overall approach to evaluation and synthesis which is in line with CCW criteria;
- is particularly strong in areas around being consistent, weighting and balanced decisions;
- has demonstrated a thorough and thoughtful approach to synthesis of insights, effectively evaluating sources and using specific insights to address business needs; and
- shows strong evidence of structured evaluation and a commitment to continuous improvement.

Scottish Water is committed to continuing to use and develop the research synthesis process and framework. Insights from synthesis are key to the development of the SR27 Business Plan, and we are also finding uses for these insights on an ongoing basis. As such, we intend to maintain and update the research synthesis on a continual basis to support the use of customer insights in our processes and decision making.

## 3.2 What is our plan between now and Final Submission?

Scottish Water, together with Consumer Scotland and ICG have agreed that Scottish Water's research programme to date, together with Consumer Scotland's Deliberative Study should maximise the use of qualitative approaches, to ensure that customers have the time and information to give informed views. However, we collectively recognise these views might not be representative of our wider customer base, for whom water industry issues might not be top of mind. Scottish Water is in the process of commissioning, a nationally representative study involving less informed customers (Activity 5 in Table 1 in the previous section). Field work will take place between Draft and Final Plan submissions, with findings influencing the Final Plan.

Consumer Scotland's Deliberative Study is ongoing, with Phase 1 fieldwork just completed. Results from Phase 2 are timed to arrive between Draft and Final Plan submissions and will influence the Final Plan. Phase 3 takes places after Final Submission and will ask consumers for their views on the acceptability and affordability of the final Business Plan as part of the Confirmation pillar. This will help meet Ministers' expectations that WICS' Final Determination commands consumers' support.

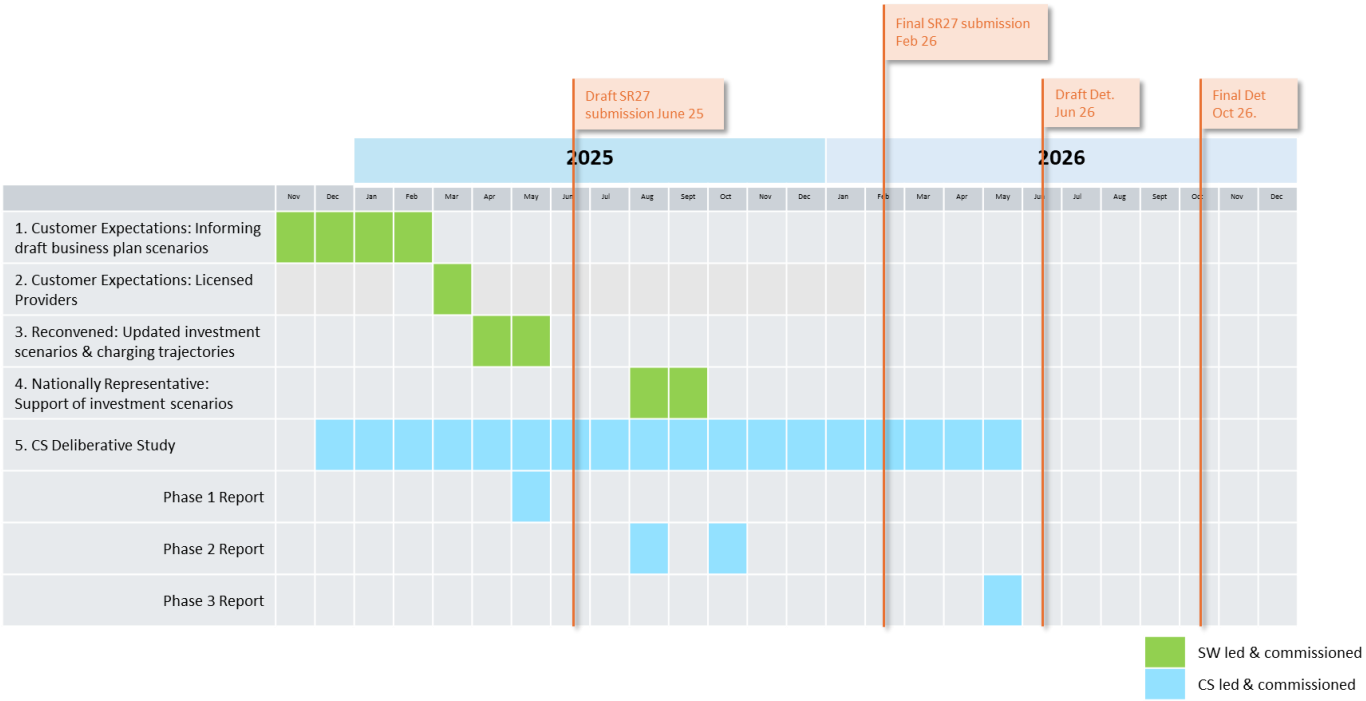


*Figure 11: Research Activity Timetable*

# 4 Outcomes of our SR27 customer research engagement

## 4.1 Collaborative SR27 customer research outcomes

**Activity 1**

| Activity | Fieldwork dates | Objectives | Sample |
|---|---|---|---|
| 1. **Customer Expectations: Informing draft business plan scenarios** | ***December 2024 February 2025*** | 1. Establish customer expectations for Scottish Water over the course of SR27<br>2. Understand customer views and preferences around SR27 charging and investment scenarios | 101 Households<br>(incl, 31 vulnerable financial or medical,<br>17 future,<br>4 water only,<br>6 as part of multi-generational groups)<br>26 Business (4 water only) |

The research approach involved customers developing an understanding of the challenges that Scottish Water faces, and the long-term context of investment decision making. Customer entered the research with positive baseline associations with Scottish Water. There was a widespread belief, regardless of sample type, that water quality was better in Scotland than in England. Participants referenced the taste of the water as well as its benefits for their hair and skin when washing. This higher quality was attributed to different factors such as the amount of rain, governance and ownership models in Scotland compared to England, proximity to hills and springs and the operational processes and structures in place in Scotland. Spontaneous 'better than' framing and belief of inferior English service drives some sense of fear and feeling that Scottish Water infrastructure needs to be maintained and future proofed.

The national pride associated with water quality in Scotland plays a significant role in shaping customer expectations. Participants often use patriotic language, viewing Scottish Water as a symbol of local pride, which adds a layer of responsibility in ensuring high standards are maintained. This perception makes customers more likely to hold Scottish Water to high expectations, especially in terms of quality, sustainability, and protection of the resource.

The invisibility of Scottish Water has both positive and negative implications. On the one hand, it means that Scottish Water is operating under the radar, with many customers feeling they don't need to think about it—this is a sign of reliable service and satisfaction, as customers aren't faced with issues or disruptions. The generally high quality of water and waste water services, non-metered billing, and reliance on Licensed Providers for non-household customers contribute to this perception of a seamless, low-maintenance service. However, the downside is that customers take the service for granted due to this lack of visibility.

The long-term view expressed by participants in the initial homework task underscores several key themes that align with the existing perceptions and expectations of Scottish Water's services. Customers are looking ahead with a clear set of priorities that reflect both continuity of service and a commitment to sustainability, balanced with a fair pricing structure. These themes are crucial when evaluating the long-term investment options, as they provide a lens through which different scenarios can be assessed and judged.

Customers were presented with three investment scenarios, each of which showed outcomes that might be offered at three different levels of charging (CPI +2, 4 and 6.5%). These were early

draft investment scenarios, which reflected Scottish Water's thinking at this early stage of business plan development. Customers were also presented with the personalised SR27 bill impacts for each scenario, taking into account their Council Tax Band and discount level to inform their feedback.

Customers gave detailed feedback on the choice areas and their comparative preference between scenarios. Their understanding and acceptance of the challenges presented by Scottish Water and their positive sentiment towards Scottish Water, led to customers wanting to protect both the public ownership of the company and its infrastructure, and generally accepting the need to pay more due to challenges and future-proofing efforts. However, none of the scenarios presented offered enough value for wholehearted endorsement from customers.

Responses from customers were reflective of the extended and exploratory research approach and reflected their well-thought out and informed perspective which was invaluable to the early development of the Draft Business Plan. However, Scottish Water and stakeholders are mindful that these views are not representative of the general public, whom we would expect to be less informed.

These findings led to 2 broad recommendations:

i) Review the scenarios to offer more value, which could involve better explanations and improved offerings to increase acceptability; and

ii) Undertake further research on a more final version of investment scenarios, giving Scottish Water an opportunity to check how the reference scenario in the Draft Business Plan might be received by less informed customers, and reflect more broadly how the general public would view the charging impact and outcomes offered in the plan.

**Activity 2**

| Activity | Fieldwork dates | Objectives | Sample |
|---|---|---|---|
| 2. **Customer Expectations: Licensed Providers** | ***March/April 2025*** | 1. Understand the needs and expectations of LPs in relation to SR27<br>2. Sense checking business customer research outputs from previous stage<br>3. Understanding LP's own future business plans or areas of focus | 6 Licensed Providers<br><br>*(all active market participants were invited to take part)* |

The research approach involved depth interview with Licenced Providers, aimed at understanding the spontaneous priorities of Licensed Providers and their views on what they and their business customers need during SR27. The choice areas and investment scenario shared with customers as part of Activity 1 was shared with them, as were insights from Business customers gathered as part of Activity 1.

As in Activity 1, participants communicated a positive sentiment towards Scottish Water, highlighting a number of areas of positivity around working as a Licensed Provider with Scottish Water. They also felt that their Business customers are happy with the operational service provided - often framed by comparison with English markets and water companies/regulators. A primary focus for spontaneous expectations for SR27 was water efficiency, where Licensed Providers wanted to see action through communications, collaboration and charges. Their spontaneous expectations for businesses were very consistent with what businesses mentioned – with some additions such as water pressure (particularly at large sites or for use in industrial

processes), resilience and back-up supplies, and efficiency and charging. Responses from business customers to the choice areas set out in activity 1 were shared, and feedback from LPs was again that these were consistent with business insight, with some valuable contributions made around how the needs of larger or smaller businesses, or those in different sectors might differ.

Response to the three investment scenarios was consistent with other business research; all scenarios were felt to be quite negative in terms of the balance between cost increases and speed of outcomes. However, LPs presented a pragmatic response and recognise the need to create a balanced plan, whilst also thinking more of the short term than business customers.

These findings led to 2 broad recommendations:

i) Review the scenarios to offer more value, which could involve better explanations and improved offerings to increase acceptability (as Activity 1); and

ii) Continue to engage with LPs as the SR27 plan develops.

**Activity 3**

| Activity | Fieldwork dates | Objectives | Sample |
|---|---|---|---|
| 3. **Reconvened groups: Updated investment scenarios and charging trajectories** | ***Early April 2025*** | 1. Gathering feedback from customers on an updated investment scenario<br>2.Understanding how customers might wish to make further changes to the investment scenarios when presented with choices as trade-offs<br>3. Understanding customer preferences around a front loaded and 'smooth and steady' charging trajectory | 33 Household<br>15 Business<br>6 Future<br><br>*(Previous participants in Activity 1.)* |

The study was delivered using an extended qualitative methodology. Participants were drawn from a panel of customers who had participated in Activity 1, so they can be characterised as informed and engaged customers. As such, while this process ensured a well-informed audience capable of providing considered feedback on the evolved investment scenario, it is important to note that these participants do not reflect the average knowledge levels of Scottish Water's broader customer base. The findings should therefore be interpreted within this context.

Customers were presented with a rebalanced, high-level investment scenario representing bill increases of CPI+4% (on a smooth and steady basis), with outcomes aligned with Scottish Waters thinking in the last stages of the development of the Draft Business plan.

Initially, the scenario was shown with indicative spend levels across investment areas. This was then followed by illustrations of potential outcomes if spending in each area were adjusted by ±£50 million. At this initial stage, the potential impact on customer bills was intentionally withheld to encourage unbiased consideration of the investment priorities. The bill implications of the rebalanced scenario were introduced later in the discussion to allow for more reflective and informed responses.

In the context of their priorities and increased understanding of the investment areas, participants generally felt that the rebalanced investment scenario was well-balanced and offered clear, tangible outcomes. When invited to consider re-prioritising expenditure across investment areas, participants generally maintained the allocations presented in the rebalanced scenario. Where

changes were suggested, they typically involved diverting funds to choice areas perceived to benefit a greater number of customers and deliver broader impact.

Customers were then shown two bill impact scenarios for discussion representing different charging trajectories, each of which would fund the rebalanced investment scenario they had just seen. One was a steady increase of CPI+4% each year over the period of SR27, the other was a front-loaded increase of CPI+11% in the first year followed by CPI+1.47% in subsequent years. Household (HH) and Business (NHH) participants were shown example bill impact trajectories and custom trajectories based on their own council tax band (HH) or water bill level (NHH). Future customers were shown example trajectories and the range of water bill levels across council tax bands.

Participants appeared generally more accepting of the need to increase bills to fund investment after two rounds of research and exposure to detailed information. However, the recent April 2025 rise in water bill and overall council tax that had happened around the time of this research has prompted some surprise and resentment. The steady increase is seen as a more acceptable way to introduce bill rises in the light of personal/business financial challenges and economic uncertainty. While the rationale for introducing higher bill increases earlier in the investment period was broadly understood and accepted, participants acknowledged that this would be challenging for customers to afford and for Scottish Water to communicate effectively.

In the post-group feedback, most participants agreed that Scottish Water listened to their feedback from the original research when designing the rebalanced investment scenario (Figure 12).

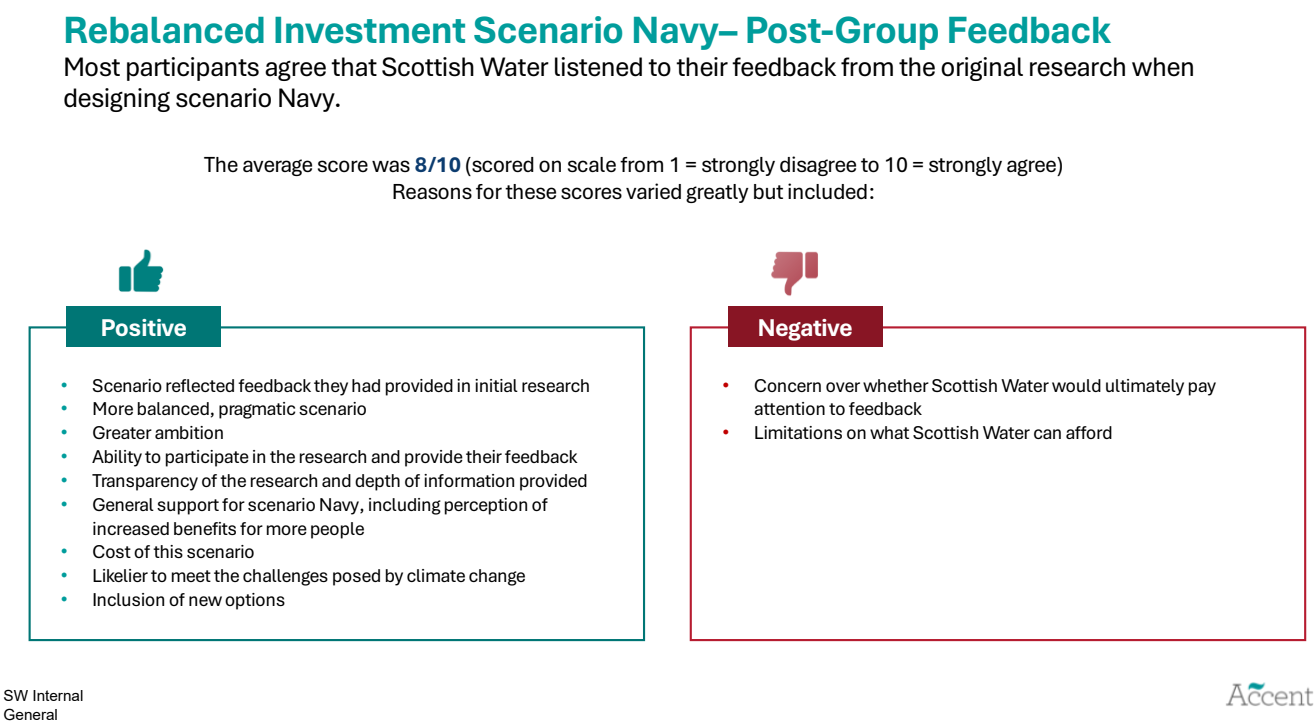


*Figure 12: Post-Group feedback*

These findings led to 2 broad recommendations:

i) To reflect customer's preference for a smooth and steady bill increase in the development of the SR27 business plan; and

ii) Undertake further research on a more final version of investment scenarios, giving Scottish Water an opportunity to check how the reference scenario in the Draft Business Plan might be received by less informed customers, and reflect more broadly how the general public would view the charging impact and outcomes offered in the plan (as Activity 1).

**Activity 4**

| Activity | Fieldwork dates | Objectives | Sample |
|---|---|---|---|
| 4. **Support of investment scenarios** | ***Planned for August/September 2025*** | 1. Support for the outcomes set out in the Draft Plan, in the context of the associated impact on customers' charges.<br>2. Impacts of levels of understanding and how should Scottish Water communicate the plan | TBC: Nationally representative sample |

This research activity is planned to meet the recommendations from Activity 1 and 3 to carry out further research on a more final version of investment scenarios, giving Scottish Water an opportunity to check how the reference scenario in the Draft Business Plan might be received by less informed customers. Scottish Water is currently carrying out the commissioning process, with ICG has been invited to participate in the selection process. This research is planned for August/September 2025.

**Activity 5**

| Activity | Fieldwork dates | Objectives | Sample |
|---|---|---|---|
| 5. Consumer Scotland's Longitudinal Deliberative Research | ***Phase 1: Jan-March 2025***<br>***Phase 2: April-Aug 2025***<br>***Phase 3: Sept 2025 – May 2026*** | 1. Explore understanding and knowledge of the long-term challenges facing Scotland's water sector and the strategies required to address these;<br>2. Assess the level of consumer support for the proposed draft and final business plans;<br>3. Gauge consumers' collective support for the proposed charging profile and the cumulative impact of price increases on customers' bills; and,<br>4. Understand views, expectations and tolerances for different service levels and/or pace of developments that would be associated with different pricing pathways. | 100 Household<br>40 Business |

The final report of Phase 1 will be available in June 2025.

## 4.2 Synthesis of customer research

### *4.2.1 Customer Research Strength by topic*

Scottish Water's research synthesis database contains ~2,000 insights drawn from more than 50 research sources involving more than 23,000 customers over 9 years. The Synthesis Framework and process have been applied to supply Key Insights to Technical Appendices and the Business Plan. Full supporting evidence, scoring and referencing for these Key Insights are set out in the Research Synthesis supporting document.

We have additionally evaluated research strength by topic (Table 2), which gives us insight into which topics areas are well explored and better understood and also helps us to understand why other topics might be less well understood.

All research topics achieve a score of more than 1.9 overall. This is primarily driven by the strength and robustness of Scottish Water's research activities, where all research areas score highly (2.6 or higher, on a scale of 0-3) for 'suitability of evidence'. This is because:

- All research in the synthesis is conducted by external research agencies.
- Most research sources include a suitable sample size, with many representing different customer segments including future and vulnerable customers.
- Many sources cover all of Scotland, with a regional breakdown supporting geographic analysis of results.
- Most research demonstrates a fair and accurate interpretation of results by including methods of analysis used or raw data that supports findings.

There is more variation on 'coverage' scores. Higher scoring topics will have relatively higher volumes of insights, number of research sources and higher volumes of customers engaged. The two topics with the lowest Topic Criteria scores are Growth and By-products and Wastes. These are topics which tend to not be subjects for targeted research and are therefore infrequently explored with customers.

Topics with higher 'coverage' scores are typically those that have been examined more extensively or those that arise more spontaneously in discussions, resulting in a higher volume of customers engaged and insights gathered. The two topics with the highest coverage scores are Drinking Water Quality and Interruptions to Supply – which to some extent reflects these areas being top of mind for customers when they think of Scottish Water and our services, and these topics coming up spontaneously with high frequency in any general research activity that Scottish Water undertakes. As the waste water and environmental side of Scottish Water's activities tend to be less top of mind for customers, they are less likely to be spontaneously mentioned, resulting in fewer insights gathered unless research is specifically targeted towards these topics.

*Table 2: Research strength [2] by topic*

| Business Plan | Research Topic | Topic & Coverage Assessment | | | | | | | | Suitability of Evidence | | | | | | | Overall Score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | #insights | Insight score | # Sources | Source score | # Customer | Customer score | Contributory score | Topic criteria score | Sample Size | Segmentation Coverage | Regional Coverage | Method of Engagement | Data Collection | Interpretation of Results | Suitability of evidence Score | |
| Business Plan | Long-Term Challenges | **59** | 2 | 13 | 2 | 7997 | 2 | 2.8 | **2.2** | 2.9 | 2.8 | 2.4 | 3.0 | 2.7 | 2.9 | **2.8** | **2.5** |
| WQ, WC, WE, WWF TA's | AR3 | **46** | 2 | 14 | 2 | 3605 | 1 | 1.5 | **1.6** | 2.7 | 2.7 | 2.4 | 3.0 | 2.6 | 3.0 | **2.7** | **2.2** |
| Business Plan | Growth | **11** | 1 | 6 | 1 | 2314 | 1 | 1.8 | **1.2** | 2.6 | 2.6 | 2.2 | 3.0 | 2.6 | 3.0 | **2.7** | **1.9** |
| Water Quality TA | Drinking water quality | **205** | 3 | 28 | 3 | 10793 | 3 | 2.4 | **2.8** | 2.7 | 2.5 | 2.5 | 3.0 | 2.5 | 3.0 | **2.7** | **2.8** |
| | Water acceptability / aesthetics | **95** | 3 | 21 | 3 | 7031 | 2 | 2.4 | **2.6** | 2.7 | 2.5 | 2.5 | 3.0 | 2.5 | 2.9 | **2.7** | **2.7** |
| Water Continuity TA | Interruptions to supply | **122** | 3 | 21 | 3 | 9322 | 3 | 2.3 | **2.8** | 2.7 | 2.7 | 2.5 | 3.0 | 2.5 | 2.9 | **2.7** | **2.8** |
| | Water pressure | **84** | 2 | 12 | 2 | 6327 | 2 | 2.3 | **2.1** | 2.6 | 2.7 | 2.8 | 3.0 | 2.5 | 2.9 | **2.8** | **2.4** |
| Water Environment TA | Pollution (EPIs / CSOs) | **84** | 2 | 17 | 2 | 7484 | 2 | 2.5 | **2.1** | 2.8 | 2.8 | 2.6 | 3.0 | 2.6 | 3.0 | **2.8** | **2.5** |
| | River water quality | **40** | 1 | 12 | 2 | 5651 | 2 | 2.2 | **1.8** | 2.9 | 2.7 | 2.6 | 3.0 | 2.6 | 2.9 | **2.8** | **2.3** |
| | Bathing Water quality | **34** | 1 | 11 | 2 | 5392 | 2 | 2.5 | **1.9** | 2.8 | 2.7 | 2.7 | 3.0 | 2.6 | 3.0 | **2.8** | **2.3** |
| | By-products and wastes | **36** | 1 | 7 | 1 | 2355 | 1 | 1.9 | **1.2** | 2.5 | 2.3 | 2.2 | 3.0 | 2.5 | 3.0 | **2.6** | **1.9** |
| WW Flows TA | Internal sewer floods | **44** | 1 | 18 | 2 | 6574 | 2 | 2.3 | **1.8** | 2.8 | 2.8 | 2.8 | 3.0 | 2.6 | 3.0 | **2.8** | **2.3** |
| | External sewer floods in private spaces | **39** | 1 | 17 | 2 | 5519 | 2 | 2.5 | **1.9** | 2.8 | 2.7 | 2.8 | 3.0 | 2.7 | 2.9 | **2.8** | **2.3** |
| | External sewer floods in public spaces | **56** | 2 | 19 | 3 | 9000 | 3 | 2.4 | **2.6** | 2.8 | 2.7 | 2.7 | 3.0 | 2.7 | 2.9 | **2.8** | **2.7** |
| | Managing Rainwater | **73** | 2 | 8 | 1 | 5035 | 2 | 2.3 | **1.8** | 2.6 | 2.3 | 2.4 | 3.0 | 2.7 | 3.0 | **2.7** | **2.2** |
| Climate Mitigation & Adaptation TA | Climate Change | **101** | 3 | 18 | 2 | 11250 | 3 | 2.5 | **2.6** | 2.9 | 2.6 | 2.4 | 3.0 | 2.6 | 2.9 | **2.7** | **2.7** |

[2] It should be noted that the number of insights, sources and customers involved cannot be totalled, as where research covers more than one topic, there will be double counts

# 5 Conclusion

Scottish Water's research programme for SR27 is underpinned by insights from Scottish Water's Research Synthesis process and framework. The synthesis process maximises the value of Scottish Water's wide and rich evidence base to date, by drawing from more than 50 research projects involving more than 23,000 customers over the past 9 years. We have been building our in-house expertise on applying thematic analysis using the Framework over the last 18 months, and a recent independent review of our process resulted in positive feedback, finding a strong, thorough and thoughtful approach to evaluation and synthesis, and strong evidence of structured evaluation. We will continue to develop the use of synthesised insights as part of building the Final Business Plan, and in support of broader Scottish Water activities.

Scottish Water's research programme for SR27 has to date engaged with more than 100 household customers and 25 businesses. The programme commenced with an extended research methodology which enabled customers to build their understanding of the Scottish water industry and provide considered meaningful views on SR27. This research will be complimented by a further Scottish Water-led study involving less informed customers between the Draft and Final Business Plan submissions, to establish a more nationally representative view of Scottish Water's plans for SR27.

These research activities run in co-ordination with Consumer Scotland's Longitudinal Deliberative Research, which will identify customers' considered views and perceptions of Scottish Water's Draft and Final Business Plan, to ascertain whether these meet customers' needs, priorities and expectations. Consumer Scotland's Longitudinal Deliberative Research will be a key piece of information in determining whether the Water Industry Commission for Scotland's Final Determination commands consumers' support.

Scottish Water's research to date has resulted in four broad recommendations which have informed the development of the SR27 Draft Business Plan content and process:

1. Review the early-stage draft investment scenarios to offer more value, which could involve better explanations and improved offerings to increase acceptability.
    a. This recommendation was actioned through the development of a rebalanced working reference scenario (based on outcomes which might be associated with a smooth and steady CPI +4% trajectory), which was shared with customers in the last stages of the development of the Draft Business Plan.
        - Customers generally felt that this was well-balanced and offered clear, tangible outcomes.
        - When invited to consider re-prioritising expenditure across investment areas, participants generally maintained the allocations presented in the rebalanced scenario.
        - Where changes were suggested, they typically involved diverting funds to choice areas perceived to benefit a greater number of customers and deliver broader impact.
        - Recognition that participants at this point in the research programme may not be representative of the general public (who we might expect to be less well informed) led to recommendation (3) below.
2. To reflect customer's preference for a smooth and steady bill increase in the development of the SR27 Draft Business Plan.
3. Undertake further research on a more final version of investment scenarios, giving Scottish Water an opportunity to check how the reference scenario in the Draft Business Plan might

be received by less informed customers, and reflect more broadly how the general public would view the charging impact and outcomes offered in the plan.

4. Continue to engage with LPs as the SR27 plan develops.

# Annex A: Customer Research Activities

### Activity 1

| Activity | Fieldwork dates | Objectives | Sample |
|---|---|---|---|
| 1. **Customer Expectations: Informing draft business plan scenarios** | ***December 2024 February 2025*** | 1. Establish customer expectations for Scottish Water over the course of SR27<br>2. Understand customer views and preferences around SR27 charging and investment scenarios | 101 Households<br>(incl, 31 vulnerable (financial or medical,<br>17 future,<br>4 water only,<br>6 as part of multigen groups)<br>26 Business (4 water only) |

SR27 research activities commenced with Accent Market research in early 2025. An extended qualitative methodology was designed (Figure 13) to ensure that participants had sufficient time and space to reflect on the topics discussed and provide considered, meaningful insights. By adopting this more extended and exploratory format, it was possible to capture richer, more nuanced feedback, ensuring that the findings reflect not just immediate reactions but also well-thought-out perspectives on key issues.

Customers undertook preparatory homework exercises from mid-December 2025, in advance of the Scottish Water hosted webinar on 8 January 2025, which was followed up by further homework exercises. The qualitative fieldwork commenced 13 January 2025. Many of the customers who participated have been retained as a panel to enable us to follow up with questions and choices for SR27 on a more flexible basis and participated in Activity 3.

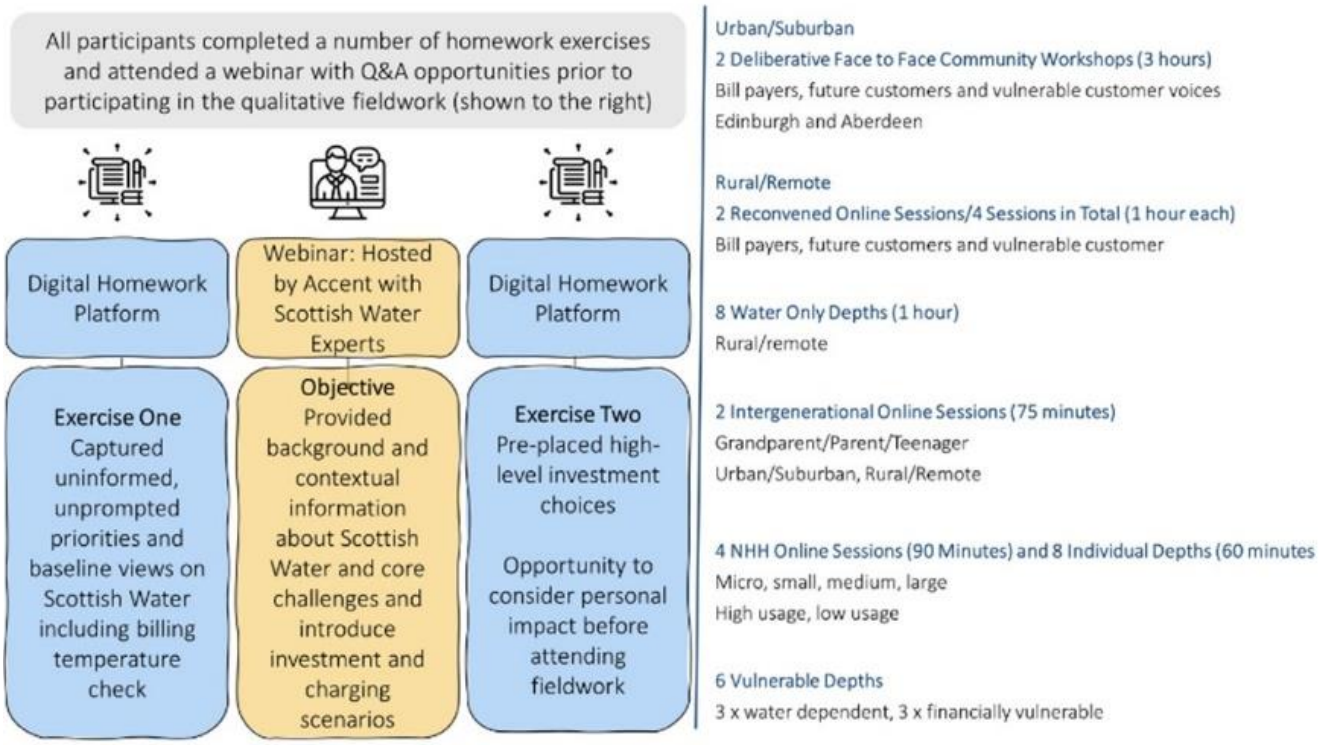


*Figure 13: A summary of the Activity 1 process*

The final report from Accent is available as a supporting document.

**Activity 2: Customer Expectations: Licensed Providers (LPs) (Scottish Water led)**

| Activity | Fieldwork dates | Objectives | Sample |
|---|---|---|---|
| 2. **Customer Expectations: Licensed Providers** | ***March/April 2025*** | 1. Understand the needs and expectations of LPs in relation to SR27<br>2. Sense checking business customer research outputs from previous stage<br>3. Understanding LP's own future business plans or areas of focus | 6 Licensed Providers<br>*(all active market participants were invited to take part)* |

Accent Market Research were commissioned to undertake this research, with fieldwork taking place in early April 2025. As a critical part of the business supply chain, and important Scottish Water customers, it is important to understand the spontaneous priorities of Licensed Providers and their views on what they and their business customers need during this period.

There are ~25 Licensed Providers active in Scotland, all were invited to participate in the research, with 6 participating. The methodology involved 'depth interviews', one-on-one conversations which explore the issues around the research objectives in detail.

The final report from Accent is available as a supporting document.

**Activity 3: Reconvened groups: Updated investment scenarios and charging trajectories**

| Activity | Fieldwork dates | Objectives | Sample |
|---|---|---|---|
| 3. **Reconvened groups: Updated investment scenarios and charging trajectories** | ***Early April 2025*** | 1. Gathering feedback from customers on an updated investment scenario<br>2.Understanding how customers might wish to make further changes to the investment scenarios when presented with choices as trade-offs<br>3. Understanding customer preferences around a front loaded and 'smooth and steady' charging trajectory | 33 Household<br>15 Business<br>6 Future<br>*(Previous participants in Activity 1.)* |

Accent Market Research were commissioned to undertake this research, with fieldwork taking place in early April 2025. Participants had been drawn from a panel created as part of Activity 1 with the understanding that they would be open to future engagement in Scottish Water research. This informed audience were reconvened into digital focus groups. This ensured continuity and deeper insight from those already familiar with key topics and created an opportunity for 'you said we did' engagement.

Customers undertook preparatory homework in advance of fieldwork, and were also asked to complete a post-task survey (Figure 14: A summary of the Activity 2 process

As participants are drawn from the same group of customers involved in Activity 1, it replicates those demographics and continues to mix those from different age and social grade bands. As in Activity 1, bill impact was presented on a personalised basis, taking into account their Council Tax Band and discount level.

The final report from Accent is available as a supporting document.

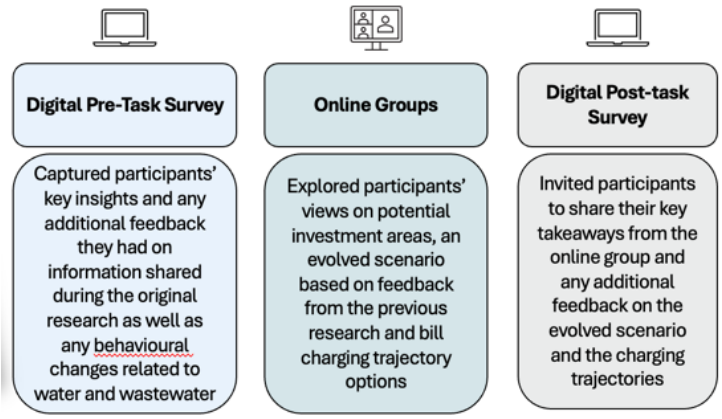


*Figure 14: A summary of the Activity 2 process*

**Activity 4: Support of investment scenarios (Scottish Water led)**

| Activity | Fieldwork dates | Objectives | Sample |
|---|---|---|---|
| 4. **Support of investment scenarios** | ***Planned for August/September 2025*** | 1. Support for the outcomes set out in the Draft Plan, in the context of the associated impact on customers' charges.<br>2. Impacts of levels of understanding and how should Scottish Water communicate the plan | TBC: Nationally representative sample |

As the co-ordinated programme of research has progressed, Scottish Water, Consumer Scotland and the Independent Customer Forum have identified the need for research with less informed customers to take place between the Draft and Final Business Plan stage. This will complement the deliberative approach taken by Consumer Scotland, and the extended approach taken by Scottish Water in Activities 1 and 3. This activity is to be commissioned and led by Scottish Water, with the Independent Customer Forum invited to participate in the selection process

A large-scale quantitative methodology has been chosen to deliver the most useful outputs by enabling us to reach larger numbers of customers and also support statistical analysis of results.

**Activity 5: Longitudinal Deliberative Research (Consumer Scotland led)**

| Activity | Fieldwork dates | Objectives | Sample |
|---|---|---|---|
| 5. Consumer Scotland's Longitudinal Deliberative Research | ***Phase 1: Jan-March 2025***<br><br>***Phase 2: April-Aug 2025***<br><br>***Phase 3: Sept 2025 – May 2026*** | 5. Explore understanding and knowledge of the long-term challenges facing Scotland's water sector and the strategies required to address these;<br>6. Assess the level of consumer support for the proposed draft and final business plans;<br>7. Gauge consumers' collective support for the proposed charging profile and the cumulative impact of price increases on customers' bills; and,<br>8. Understand views, expectations and tolerances for different service levels and/or pace of developments that would be associated with different pricing pathways. | 100 Household<br>40 Business |

Consumer Scotland has commissioned IPSOS to undertake longitudinal deliberative research over an 18-month period to enable consumers to inform Scottish Water's Business Plan at key stages of development. A longitudinal deliberative approach has been adopted for this research due to the complex nature of the topic and to ensure that customers can inform the development of Scottish Water's Business Plan as it progresses.

The methodology combines a public dialogue with domestic customers, longitudinal qualitative research with domestic customers from under-represented groups, and in-depth qualitative research with non-domestic customers using a Delphi-style approach.

- **Phase one** focuses on domestic customers, exploring initial views and awareness of water and waste water services in Scotland and gathering initial views on the key issues facing Scottish Water for its Draft Business Plan.
- **Phase two** engages both domestic and non-domestic customers, exploring Scottish Water's Draft Business Plan and pricing pathways in more detail.
- **Phase three** provides an opportunity for domestic and non-domestic customers to review any changes to Scottish Water's Business Plan and to form conclusions

# Annex B: Customer Research Synthesis Weighting and Scoring

### Evaluating Research Insights

The synthesis framework and process bring objectivity through a strong weighting and scoring mechanism (Figure 15: Source and Insight scoring

helps us to avoid confirmation bias. There are two sets of scores:

- **Source Assessment** (Table 3) Sources are scored to understand how suitable the evidence is within source for the purpose of synthesis. It aims to answer questions such as:
    - **Suitability**: How big was the sample? Did they break down findings between customer segments or geographical areas? How was the raw data collected? How did we engage customers? Is there evidence that the findings are supported by the raw data?
    - **Coverage**: How aligned are the findings with each topic? What is the contribution to topic of each resource:

Only the highest quality and most relevant insights are synthesised into key findings for the topic.

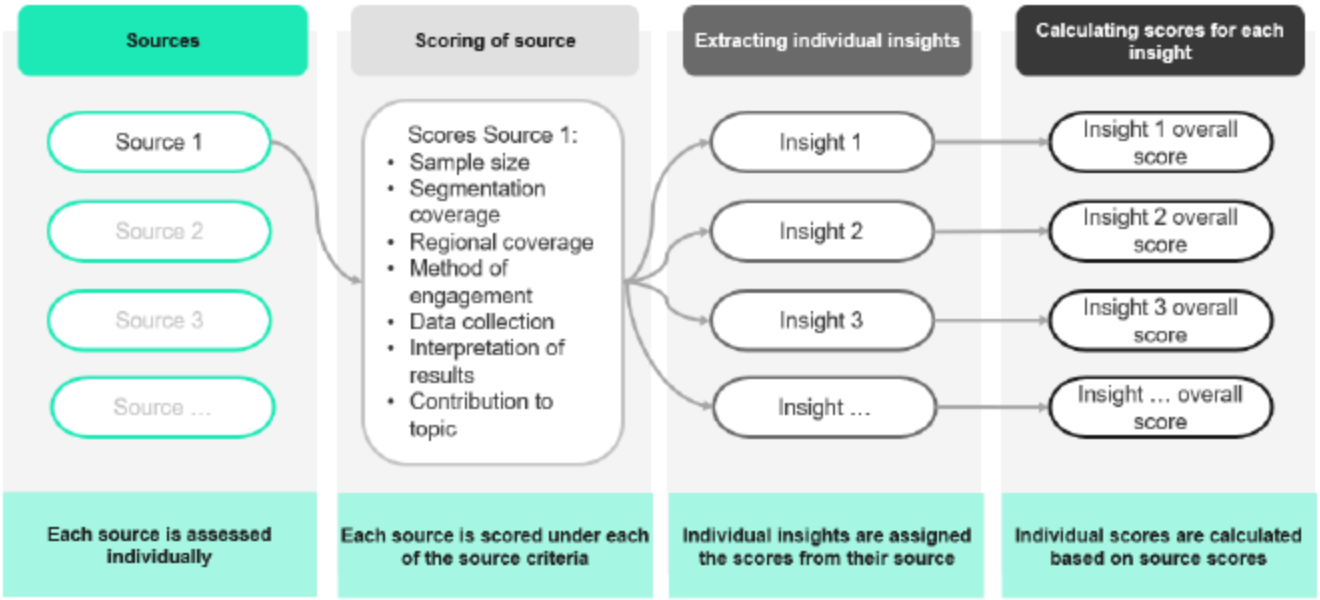


*Figure 15: Source and Insight scoring*

### Evaluating Research Strength

The synthesis process also enables us to understand where our evidence base is strong, and where it needs strengthening. If topics are frequently studied in a methodologically-sound way, there is stronger evidence for the value of the findings.

- **Topic Assessment** (Table 4) Topics are scored to understand how frequently the topic has been studied in the sources analysed. It aims to answers questions such as: How many sources cover the topic? How many customers were engaged on this topic across all sources? How many insights were gathered across all sources?

*Table 3: Source assessment criteria*

| Score | Source Assessment (50%) | | | | | |
|---|---|---|---|---|---|---|
| | Sample Size | Segmentation Coverage | Regional Coverage | Method of Engagement | Data Collection | Interpretation of Results |
| 0 | Unknown / not provided | Not specified | Outside of Scotland | Unstructured data - e.g. customer verbatim | Not specified how data was collected | No interpretation of findings |
| 1 | Survey with less than 50 people or workshop / focus / group / interview with less than 10 people | High level e.g. customers/stakeholders | UK Wide | Generic surveys, social media tracking | Limited discussion of data collection technique | Lack of credible interpretation with potential for bias. |
| 2 | Survey with 50-100 people, workshop / focus / group / interview with 10-25 people | Certain customer types with indications of coverage such as across geographies and inclusion of vulnerable customers - e.g. HH, NHH | Scotland wide or one area in Scotland | Internal high quality, targeted qual/quant surveys, consultations, workshops, focus groups | Some discussion of data collection and the methods. | Some links and discussion of the engagement details, including some differing views. |
| 3 | Survey with 100+ people, workshop / focus / group / interview with 25+ people | Insights organised across detailed segments - e.g. vulnerable, future customers, HH, NHH, Developers | Breakdown of specific Scottish regions | External research, externally facilitated focus groups, workshops, online communities, surveys, etc. | Thorough discussion of data collection procedures, noted a range of perspectives and extensive detail of feedback | Engagement work interpreted accurately and fairly with a detailed outline of all perspectives and issues discussed. |

| Coverage Assessment (50%) | |
|---|---|
| 0 | Topic not covered by source |
| 1 | Source not designed to explore specific topic, however unprompted feedback on topic provided when discussing other topics within the source |
| 2 | Source not designed to explore specific topic, but certain questions include reference to the topic as it links with the objectives of the source |
| 3 | Source designed to explore the topic(s) |

*Table 4: Topic assessment criteria*

| Topic Assessment | | | |
|---|---|---|---|
| Score | Volume of Insights | Number of Sources | Volume of Customers |
| 0 | No insight on this topic | No sources on this topic | No customers engaged on this topic |
| 1 | Relatively low number of insights | Relatively low number of sources | Relatively low number of customers engaged |
| 2 | Relatively moderate volume of insight | Relatively moderate number of sources | Relatively moderate volume of customers engaged |
| 3 | Relatively high volume of insight | Relatively high number of sources | Relatively high volume of customers engaged |

# Risk & Assurance
# Technical Appendix 010

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# 1 Executive Summary

The purpose of this Technical Appendix is to build confidence in the Draft Business Plan (DBP) through understanding the balance of risk associated with achieving the outcomes and explaining the assurance process that supports the plan. This document provides:

- a qualitative overview of the key risks (threats and opportunities) to achieving the outcomes in our SR27 Draft Business Plan and the further analysis planned ahead of Final submission in February 2026.
- an explanation of how our plan has been assured.

## 1.1 Risk Management

One of the key purposes of a business plan submission is to outline the funding required to run the business and enable outputs and outcomes to be delivered. We typically break our expenditure into two key elements – the operating costs and the Investment Planning Scenario. These proposed outcomes will form a baseline against which we will be measured for the SR27 period. Whilst we will retain the principles of the dynamic Investment Planning and Prioritisation framework, it is important that we understand the risks (threats and opportunities) of the analysis and assumptions that underpin these estimates, and to ensure that we understand the balance of risk across the plan.

The overall summary of the net qualitative risk assessment for the DBP is shown in Table 1 (below). This assessment is a review of the balance of threats and opportunities for each category of investment with the more detailed rationale for these assessments set out in this Appendix.

*Table 1: Draft Business Plan initial risk assessment*

| Assessment Levels | Category | Overall Net Assessment |
|---|---|---|
| **Generic Investment Risks** | Needs - Enhancement | Neutral |
| | Needs – AR3 | Medium Threat |
| | Scope | Neutral |
| | Cost | Neutral |
| | Efficiency | Low Threat |
| | Deliverability | Neutral |
| **Specific Risks to Key Investment Areas** | Water Quality | Neutral |
| | Water Continuity | Low Threat |
| | Waste Water Flows | Low Threat |
| | Water Environment and Net Zero | Neutral |
| **Opex plan** | Costs & Efficiency | Neutral |

## 1.2 Assurance

Assurance is the process by which we ensure the DBP is well evidenced, meets our obligations, follows the Water Industry Commission for Scotland's (WICS) methodology and is trustworthy. We use assurance to identify potential errors (e.g. in data and approach), make improvements and monitor how we develop our plan. We have worked with WICS to co-design the assurance requirements for our business plan submission, aligning with the requirements of WICS' SR27 Final Methodology.

The WICS SR27 Final Methodology requires the Board to provide appropriate assurance of Scottish Water's SR27 Business Plan. Discussions with WICS indicate that the Board Assurance

Report for DBP submission focuses on the processes that have been followed and assesses the DBP completeness as being appropriate for this stage in the process, explicitly acknowledging that the plan will develop significantly between the submissions of the DBP and Final Business Plan (FBP). Our assurance framework follows the three lines of assurance model, with internal data/product owners having independent review by senior independent management culminating in a review by an external third party assurance partner.

# 2 Background

## 2.1 Context and driver

Building a thorough understanding of the level of risk across our DBP, the underlying factors driving this risk and how these can best be mitigated, enables us to build confidence in the plan and our ability to deliver the outcomes to which we are committing. It also underpins how we communicate and evaluate the plan with our key stakeholders, and how the plan can be assured.

Risks have been assessed against the key outcomes for four Key Investment Areas (KIAs):

(i) Managing Quantity of Flows;

(ii) Water Environment and Net Zero;

(iii) Water Quality; and,

(iv) Water Continuity.

These outcomes create the baseline against which performance will be measured in SR27. It is therefore important we have a robust understanding of the analysis which underpins the investments and service choices we are making to achieve these outcomes, and any associated assumptions. This in turn enables us to have a clear understanding of the threats and opportunities.

## 2.2 What we have done so far

This Appendix sets out our approach to identifying, evaluating and managing risk in terms of threats and opportunities, within the plan. It considers risk across the whole plan, both top-down (macro view on our service outcomes), and bottom up (the underlying factors which affect our ability to deliver these outcomes within the investment plan). It outlines a net risk position across a suite of general risks for the whole business plan and our four biggest Key Investment Areas (KIAs). This gives us the ability to evaluate whether we have a balanced plan overall, from a threat and opportunity perspective.

Furthermore, we have outlined how threats and opportunities will be proactively managed, and aligned this to our overall Assurance and Monitoring programmes0. Our intent is to ensure that we have taken an “evidence-based decision making” approach “including demonstrating how risk is both understood and taken into account”[1], as required in the WICS methodology.

This Appendix should be read in conjunction with the Investment Planning Technical Appendix, which provides greater detail on the components of our Investment Planning Scenario work, and how schemes and interventions have been selected, including their contribution to service outcomes and other commitments.

[1] https://wics.scot/system/files/2024-08/SRC27-Draft-Methodology.pdf

# 3 Overview of risk within our SR27 plan

## 3.1 Our overall approach to identifying threats and opportunities

We have used a qualitative approach to identify risks and opportunities across our SR27 business plan for this draft submission. Figure 1 below, outlines how we have identified, evaluated, and prioritised both threats and opportunity. In turn we have then established mitigation plans for the key risks, and action plans to maximise the areas of opportunity. We will continue to develop our overall approach between Draft and Final Business Plan submission,

more information on our intended approach can be found in Section 7 of this document.

*Figure 1: Threats and opportunities identification and management approach*

A top-down and bottom-up, qualitative approach has been taken to assessing risks across the SR27 Business Plan in order to provide confidence, clarity and collective understanding of the net risk position Scottish Water is adopting.

Firstly, risks have then been identified through the building of the key investment areas as detailed in the Technical Appendices. Authors have considered risk whilst building out plans for their area, identifying potential threats and opportunities, and assessing if they are material to the delivery of the business plan. This has included assessing risk likelihood, and the potential impact on outcomes should it occur. These have been summarised qualitatively for each key investment area, and iterated as the plan has developed and matured.

A workshop was held in March 2025 to confirm all risks relevant to the SR27 business plan had been identified and captured. This was attended by SMEs from across the business. Outputs were used to complete the qualitative risk assessment for the four KIAs, and overarching risk items which could impact the overall business plan. The most material threats and opportunities across the KIAs were then scaled based on the likelihood and the impact of the threat or opportunity occurring. This provided a qualitative view of overall risk for each KIA and these are outlined below in Section 5.

In April 2025, the Board identified generic risks to the business plan which were captured and then categorised. These categorisations were iterated and potential impacts assessed with SMEs across Scottish Water. The outputs of this are outlined below in Section 0.

This assessment of risk has provided us with an overall balanced view of the risks of our SR27 business plan. For DBP, to reflect the developing and evolving nature of our plan up to this point in time, this balanced view of risk has been via a qualitative assessment. However, between DBP and FBP and into delivery planning, as more granular intervention and investment details are finalised, we will undertake quantitative modelling, including the potential for us to use Monte Carlo analysis.

The analysis excludes consideration of risks deemed outwith management control. Although these risks are deemed outwith management control they are monitored and managed at a corporate level. These risks include:

- Macroeconomic and revenue risks – including significant variations in assumption in areas such as inflation, borrowing and demand/growth;
- Obligational risks – such as future changes to legislation, e.g. increased obligations arising from the recast Urban Wastewater Treatment Directive, and as a result of the Climate Change policy work underway with the Scottish Government; and
- Exogenous risk – consideration of high impact, low likelihood events such as failure of a key supplier (e.g. supplier default) or system (e.g. cyber-attack), loss of a critical asset (fire, flooding, etc) or changes to essential processes (e.g. the manner in which we bill and collect revenue from household customers).

## 3.2 We will proactively manage risks on an ongoing basis

Threats and opportunities will be managed, reviewed and updated on a regular basis, with specific threat and opportunity owners for each area of risk. We will monitor this through our Risk Management process and update this following the process outlined below during SR27:

- We will establish a thorough review process to assess the identified and emerging threats and opportunities, ensuring they do not lead to any non-compliance with regulatory commitments or hinder our ability to achieve our Ministerial Objectives and service outcomes. This review will involve assessing the current and emerging threats and opportunities across all relevant areas of operation.
- We will engage stakeholders across the business and our regulators to establish that we are capturing and monitoring all relevant threats and opportunities. We will also use robust monitoring tools to track changes in the regulatory landscape and market environment such as regular horizon scanning.
- As part of this process, we will reflect any adjustments in priorities or external conditions. Additionally, threats and opportunities will be reviewed monthly by the Senior Management Team, ensuring alignment with our overarching vision and compliance.
- Performance against the Business Plan will be reviewed quarterly to determine if objectives and targets are being met effectively. This regular evaluation will provide a review against progress and help plan for how to stay on track to meet our outcomes.

# 4 Generic investment risks across the SR27 business plan

The Reference Investment Planning Scenario (IPS) equates to £8.3bn[2] of the total funding of the Draft Business Plan (£13.4bn in total). The primary factors effecting the build-up of this investment estimate are as follows:

## 4.1 Needs

We have a robust, well evidenced plan that has been built using data and processes of a higher standard than at previous Strategic Reviews. The Enhancement part of the Reference IPS contains "high certainty needs" that have typically been studied in previous periods and are of priority to our quality regulators or are known customer and stakeholder priorities (flooding, Net Zero Emissions, growth). There is a threat that more demand is included by regulators demanding more outputs as the period proceeds, but the combination of a clearly articulated baseline of assumed needs and the protection of the IPPF to manage any changes in the baseline means this is likely to be a neutral risk to the plan overall.

In relation to the Asset Repair, Refurbishment and Replacement (AR3) investment, the work completed in development of the Management Approaches (MAs) over recent years creates high confidence in the forecast estimates. Our proposed level of asset repair, refurbishment and replacement investment (~£5bn) in SR27 is ~28% above the levels of investment in SR21, but remains below the long term sustainable level appraised in our Management Approaches (assessed as being ~£8bn for a 6-year period). This proposed level of spend reflects an increase towards a more sustainable level of investment and charging over the coming investment periods. Taking this 'stepped' approach in increases of investment in each subsequent investment period towards the identified sustainable level allow us to manage the maintenance of our asset base for the long term with the effect on intergenerational equity and short-term charges on customers. Given the difference between estimates for the MA Policy and the SR27 allocations, we can be confident that the agreed allocations of ~£5bn will be used for the most critical activities. Further explanation can be found in the Investment Planning Technical Appendix. Any potential increase in the volatility of service risk and associated operational pressure will be mitigated by further careful risk management in terms of delaying non-time-critical AR3 investment into the following investment period. This factor should be considered as a medium threat to the plan given the reduction in the allocation compared to the Management Approach policy positions.

## 4.2 Scope

The programme is based on scopes of work that are at various levels of maturity, measured by a stage-gate process from Gate 30 to Gate 120. Some proposals have yet to pass Gate 30[3] whilst others have passed Gate 90[4]. This is fundamental to a maturing rolling investment programme at the core of the Investment Planning and Prioritisation Framework (IPPF) to which all stakeholders have agreed. As part of this process, we have a rigorous transparent Project Investment Appraisal process that provides WICS and stakeholders full transparency as the project develops. We will

[2] In 2023/24 price base after adjustment for efficiency
[3] Gate 30 is the stage at which the investment need is confirmed through appropriate study and investigation work. At this point forecast expenditure is based upon strategic estimates for generic scopes.
[4] Gate 90 is the stage at which a commitment for delivery of the preferred option is made. At this point, forecast expenditure is based upon commercially tested and contracted prices for the project.

be refreshing the IPPF with WICS and wider stakeholders ahead of the commencement of SR27. This factor should be considered to be a neutral risk to the plan.

## 4.3 Cost

The plan has been costed using tools based on the latest 'cost curves', run-rate market data or via project-specific costing where appropriate. Information on the efficiency of the costs has been assessed and shared with WICS. Where WICS has provided feedback we are progressing implementing this feedback ahead of FBP.

We have taken account of costing that is based on different points of maturity of the project scope. Whilst there will always be uncertainty in project costing, we have used the best information available to us. We continue to work to improve the accuracy of our costing methodologies and will engage with WICS on this to ensure that the regulator retains confidence in our approaches. We also have opportunities to update WICS and other stakeholders if there are significant changes to cost estimates as projects develop and scopes become more defined. In Section 4 below we flag some programme-specific risks that will require close monitoring. Overall, this factor should be considered to be a neutral risk to the plan.

## 4.4 Efficiency Position

We have conducted a suite of analyses of our current efficiency position. This concluded that Scottish Water's operating and capital costs are efficient in aggregate. Our efficiency evidence and assessments have been peer reviewed by First Economics and shared with WICS in advance of submission of the DBP. Where we have received feedback from WICS we have and will continue prior to FBP, to implement these changes.

In relation to our frontier efficiency proposal of 0.8% pa, this is stretching relative to recent economic data. We think this level of efficiency improvement is ambitious, but that it can be met with significant contribution from our identified transformation opportunities. In addition, we have proposed to incorporate adjustments to take account of Real Price Effects (RPEs), the impact of inflation in costs that is different to general Consumer Price Index (CPI) inflation. Incorporating adjustments to take account of RPEs would lower the threat of output and outcome under-performance in SR27. As described in the Efficiency Technical Appendix, we have not applied RPEs to our draft plan. We will incorporate RPEs into our Final Business Plan, incorporating any feedback from WICS on preferred implementation approaches.

On balance, we consider our efficiency position in the DBP to be a neutral risk. Further information on our efficiency position can be found in our Efficiency Technical Appendix.

## 4.5 Deliverability

There is a ~50% increase in the size of the Investment Planning Scenario[5] from SR21 to SR27 and we are aware of the challenge this provides regarding deliverability, including the capacity of our supply chain to support this increase in plan size. However, in knowing this challenge, we have been assessing the capacity of the supply chain in recent years. In 2024/25, (our peak

[5] SR21 IPS is £5.85bn and SR27 IPS is £8.75bn on a like for like basis using 2023/24 price base

investment year) we invested ~£1.12bn and assessed that there was still further capacity available, indicating that we could have invested, and supply chain could have delivered ~£1.2bn of investments.

In SR27 the average annual investment is forecast to be £1.46bn per annum, indicating a 20% increase in capacity required. However, this 20% increase is not required immediately - with Year 1 investment forecast to be ~£1.2bn and Year 6 forecast at £1.6bn. This progressive increase in expenditure provides the supply chain with time to grow in capacity at a sustainable rate in line with the investment required.

The major risks to the deliverability of the investment include:

- A threat that significant change in the type of work in the final IPS results in a mismatch between the investment required and the supply chain capabilities – however, this is considered unlikely at a macro level.
- A threat from changing the volume of work within each programme area significantly in period due to the flexibility of the IPPF – the supply chain thrives on visibility and certainty of programme.
- An opportunity to provide suppliers with an increased scale of work, potentially making Scottish Water a more attractive client and helping to support our efforts to achieve the best possible pricing.

Given the extensive work being undertaken to rigorously assess the capacity of the supply chain, the proactive work on the procurement of Enterprise model (DV4) and refreshing the DV2 models, this is deemed to be a neutral risk to the plan. Further detailed information will be available in August when the DV4 bids have been received and analysed which reduce this uncertainty further in advance of the Final Business Plan.

# 5 Risks across the Key Investment Areas

We have undertaken a qualitative review of the main areas of investment:

- Managing Quantity of Flows
- Water Environment
- Water Quality
- Water Continuity

The following sections provide a visual summary of the risks for these main investment areas by considering the commitment made (outcomes to be achieved in SR27), the comparison with the SR21 position. Each chart illustrates the range of threats and opportunities against the delivery of the draft plan outcomes, and a brief commentary is also included for each chart.

## 5.1 Managing Quantity of Flows

Risks concerning quantity of flows have been analysed across three areas:

(i) Internal Sewer Flooding;

(ii) External Sewer Flooding; and,

(iii) Internal Flooding Other Causes (IFOC) and External Flooding Other Causes (EFOC).

These have been analysed and scaled based on their potential level of threat or opportunity in Figure 2 below.

Overall, the balance of risk is slightly towards the threat side where there is a higher level of threats to opportunities.

| Risk area | Commitment | Compared to SR21 |
|---|---|---|
| **Internal Sewer Flooding (ISF)** | Maintain the ISF At Risk Register (ARR) SR21 exit position throughout SR27 | Average additions to the ARR have been 60 per year. Not been able to maintain the offset due to increasing cost per intervention and reduced sewer flooding investment funding. |
| **External Sewer Flooding (ESF)** | Deliver projects to resolve 135 externally flooded areas Accept increase in ARR in SR27, maintain in long term | Number of properties on the external ARR increase by on average 140-160 properties per year. |
| **Internal Flooding Other Causes (IFOC) and External Flooding Other Causes (EFOC)** | Aim is to drive down the number of recorded incidents across SR27 | The number of IFOC and EFOC incidents recorded across SR21 remained consistent |

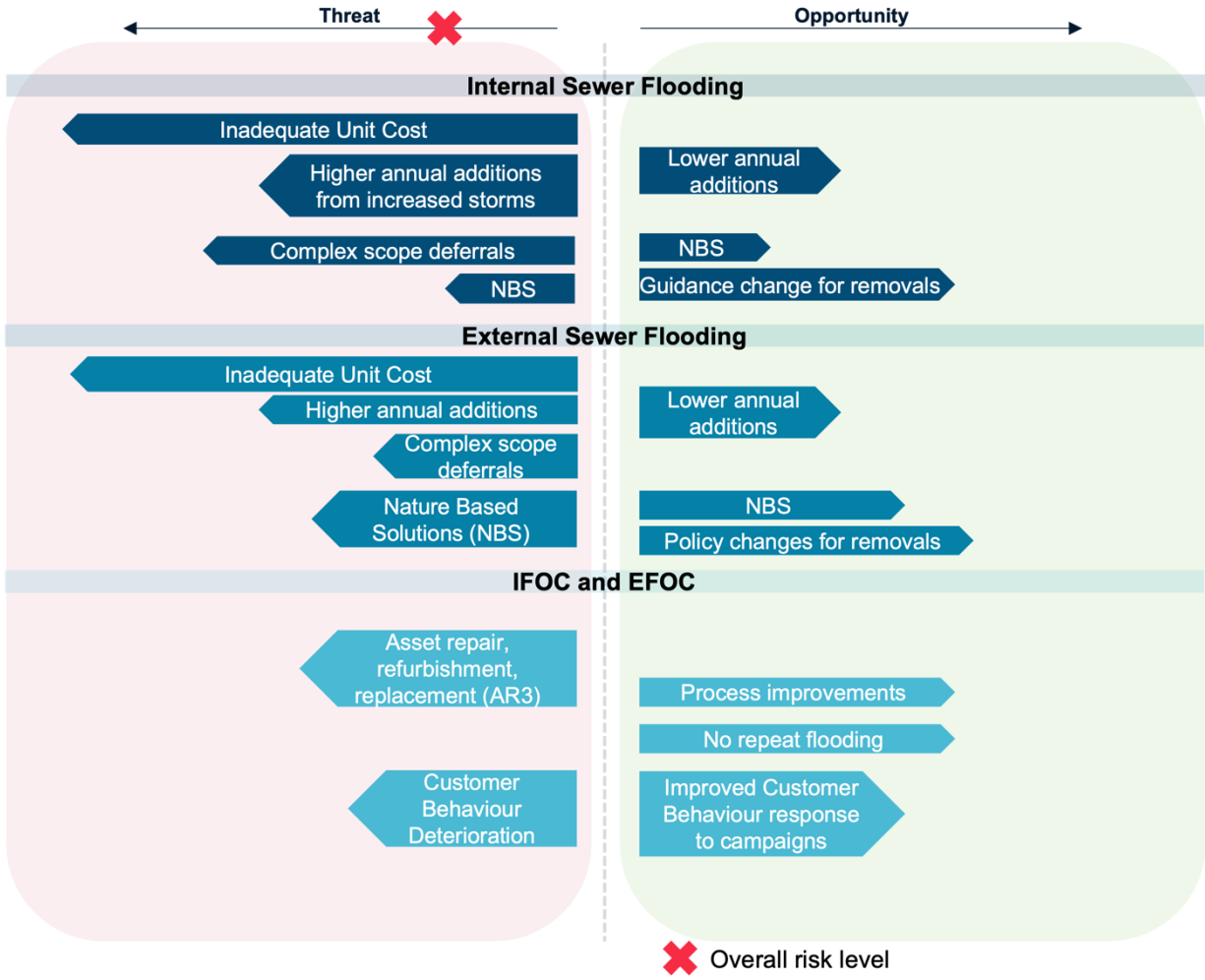


*Figure 2: Managing quantity of flows balance of risk*

### 5.1.1 Internal Sewer Flooding (ISF)

For Internal Sewer Flooding, the SR27 Business Plan commits to maintain the ISF At Risk Register (ARR) SR21 exit position throughout SR27. During SR21, average additions to the ARR have been around 60 per year (with the lowest at 15, highest 95). Our base planning assumption for SR27 is there will be 51 additions per annum.

**Unit cost:** One of the key threats to meeting this commitment is the unit cost of removing a property from the register. As the lower-cost, less complex solution properties are removed, the more complex properties to remove are left, with more complex issues, which increases the cost of removal. This is due to the complex solutions sometimes being deferred due to financial constraints or the need for further evaluation.

**Complex property removals:** There is also a risk that where the scope has been too complex to remove properties off the ARR across SR21, these will be deferred to SR27, increasing the starting position of the number of hard to remove properties from the register for SR27.

**Climate change:** There is also a threat that climate change will increase the number of heavy rainfall events, causing more properties to be added to the ISF ARR each year. However, this could be an opportunity if the effects of climate change have less of an impact and there are actually fewer heavy rainfall events. This would lead to less properties being added to the ISF ARR. We have assessed that this opportunity is less likely than the threat of more heavy rainfall events. Over the last few decades, the UK has become wetter and since 1862, six of the ten wettest years across the UK have occurred since 1998[6]. Scotland has experienced the greatest increase in rainfall, and it is expected that this increasing trend will continue.

**Nature Based Solutions (NBS):** NBS are both a threat and an opportunity. Given that best practice approaches in NBS are still developing and maturing, unit costs for this approach currently remain high. NBS could however help to reduce the impact of ISF through increasing the number of solution options available to reduce the amount of stormwater and ease the pressure on our drainage systems.

**Guidance changes**: We believe that there could be possible changes to our Flooding Database and At Risk Register (ARR) Guidance which could mean that the criteria of what leads to a property being on the ARR changes. There is also work being undertaken to prove that mitigations that do not currently qualify a property to be removed from the ARR, can be removed in the future. This could potentially lead to a lower number of properties on the register.

### 5.1.2 External Sewer Flooding (ESF)

For External Sewer Flooding, the SR27 Business Plan commits to deliver projects to resolve 104 properties at risk of ESF areas. Across SR27, a slight increase in the ARR is expected (approximately 128 per annum), with a view to maintaining the register in the long term. Across SR21, the number of properties on the external ARR increased by on average 140-160 properties per year.

[6] https://www.metoffice.gov.uk/research/climate/understanding-climate/uk-and-global-extreme-events-heavy-rainfall-and-floods

The threats and opportunities to meet the ESF commitments are the same as the ISF risks outline above.

### *5.1.3 Internal and External Flooding Other Causes (IFOC and EFOC)*

The final outcome area for waste water flows is IFOC and EFOC. Across SR27 the aim is to drive down the number of recorded incidents. In SR21, the number of IFOC and EFOC incidents recorded remained consistent.

**Asset Repair, Refurbishment and Replacement (AR3):** The main threat to meeting the IFOC and EFOC outcome is reduced AR3 investment. With a greater than 30% reduction in AR3 investment means that assets might not be maintained to such a good condition which may increase the risk (likelihood) of incidents. Further explanation on this position can be found in the Investment Planning Technical Appendix.

**Customer Behaviour:** A key threat and opportunity to the number of IFOC and EFOC incidents is customer behaviour. Through targeted campaigns, behaviour change can encourage individuals, businesses and society to adopt practices that minimise their impact on the likelihood of these events happening. If awareness declines however and customers begin flushing inappropriate items or disposing of substances down sinks that lead to blockages, the risk of IFOC and EFOC incidents will rise. Effective educational initiatives can therefore help customers to make more informed choices, reducing the likelihood of blockages and decreasing the number of incidents. Across SR27, we are planning to run more customer engagement activities to help mitigate this threat further.

**No repeat flooding:** Another key opportunity to help reduce the number of IFOC and EFOC events is if there is no repeat flooding. By reducing recurring flood incidents, pressure on infrastructure decreases, reducing the likelihood of blockages and lowering the threat of other contributing factors leading to internal or external flooding events.

## 5.2 Water Environment

There are a number of risks concerning the three outcomes for water environment and net zero, namely Scottish Environment Protection Agency (SEPA) licence compliance, Environmental Pollution Incidents (EPIs), and Unsatisfactory Intermittent Discharge (UIDs).

These have been analysed and scaled based on their potential level of threat or opportunity in Figure 3 below. Overall, the balance of risk across Water Environment is **neutral**, as there is a similar level of threats to opportunities.

| Risk area | Commitment | Compared to SR21 |
|---|---|---|
| **SEPA compliance** | 96.37% compliance with SEPA discharge permits | 96.3% compliance on average over last 3 years of SR21. |
| **Environmental Pollution Incidents** | Total number of pollution incidents from a sewerage asset not greater than 8 per year. | 8 pollution incidents on average over last 3 years of SR21. |
| **Unsatisfactory Intermittent Discharges (UIDs)** | Number of UIDs to be not greater than 778 Over SR27, the number of UIDs needs to reduce by 113 to clear all of the high priority UIDs by SR27 exit. | In SR21 exit in March 27 there will be 113 remaining high priority needs including 15 water quality, 43 high priority aesthetic and 55 Clyde. |

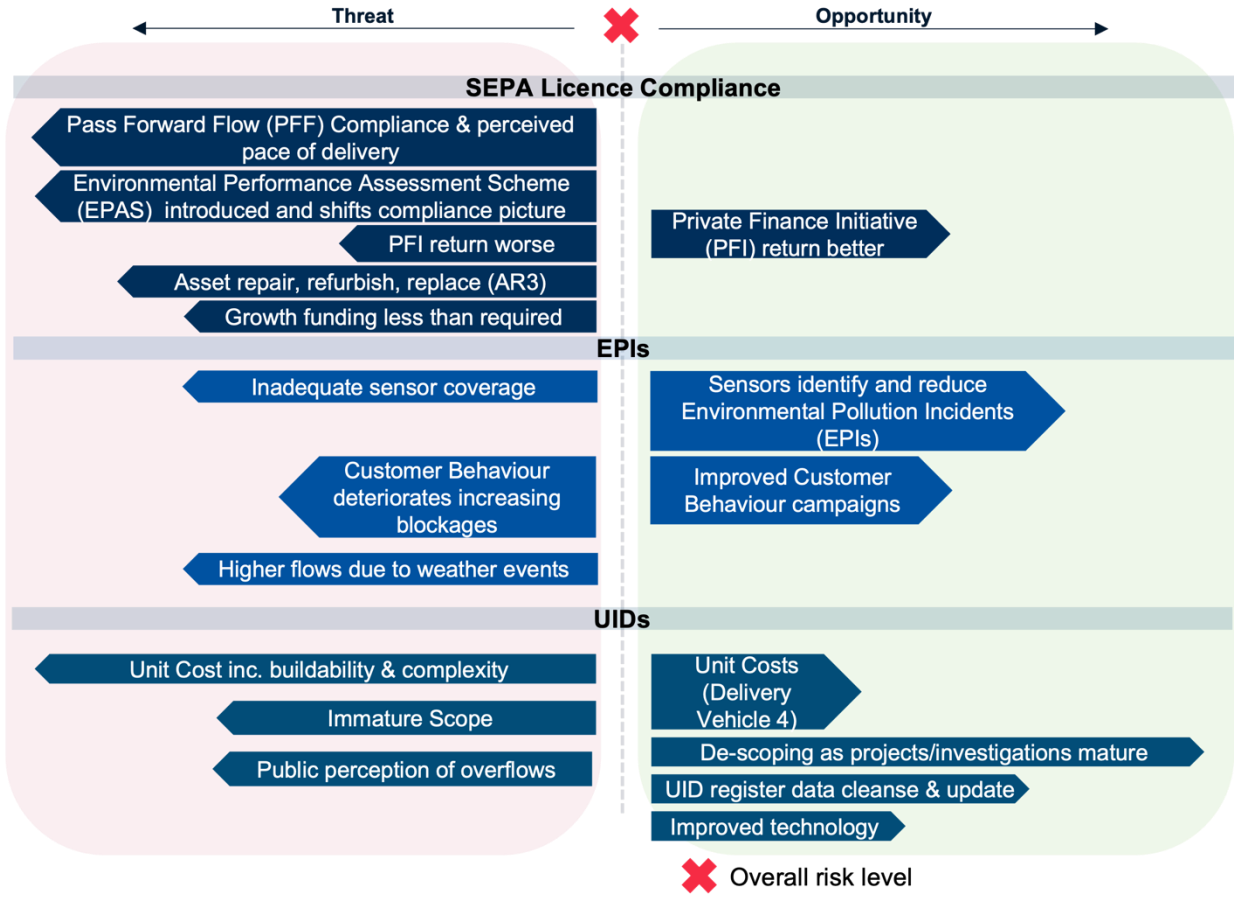


*Figure 3: Water environment*

### 5.2.1 SEPA Licence Compliance

Across SR27, Scottish Water (SW) have committed to 96.37% compliance with SEPA discharge permits. Compared to SR21, 96.3% compliance has been achieved on average over the previous three years of SR21.

**Pass Forward Flow (PFF) Compliance:** Changes to PFF compliance and the perceived pace of delivery of addressing these changes to maintain compliance is a threat to meeting this commitment. Any changes could impact the % compliance and could require a significant investment and resource to reach satisfactory compliance levels again. This is because audit and monitoring requirements may change, leading to changes to the level of compliance based on new regulation.

**Environmental Performance Assessment Scheme (EPAS):** The introduction of the new EPAS by SEPA aims to provide a more real time view of compliance. This new, more dynamic view of compliance could be different to the current compliance reported due to the more immediate view of compliance. This provides a threat to meeting SEPA compliance targets.

**Private Finance Initiative (PFI) transfer:** PFI transfer to Scottish Water is both a threat and an opportunity to meeting SEPA licence compliance. There is potential that the assets returned are in worse condition than anticipated, potentially worsening the compliance levels with SEPA discharge permits. On the other hand, the asset could be in better condition than planned for, enhancing and improving the compliance with SEPA discharge permits. Decisions around the replacement of Daldowie sludge processing plant are also currently under development.

**AR3:** The 30% reduction in AR3 (compared to forecast demand) is a substantial risk to SEPA licence compliance. Less asset upgrades and maintenance may cause an increased rate of deterioration in assets which in turn may increase the likelihood of SEPA non-compliance incidents.

**Growth funding:** Growth funding being less than forecasted is also a threat to SEPA licence compliance. This could result in less upgrades to assets, creating greater pressure on existing assets which may cause failures of such assets and therefore increase the threat of more environmental violations.

### 5.2.2 Environmental Pollution Incidents (EPIs)

The outcome commitment for EPIs in SR27 is to reduce the number of serious EPIs (Category 1 and 2) to 5 or less. There have been eight EPI pollution incidents on over the last three years of SR21.

**Sensor coverage:** A key threat to meeting this commitment is inadequate sensor coverage (location or volume of sensors). This would mean that sewers are inaccurately monitored, meaning if sewers start experiencing high levels of environmental pollutants, mitigations may not be able to be put in place in time to prevent an incident. There is however also the opportunity that the sensors are placed optimally and are able to accurately identify dangerous levels of sewage. This would mean that they can be effectively monitored and in the case of the pollutant levels becoming high, mitigations can be put in place in time to attempt to stop an incident from occurring which may reduce incidents below outcome levels forecast.

**Customer behaviour:** Another key threat is customer behaviour deterioration increasing blockages and therefore increasing the number of EPIs. Flushing inappropriate items or improperly disposing of substances down the sink can lead to blockages, which can then cause sewage to back up, potentially resulting in a pollution incident. If customers are aware of the effects of what they dispose of into the waste water network, this can help reduce blockages and therefore pollution incidents.

**Climate change:** Increased volume and severity of weather events as a result of climate change causing higher flows of waste water is a potential threat to meeting the EPI commitment. If there is heavy rainfall, this can increase the pressure on waste water assets, increasing the likelihood of a pollution incident.

### *5.2.3 Unacceptable Intermittent Discharges (UIDs)*

The commitment for UIDs across SR27 is for no more than 748 UIDs per year to occur. Over the previous three years of SR21, there were 859 UID outputs on average per year.

**Unit cost:** One of the key threats to meeting this commitment is the unit cost, including the buildability and complexity of UID solutions. Unit costs for UID solutions are high and are likely to increase throughout SR27 due to rising complexity of UIDs, making it harder to combat enough UIDs to meet the commitment. There is a small opportunity however than the unit cost could be decreased as a result of our DV4 – our incoming, new 'advanced partnering' Delivery Vehicle which will deliver asset investments including high-value and complex construction and engineering projects. Should DV4 suppliers have greater experience or innovation with UID solutions, this may enable a lower unit cost.

**Scope:** Another threat is the immaturity of the scope for preventing UIDs, meaning that additional resources and time will be required to fully assess effective prevention methods and remove them from the register. This increases the complexity of mitigation which could delay removals of UIDs from the register. There is also an opportunity however for de-scoping as investigations and project specifications mature, as UID causes become better understood and it is known how to deal with them.

**Public perception:** Public perception of UIDs is a key threat. It could increase the amount of scrutiny and reporting around UIDs, potentially increasing the number of UIDs identified and therefore adding to the UID register.

**Register updates:** Another key opportunity is cleansing and updating of the register through analysis of more data. This could lead to a number of UIDs being removed from the register due to better information.

**Improved technology:** Improved technology could also help meet the UID commitment. Technology could help improve the monitoring of UIDs and therefore help with understanding how to mitigate the number of UIDs.

## 5.3 Water Continuity

Risks for Water Continuity have been analysed across five outcome commitments being made for SR27. These include leakage, per capita consumption (PCC), interruptions, drought and peak demand. These have been analysed and scaled based on their potential level of threat or opportunity in Figure 4 below. Overall, the balance of risk for Water Quality is slightly **low threat** as the balance of threats to opportunities is slightly skewed towards threats.

| Risk area | Commitment | Compared to SR21 |
|---|---|---|
| **Total Zonal Leakage** | Reduce leakage by 10% in SR27 | Average leakage at 452 million litres per day (ml/d) over last 3 years of SR21 |
| **Per Capita Consumption** | Achieve 174 litres per person per day (l/p/d) three-year average per capita consumption | Average PCC of 181l/p/d over last 3 years of SR21 |
| **Interruptions** | Maintaining number of interruptions greater than 6 hours our customers experience | Average unplanned interruptions of 6750 over last 3 years of SR21 |
| **Drought** | Customers supplied by systems not capable of meeting demand during a worst historic drought to reach 2,382,000 by end of SR27 | Average number of customers in a deficit zone was 2,860,000 over the last 3 years of SR21 |
| **Peak Demand** | Customers supplied by systems not capable of meeting peak demand to reach 346,000 by end of SR27 | Average number of customers in a deficit zone was 1,002,000 over the last 3 years of SR21 |

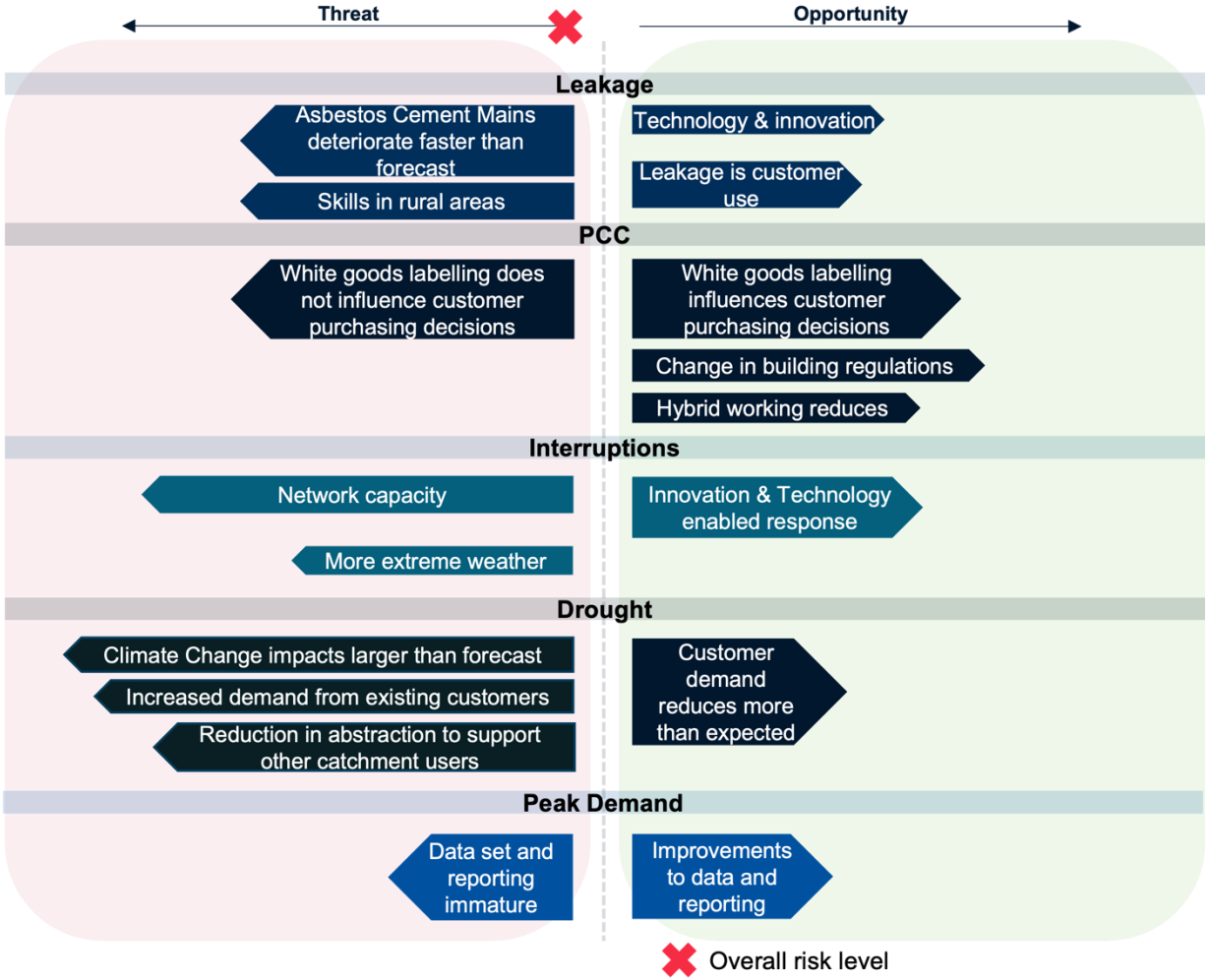


*Figure 4: Water continuity balance of risk*

### 5.3.1 Total Zonal Leakage

For total zonal leakage, the SR27 business plan commits to reducing leakage by 10% in SR27. Over the previous three years of SR21, average leakage has been at 452ml/d. This will need to reduce to 400ml/d to meet the target by the end of SR27.

**Asbestos Cement (AC) mains:** A key threat to the level of zonal leakage is the rate of deterioration of AC mains. If these deteriorate faster than forecast, leakage levels may exceed projections, creating an unanticipated issue that was not accounted for in the business plan and lacks allocated investment for mitigation. This could be a threat to meeting the 10% reduction in leakage by the end of SR27.

**Skills shortage:** There is also a threat due to a skills shortage in some rural areas. This limits the workforce available to provide maintenance and repairs needed to reduce leakage, and workers that are able to provide maintenance and repairs have to travel further, increasing the cost of maintenance and repair.

**Technology and innovation:** Technology and innovation is an opportunity which could help reduce the level of total zonal leakage through enabling more efficient leak detection and repair. Advanced solutions can actively identify and pinpoint leaks, streamlining the process and conserving time and resource that would otherwise be spent searching for and addressing the issue, or even identifying leaks that might have otherwise gone undetected.

**Leakage is customer use:** There is also an opportunity if some reported leakage is actually customer use. Through accurately identifying instances where what was initially classified as leakage is actually legitimate consumption, we can adjust calculations accordingly, leading to a reduction in the reported level of total zonal leakage.

### 5.3.2 Per Capita Consumption (PCC)

Across SR27, the business plan commits to achieving 174 litres per person per day (l/p/d) three year average per capita consumption. Over the previous 3 years of SR21, average PCC has been 181 l/p/d.

**White goods labelling:** There is a threat that white goods labelling could take up to 10 years to influence customer purchasing decisions to choose more water efficient goods, leading to continued selection of high-PCC appliances. As a result, during SR27, PCC levels could remain similar to SR21, with little progress achieved. Alternatively, if white goods labelling proves effective sooner than anticipated, this could increase consumer awareness and encourage more water-efficient purchasing choices sooner, accelerating improvements in PCC reduction.

**Hybrid working:** There is an opportunity that hybrid working reduces as more companies make it mandatory to return to the office. Although this is not likely to go back to pre-covid levels, this could help improve PCC as customers would consume less water in the office.

**Building regulations:** Another opportunity is if there is a change in building regulations to ensure there are water saving measures in place. This would also help reduce PCC and meet the commitment of influencing domestic customer demand. The Scottish Government is aiming to publish revised building regulation standards in early 2026, and these will become mandatory in

2028[7]. This is expected to include components of the Passivhaus standard, including more energy efficient measure and this should help improve water efficiency too through reducing hot water consumption, low flow fixtures and efficient water heating solutions.

### 5.3.3 Interruptions

Across SR27, the aim is to maintain the number of unplanned interruptions greater than 6 hours our customers experience, which is forecast to be approximately 7000 properties.

**Network capacity:** A threat to maintaining this level of unplanned interruptions is network capacity. If demand increases to a level that is greater than the headroom in the network capacity, the water network may struggle to accommodate the increased pressure, leading to a higher likelihood of interruptions to supply.

**Extreme weather:** More extreme weather can also lead to a higher likelihood of interruptions to supply. Freezing conditions can cause pipes to burst, leading to supply outages whilst heatwaves can cause more evaporation and water consumption, straining water supply networks.

### 5.3.4 Drought

The SR27 business plan commits to addressing the supply-demand deficit and continue to improve drought management capability and develop Strategic Drought Plan. Customers supplied by systems not capable of meeting demand during a worst historic drought should reduce to 2,382,000 by the end of SR27. The average number of customers in a deficit zone was 2,860,000 over the previous three years of SR21.

**Climate change:** The main threat to increasing the number of customers in a deficit zone is climate change. Changing weather patterns could mean longer periods without rain, increasing the number of customers in deficit zones. This is expected to get worse over SR27.

**Decreased demand:** Another key threat to drought resilience is increased demand from existing customers. Increases in demand from existing customers without supply improvements will deplete water resources faster, reducing available reserves during dry periods. On the other hand, if customer demand reduces more than expected, drought resilience is likely to increase, as it will increase the headroom in the amount of water supply should a drought event occur.

**Reduced abstraction:** A reduction in abstraction to support other catchment users could increase the threat of more customers being in a drought. This would increase the constraints to supply and limit reserves for public water supply, increasing vulnerability during prolonged droughts.

**Peak Demand:** Peak demand is also a commitment for SR27. The commitment is to ensure water treatment production and network capacity in key locations at risk of supply interruptions during peak demands. Customers supplied by systems not capable of meeting peak demand is targeted to reach 364,000 by the end of SR27. The average number of customers in a deficit zone was 1,002,000 over the last 3 years of SR21.

[7] https://blogs.gov.scot/building-standards/2024/12/12/update-on-the-review-to-introduce-a-scottish-equivalent-to-the-passivhaus-standard/#:~:text=The%20Scottish%20Government%20is%20aiming,on%20the%20Working%20Group%20webpage.

**Data reporting:** The main threat to reducing the number of customers in a deficit zone is that the data and reporting is immature. This means that it is difficult to assess what is causing the deficit, where the deficits are, the customers that would be affected and how best to mitigate against it. However, there is also an opportunity to make improvements to the data set and reporting, increasing the ability to analyse the deficit zones and better plan for how to reduce the number of customers in deficit zones.

Overall, the balance of threat for Water Quality is very **low threat**.

## 5.4 Water Quality

Risks for Water Quality have been assessed against six commitments, namely taste and odour (T&O), discolouration contacts, lead, drinking water compliance, water quality risk and Drinking Water Quality Regulator (DWQR) incidents. These have been analysed and scaled based on their potential level of threat or opportunity in Figure 5 below.

Overall, for water continuity there is a **neutral** risk position as the balance of threats and opportunities is similar.

| Risk area | Commitment | Compared to SR21 |
|---|---|---|
| **Taste & Odour (T&O)** | Reach 0.53 T&O contacts by the end of SR27. | In 2024, over two-thirds of customer contacts relating to water quality were associated with discolouration with a further 16% associated with taste and odour |
| **Discolouration contacts** | Reach 2.08 discolouration contacts by the end of SR27. | In 2024, over two-thirds of customer contacts relating to water quality were associated with discolouration |
| **Lead** | Reach 27,550 lead pipes remaining in the network by the end of SR27. | In 24/25, the number of lead pipes remaining was 51,900, expected to be 45,550 by the end of SR21 |
| **Drinking Water Compliance** | Reach 99.950% compliance by the end of SR27 | In 2024, total compliance was 99.934%, expected to be 99.929% by the end of SR21 |
| **Water Quality (WQ)** | Drinking water quality risks across all systems above long-term tolerable threshold to reach 6,465 by end of SR27. | In 2024/25, the number of WQ hazards above long term tolerable level was 7,975 |
| **Drinking Water Quality Regulator (DWQR) incidents** | Number of DWQR incidents to meet 25 by the end of SR27. | Number of incidents reduced from 43 to remain around 30 per year |

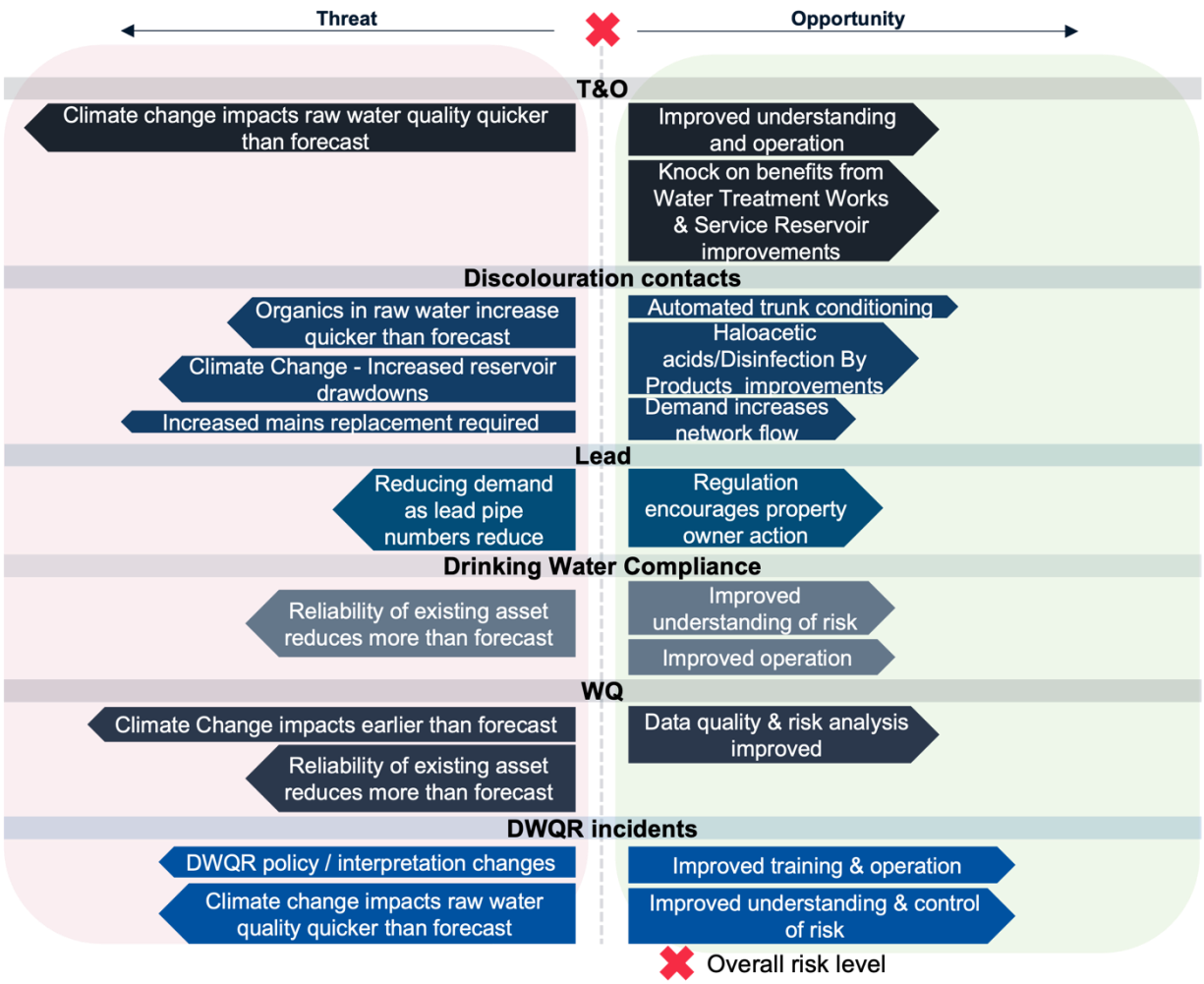


*Figure 5: Water quality balance of risk*

### 5.4.1 Taste & Odour (T&O)

For T&O, SR27 commits to enhancing disinfection processes at Water Treatment Works (WTW). By the end of SR27, the aim is to reach 0.53 T&O contacts. In 2024, over two-thirds of customer contacts relating to water quality were associated with discolouration with a further 16% associated with taste and odour, highlighting the need for improvements to WTWs.

**Climate change:** The main risk concerning the number of T&O contacts is climate change. Climate change is already increasing the number of taste and odour contacts and this is expected to increase across SR27. Climate change and warming temperatures are increasing the algae taste and odour risks across more sites, and more earthy/musty contacts are occurring and could increase by 50% by 2033.

**Water Treatment Works improvements:** There is opportunity to mitigate this through the work being undertaken at Water Treatment Works and service reservoirs. For example, improvements at Carron Valley over SR21 which should reduce the numbers of T&O contacts by 50%. There is also opportunity to reduce the number of contacts further through improvements to booster chlorination and DBP which could reduce T&O contacts by 10%.

**Understanding and operation:** Improving our understanding and operation of our water supply can help us improve our monitoring and detection, allowing for quicker intervention. It can also help with optimisation of the treatment process, minimising taste and odour issues and can also help with proactive maintenance and identifying any key causes of taste and odour issues.

### 5.4.2 Discolouration contacts

The commitment across SR27 is to continue to take a risk-based approach to cleaning and conditioning water supply pipes or replacing them where required. The aim is to reach 2.08 discolouration contacts by the end of SR7. In 2024, over two-thirds of customer contacts were relating to water quality were associated with discolouration.

**Increasing organics:** A key threat is increasing organics. As a result of climate change, the amount of organics is increasing, impacting the quality of raw water.

**Reservoir drawdown:** Another key threat is increased reservoir drawdown as a result of climate change. As there are further supply challenges with the increased likelihood of drought events, reservoir drawdown is likely to increase, increasing the amount of discolouration.

**Mains replacement:** An increase number of mains replacement required also is a key threat to increasing the number of discolouration contacts. Deterioration of mains can lead to discolouration due to corrosion of pipes releasing rust particles into the water or cracks or bursts in mains can allow the water to be contaminated and discoloured.

**Automation of trunk main conditioning:** There are a number of opportunities that can help mitigate against these threats. Automation of trunk conditioning will mean that water flows are increased, reducing the stress on the pipe walls and therefore causing less discolouration.

**Haloacetic acids (HAA) and disinfection byproducts (DBP)**: Improvements to the use of HAA and DBP can help reduce water discolouration as the use of them can sometimes cause

exacerbation of discolouration. Also improvements to organics removal can also help reduce discolouration.

**Demand:** Increases to demand can also help through increasing the amount of flow in the network. This can reduce the amount of discolouration through increasing flow and diluting any discolouration from corrosion or any deposit particles.

### *5.4.3 Lead*

The aim for SR27 is to remove ~3000 lead communication pipes per year. The aim is to have reached 27,550 lead pipes in the network by the end of SR27. In 2024/25, the number of lead pipes remaining was 51,900, expected to be 45,550 by the end of SR21.

**Customer contacts:** There is a threat that there will be more demand for lead pipe replacements by customers, potentially as a result of news coverage and greater awareness. This could increase the number of customer contacts regarding lead pipes and place greater pressure on the replacement team. There is an opportunity however, due to capacity in the replacement team, and therefore the potential to be replacing more lead pipes.

### *5.4.4 Water Quality Compliance*

The level of drinking water compliance is aimed to be maintained or improved where possible at SR21 position over SR27. By the end of SR27, the aim is to reach 99.950% compliance. In 2024, total compliance was 99.934%, expected to be 99.929% by the end of SR21.

**Asset reliability:** The main threat to drinking water compliance is reliability of existing assets reducing more than forecast. For example, aging water assets can increase the threat to drinking water compliance due to the higher potential for contamination, water loss and reduced water quality. This can then require higher treatment costs, increased maintenance and repair costs and breaches in compliance.

**Improved understanding and operation:** There are opportunities however, to reduce this threat through improving the understanding of this threat and which assets might pose a higher threat to compliance. Also, through improved operation, allowing for better monitoring of drinking water and better mitigation if an issue arises.

**Water Quality:** Water quality levels are expected to be maintained from the SR21 level or improved across SR27. The aim is for drinking water quality risks across all systems above long-term tolerable thresholds to reduce to 6,465 by the end of SR27. In 2024/25, the number of WQ hazards above long term tolerable level was 7,975.

**Climate change:** The greatest threat to water quality is climate change for a number of reasons. Increased flooding from more frequent and intense rainfall can lead to more runoff, carrying more pollutants into the water. Increased water scarcity and water temperatures in some areas can reduce the water flow meaning more algal blooms, reducing water quality.

**Reliability of assets:** The main threat to drinking water compliance is reliability of existing assets reducing more than forecast. For example, aging water assets can increase the threat to water quality due to the higher potential for contamination, water loss and reduced water quality. This can then require higher treatment costs, increased maintenance and repair costs.

**Data improvements:** However, data improvements could help reduce water quality threats. Accurate water quality data can help create early warning systems for contamination events, which can allow mitigations to be put in place to prevent contamination reaching customers.

### *5.4.5 DWQR incidents*

DWQR incidents are also planned to be maintained or improved where possible across SR27 based on the SR21 position. The aim is for the number of incidents to reduce to 25 by the end of SR27. The number of incidents reduced from 43 to remain around 30 per year across SR21, so the aim will be to maintain or reduce the incidents from 30.

**DWQR policy change:** A key threat to the number of incidents over SR27 is that the DWQR policy could change, changing what is determined as an incident and potentially increasing the number of incidents.

**Climate change:** Another key threat is that climate change impacts raw water quality quicker than forecast. An increase in temperatures due to climate change is increasing the levels of naturally occurring organic matter in source waters, which is resulting in higher levels of disinfection by-products at customer taps.

**Improved understanding:** These threats can be mitigated through an improved understanding and therefore a better ability to control and mitigate these threats.

**Training and operations:** Improved training and operations can also help reduce the number of incidents through enhancing the ability to prevent, detect and respond to any water quality issues.

# 6 Operating cost risks

All operating costs combined (operating costs, PFI, interest, reasonable cost contributions and tax) equate to £5.1bn[8] of the total funding of the Draft Business Plan (£13.4bn). PFI and interest costs are driven by macroeconomic assumptions which are risks deemed outwith management control and reasonable cost contributions and tax are smaller value.

The focus therefore is operating costs, and the key risks against the provision in our Business Plan are commodity cost spikes (particularly electricity), and if we are able to appropriately control our employment costs. A further low likelihood but high impact threat is if our pension contributions increase because the current surplus of assets over liabilities substantially declines.

We are seeking agreement with WICS that any increase in our pension contributions rate should lead to a change in our operating cost allowance.

Overall, we have assessed our Operating cost risk position as being **Neutral**.

[8] In 2023/24 price base after adjustment for efficiency

| Risk area | Descriptor |
|---|---|
| **Employment costs** | Assumed that the plan will be delivered by stable FTE base with no additional reward review and pay award at CPI+1%. However, a upward change in FTE or revised reward framework would affect our cost base |
| **Electricity costs** | Assumed that costs increase in line with electricity industry forecasts. However volatility in electricity market prices presents a threat and opportunity |
| **Cloud arrangement costs** | SR27 Cloud arrangement costs have been assumed as levels similar to 2026/27. However, these could increase or decrease |
| **Pension contributions** | Our plan assumes that pension contributions remain at current levels. However, there is a risk that our contributions in SR27 need to increase |

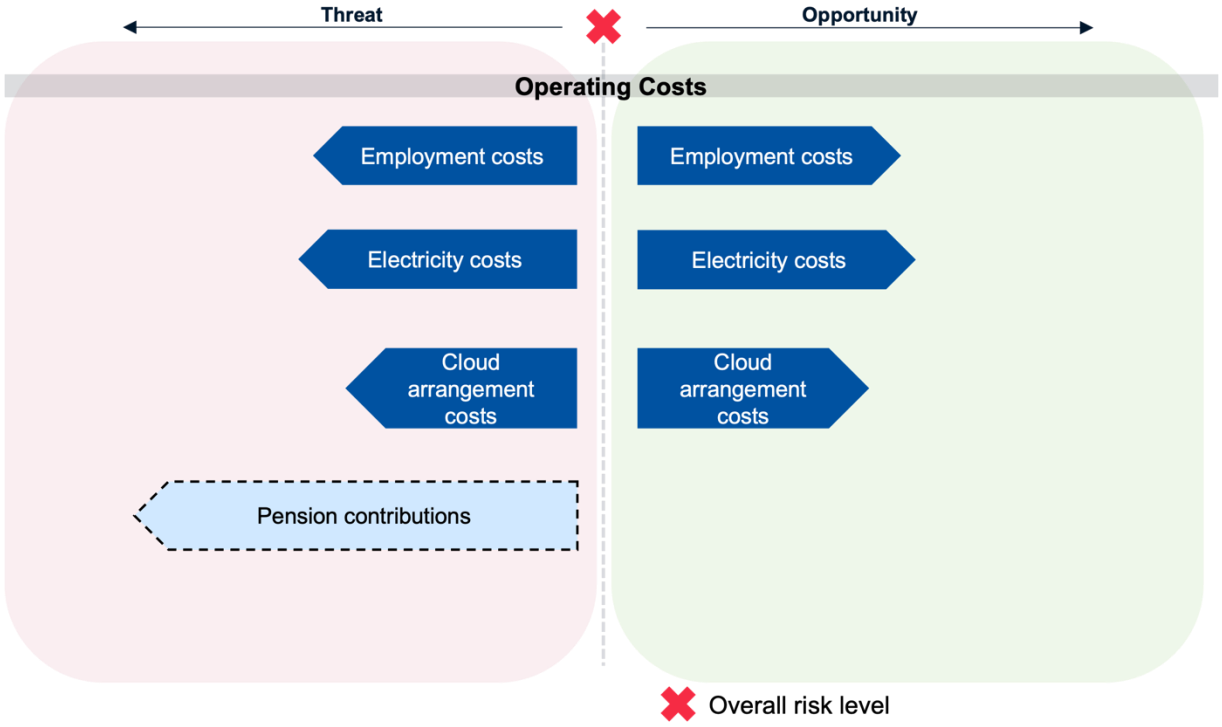


*Figure 6: Operating cost risks*

# 7 Enhancing understanding and control of Risk - next steps

Between Draft and Final Business Plan submissions we will further re-validate threats and opportunities as described above, and where possible we will quantify these based on all available information.

To achieve this we will:

- Work collaboratively with WICS, DWQR and SEPA to refine our risk assessment, and validate our proposed priority focus areas. This will help us achieve compliance and prioritise the correct risks and opportunities to achieve outcomes required by stakeholders and customers.
- Work on quantifying PFI risk where possible through undertaking site surveys to assess the asset condition, checking any contract liabilities to understand if the companies that have invested have met all of their obligations. This will provide us with a better idea of the funding required to ensure the assets are in a suitable condition for continued, safe use.
- Undertake additional research to provide market backed pricing for DV 4 and supply chain costs. This will help provide more robust estimates for costs across the business plan.
- Consider risks outwith management control as part of our analysis, and the effectiveness of existing regulatory recourse mechanisms.
- Further quantify the risks in more detail, potentially using Monte Carlo analysis or further modelling of the risks to provide a better estimate for the KIA risks and opportunities.

# 8 Assurance

## 8.1 Context

The following section explains our approach to assurance for the Strategic Review of Charges 2027 (SR27) Draft and Final Business Plan including development of the Long-term Strategy.

We want the information we publish to be trusted by all sector stakeholders, so it is important that we evidence the reliability of our approach to business planning. To do this we have a detailed assurance approach, that builds on our well-established annual return regulatory assurance processes.

We have worked with WICS to co-design the assurance requirements for our business plan submission, aligning with the requirements of WICS' SR27 Final Methodology. The Scottish Water Board is ultimately accountable for the assurance of the business plan, and responsibility for delivery is delegated to identified individuals within the company.

In line with our continuous improvement approach, assurance for SR27 builds upon the SR21 approach, previously presented in the SR21 Strategic Plan: Quality and Assurance Plan.

## 8.2 Our Approach to SR27 assurance

Within Scottish Water we have a well-established risk management policy and system which sets out Scottish Water's commitment to Risk Management. It seeks to define and promote an integrated, holistic approach to managing risk within our organisation, which ensures that risks are appropriately identified, assessed and managed in line with our Risk Appetite.

Using this as our starting point, we developed a bespoke risk management approach for identifying and managing Business Plan reporting risk aligned to Ministerial Objectives and the WICS' reporting requirements. We mapped these to a set of key themes and tests (see Section 8.6.1).

We developed an assurance map that targets proportionate assurance based on the reporting risk assessment, deploying three lines of assurance to check compliance with business plan requirements and management of reporting risk.

We evidence completion of our lines of assurance through self-assurance statements, assurance reports and governance papers. Our Regulatory Assurance Team monitors assurance findings and manages responses, reporting findings and evidence of compliance / reporting risk management to the Audit and Risk Committee (ARC) and the Board.

The WICS SR27 Final Methodology requires the Board to provide appropriate assurance of Scottish Water's SR27 Business Plan. Discussions have been completed with WICS regarding the content required for the Draft Business Plan Board Assurance Statement considering that the Plan will continue to develop ahead of submission of the Final Business Plan. The Draft Board Assurance Report is distinct from the more formal Board Assurance Statement that will be required for the Final Business Plan. The Board Assurance Report focuses on the processes that have been followed and assesses the Draft Business Plan's completeness as being appropriate

for this stage in the process, explicitly acknowledging that the plan will develop significantly between the submission of the Draft and Final Business Plans.

## 8.3 How the SR27 Assurance Approach fits into existing governance structures

The SR27 assurance approach links into existing Internal and External Governance groups, this section summarises each of these.

The development of the SR27 Draft and Final Business Plans is led by the Strategy and Regulation Directorate with input from across Scottish Water. There are five key workstreams which develop and inform the Business Plan and each of these has a director level sponsor. The Strategy and Regulation Directorate are responsible for coordinating and assuring the inputs from these workstreams into the plan and the submission of the plan and the Director of Strategy and regulation is the accountable director for the plan. This structure is shown below:

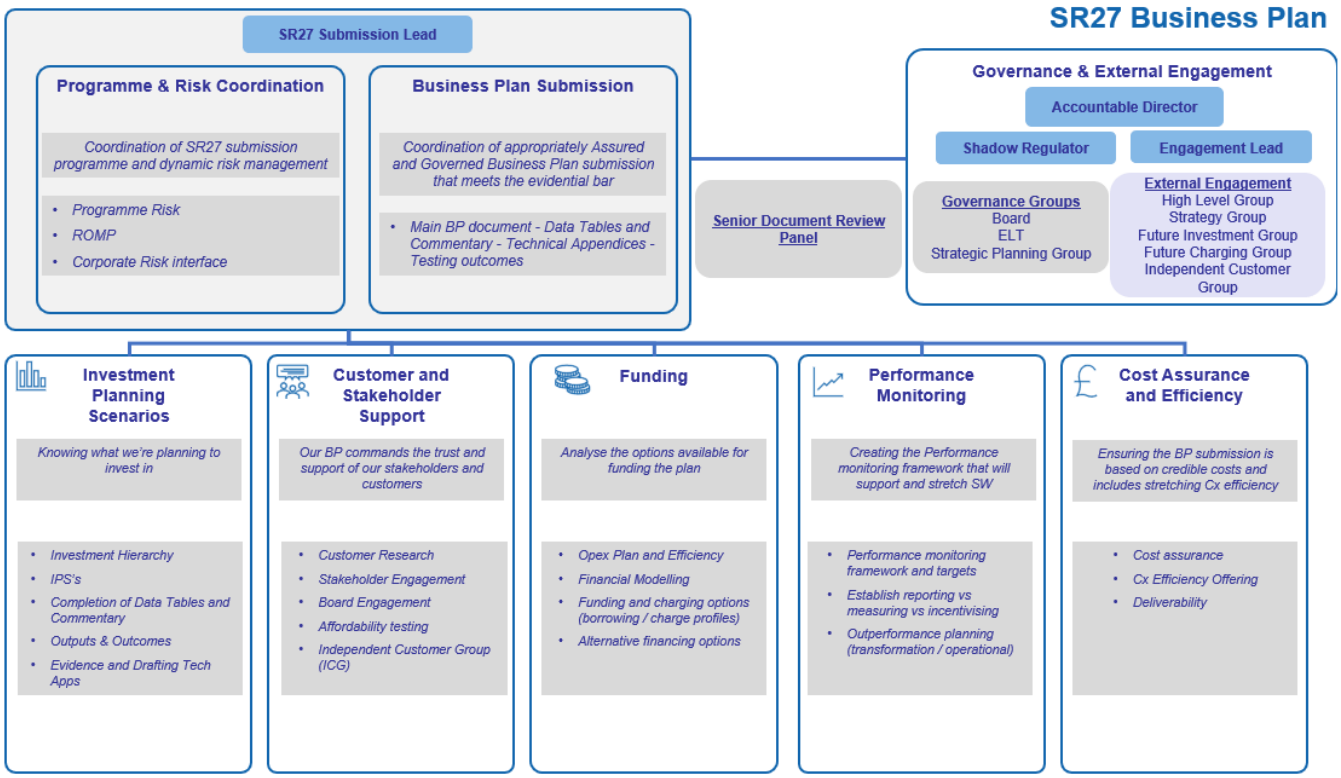


*Figure 7: SR27 Business Plan organisational structure*

### *8.3.1 Internal Governance*

There are three key internal governance groups which have responsibility or accountability for the governance and assurance of the SR27 Business Plans.

**Scottish Water Board**

The Board of Scottish Water (SW Board) is accountable for approving Long-Term Strategy and SR27 submissions and publications. It is also required to sign a Board Assurance Report for the Draft Business Plan and a Board Assurance Statement for the Final Business Plan.

**Executive Leadership Team (ELT)**

ELT has provided delegated authority to the Strategic Planning Group (SPG) to make project related decisions (which includes but is not limited to such as assurance approach, economic analysis and customer and community research). ELT retain responsibility for approval of key decisions in strategy and SR27 such as setting service outcomes and pricing and submissions to SW Board.

**Strategic Planning Group (SPG)**

The purpose of the SPG is to oversee the effective development of the Long-Term Strategy and SR27 submissions to achieve the following objectives:

1. Publish Long-Term Strategy ahead of SRC27 Final Submission

2. Prepare the SR27 Draft and Final Business Plan Submission documents in accordance with WICS Methodology and milestone dates, and to meet Ministerial Objectives for approval by the SW Board.

3. Ensure SR27 is demonstrably informed by and aligned to the Long-Term Strategy and Scottish Government Climate Change Adaptation (CCA) Policy Development

4. Ensure all internal and external stakeholders have confidence in our Long-Term Strategy and SR27 submissions

5. Ensure assurance, quality and governance expectations are met

6. Ensure satisfactory SR27 funding is secured

### *8.3.2 External Governance*

There are several different external governance groups which all have a role across the current and future investment periods which Scottish Water use to engage with its external stakeholders as shown in the figure below.

The Water Industry Investment Group predominately focuses on investment within the current SR21 investment period and the completion programme from SR15. As some investment will cross into SR27 there is a link between this and the main group responsible for SR27 development the Future Investment Group. The Future Investment Group, which has a focus on setting the Ministerial Objectives for the SR27 period, is the group at which key SR27 Business Plan development information is shared with Key Stakeholders.

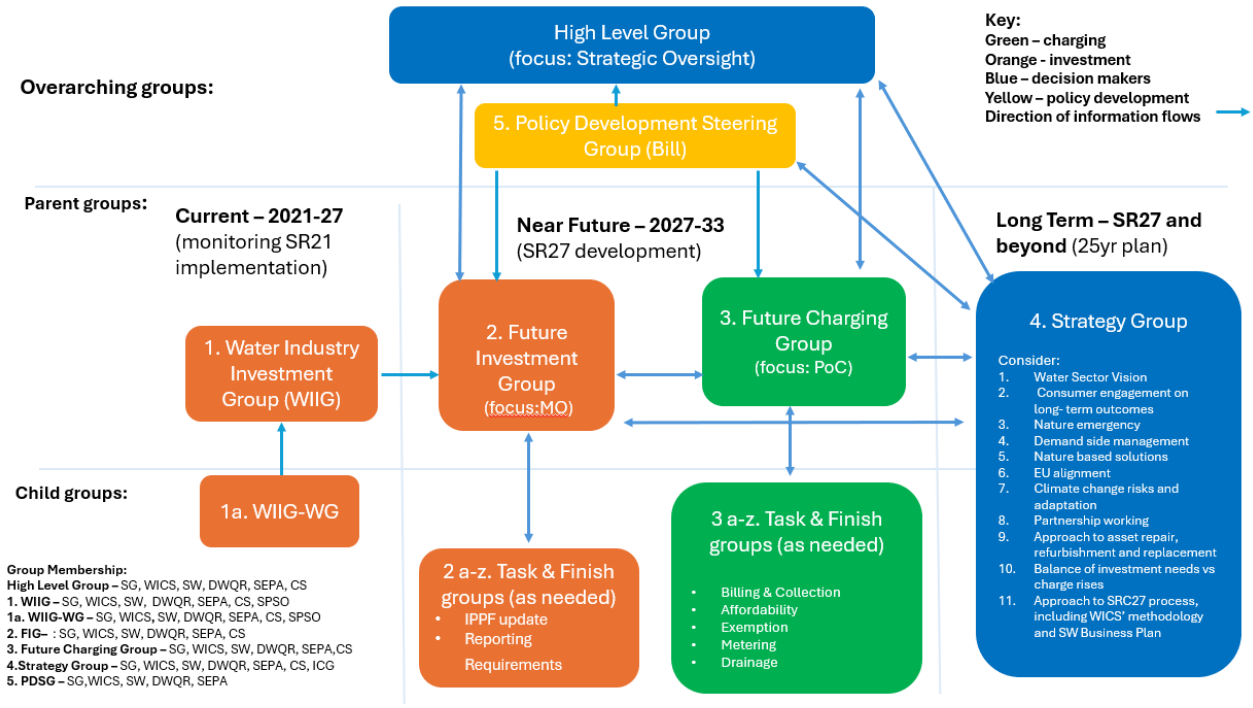


*Figure 8: External governance groups*

## 8.4 Key elements of the SR27 Assurance Approach

Our approach to SR27 assurance has been built around Three Lines assurance and a risk assessment of the plan to target the appropriate assurance in the right areas.

### *8.4.1 Three lines of assurance approach*

Assurance is the process by which we ensure the Business Plan is well evidenced, meets our obligations, follows the WICS' methodology and is trustworthy. We use assurance to identify potential errors (e.g. in data and approach), make improvements and monitor how we develop our plan.

Assurance differs from audit in that audit looks backwards from the end of the process to assess whether something is right or wrong, whereas assurance aims to assess what is done during the process, so that any required corrections and improvements can be made as the plan is developed.

Scottish Water uses a 'three lines of assurance model which has layers of assurance, with each one responsible for building on the work of the previous line (see Figure 9). For the SR27 Business Plan each stage has been split into two parts to clearly define areas of responsibility.

The first line of assurance is broken into two parts (1a &1b) to ensure proper management oversight of the data production process.

We break down the second and third lines of assurance into two (2a & 2b; 3a & 3b) to differentiate between the responsibilities of the different assurance providers.

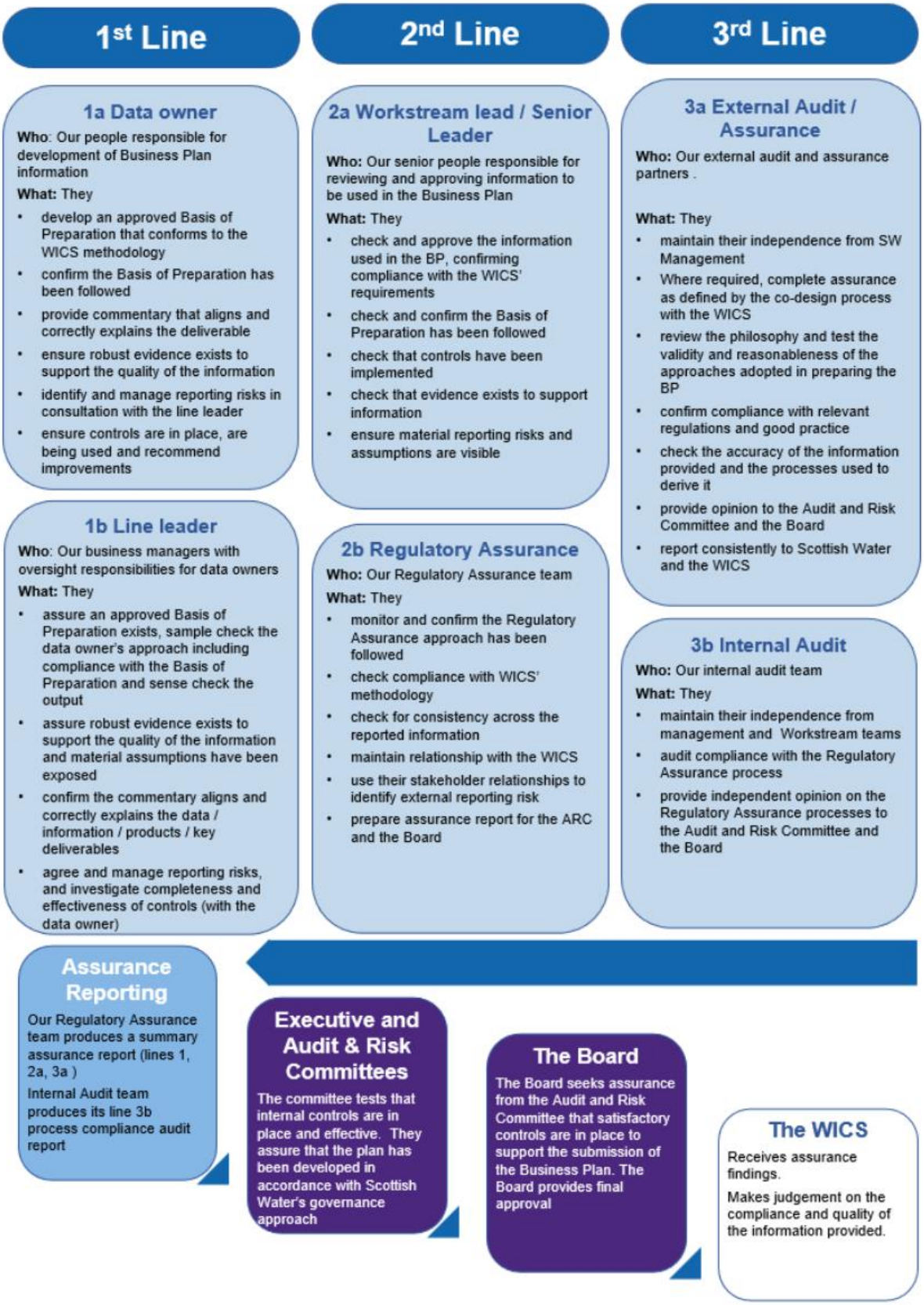


*Figure 9: Three Lines of assurance approach (for Draft and Final Business Plan)*

### 8.4.2 Risk assessment

We developed an initial matrix based on our existing Risk approach reviewing the initial workstream maturity (Step 1a); which was revised once workstreams and work packages were mature enough to make an assessment on risk markers such as complexity (Step 1b)]

**Step 1a Initial risk assessment to target assurance**

An initial risk assessment was undertaken to review all the components of the plan considering where the greatest opportunity for material errors and shortfalls in the plan quality could occur. This reviews:

- The likelihood of a reporting error of a component due to the maturity of the workstream plans.
- The impact if an error should occur, particularly on customers' and stakeholders trust and confidence, and our reputation.

The following matrix was used very early in the process to assess individual workstreams' risks in terms of their initial plan development.

| Initial framework for assessing Business Plan risk - Matrix<br>*'Risk of workstream deliverables and key products failing to meet the reporting requirements'* | | Likelihood | | |
|---|---|---|---|---|
| | | The workstream plan has clearly articulated activities, owners and timescales that meet the DBP programme milestones; AND<br>The products/deliverables are specified and agreed, AND<br>The team is fully resourced, with experienced individuals and expert support, AND<br>Workstream risks are known and managed. | The workstream plan is in outline/high level with provisional timescales that have not been confirmed to deliver the DBP programme milestones; AND<br>The products/deliverables are generally understood but not specified, AND<br>The team is partially resourced with some experienced individuals and support is being procurred, AND<br>Workstream risks are known but not managed. | The workstream plan is under development, OR<br>The products/deliverables are being formulated, OR<br>The team is either not resourced or resourced with inexperienced individuals, or contracted support is not yet in place OR<br>Workstream risks have not been assessed. |
| | | L | M | H |
| Impact | £50m or greater at risk from inadequate business planning; OR<br>Significant stakeholder concern. | H | | | |
| | £5m - £50m at risk from inadequate business planning; OR<br>Moderate stakeholder concern. | M | | | |
| | Less than £5m at risk from poor business planning; OR<br>Minor stakeholder concern. | L | | | |

*Figure 10: Risk Assessment Framework*

A desktop risk assessment was undertaken by the Scottish Water SR27 Business Planning Team to undertake an initial assessment of each workstream against the eleven themes and tests. This assessment identifies the highest risk areas for assurance across all themes and tests were Performance Measures, Targets, Governance and Reporting and Investment Planning and Delivery. This initial assessment was undertaken in August 2024.

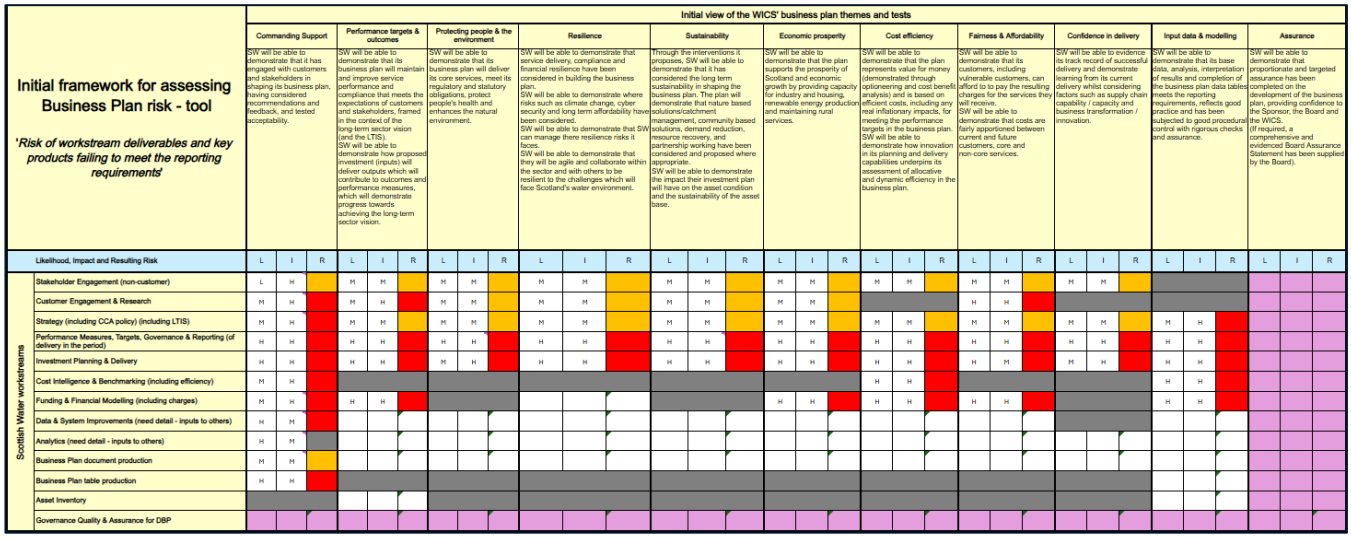


*Figure 11: Initial framework for assessing Business Plan Risk*

### Step 1b Second risk assessment to target assurance

In February 2025 the Basis of Preparation Documents, which set out how each element of the plan was to be developed, were used to undertake a second risk assessment. This second assessment identified where Scottish Waters planning could fail to deliver a plan that meets customer and stakeholder needs, could be non-compliant with the WICS reporting requirements and as a result, facilitate the prioritisation of the proportionate level of assurance activity. This reviewed:

- the likelihood of a reporting error due to the source of the base data or complexity of the processing/ analysis, and
- the impact if an error should occur, particularly on customers' and stakeholders trust and confidence, and our reputation.

This risk assessment was undertaken using the information productions risks under the five risk sources which are identified in the table below for each of the workstream packages:

| Risk source | What to consider when looking for risk |
|---|---|
| **Data** | Integrity – are there known inconsistencies and weaknesses in the source data used for the analysis.<br><br>Capture – is the source data captured manually or automatically and is there scope for error to be introduced through the collection, transfer and collation methods.<br><br>Validity – is the source data considered to be representative of the company and the WICS reporting requirement and is it sufficiently accurate.<br><br>Volume – how many and how large are the data sources required to produce the information. |

| Risk source | What to consider when looking for risk |
|---|---|
| | Verification – are there sufficient controls and assurance processes in place for the collection and storage of the source data. |
| **Analysis & processing** | Integrity – are there known shortfalls or inadequacies in the data storage, transfer, collation, processing and analysis.<br><br>Basis of preparation – is the documentation sufficiently detailed to ensure consistent and repeatable production of reliable information.<br><br>Complexity – how complex/complicated is the combination of data sources, and how complex/complicated are the necessary analytics needed to produce the information.<br><br>Assumptions – how many assumptions or estimation exercises are required for the production of the information and are they reasonable.<br><br>Checking – is the analysis subject to procedural controls and effective checks.<br><br>Resourcing – are there enough resources available to produce the information and are they sufficiently familiar with the base data, reporting requirements and analytical approaches to produce it reliably. Is there a potential single point of failure. |
| **Assurance & checking** | Integrity – have there been shortfalls in the checking processes for similar information used in annual reporting or ad-hoc information provision.<br><br>Suppliers – where 3rd parties are supplying base data or processed data are there requirements for quality control and is there evidence it has been completed to the satisfaction of Scottish Water.<br><br>Frequency – are the data, analysis and information subject to regular and sufficient quality control and assurance.<br><br>Resourcing – do the individuals completing checks and assurance have sufficient time and support for completing their assurance activities and do they have routes to escalate actions to improve the information prior to submission. |
| **Change** | Familiarity – is the information required by the WICS known and understood by the business or is it unfamiliar to the data providers.<br><br>Consistency – are the data sources, analytical resources, assurance resources expert and experienced in producing the information, or similar information for other reporting activities. |

| Risk source | What to consider when looking for risk |
|---|---|
| | IT changes – have there been any planned or unplanned introductions or changes to systems which could have impacted the integrity of the source data or analytical capability.<br><br>Contractual changes – have there been any changes to contractual terms or suppliers which could have impacted the integrity of the source data or analytical capability. |
| **Sensitivity** | Ministerial Objectives – is the information being produced critical to demonstrating how Scottish Water is meeting the requirements of the Scottish Government.<br><br>Reputation – would the provision of incorrect information materially damage the reputation of Scottish Water with customers, government or the regulator. |

*Table 2: Step 1b Risk assessment*

**Step 1b Risk assessment to focus assurance tests against key themes at work package level (rolled up to workstreams)**

The process is to assess each of the work packages under each workstream as High, Moderate or Low against each of the risk source categories to make a workstream level information production risk assessment and identify the workstream level assurance requirement.

To identify the overall workstream level information production risk assessment the following rules are applied:

- If the assessment within the **Sensitivity** risk source category is identified as **High** then the default Workstream level information production risk assessment is always **High** defaulting the Workstream level assurance requirement to **External 3rd line** as well as 1st & 2nd lines.
- If the assessment within in the **Sensitivity** risk source category is not identified as **High** then the following rules are to be applied:
    - 3 or more **Low** assessments the Workstream level information production risk assessment is **Low** with the Workstream level assurance requirement identified as Internal 1st & 2nd lines
- 3 or more **Moderate** assessments the Workstream level information production risk assessment is **Moderate** with the Workstream level assurance requirement identified as Internal 3rd lines as well as 1st & 2nd lines
- 3 or more **High** assessments the Workstream level information production risk assessment is **High** with the Workstream level assurance requirement identified as **External 3rd lines** as well as 1st & 2nd lines
- No more than 2 of any assessments then an average of all assessments should be assessed and sense checked to identify the Workstream level information production risk assessment and the Workstream level assurance requirement

An example of the assessment template can be seen below:

| | |
|---|---|
| H | External 3rd line |
| M | Internal 3rd line |
| L | Internal 1st & 2nd line |

| No | Workstreams/Work packages | Information production risks | | | | | Workstream level information production risk assessment | Workstream level assurance requirement |
|---|---|---|---|---|---|---|---|---|
| | | Sensitivity | Data | Analysis & processing | Assurance & checking | Change | | |
| 1 | **CC Adaption, Policy & Legislation** | | | | | | | |
| | Scottish Government Policy Development | Low | Low | Low | Low | Moderate | L | Internal 1st & 2nd line |
| | Climate Change Adaptation Mitigation | High | High | High | Moderate | Moderate | H | External 3rd line |
| 2 | **SG & WICS Strategic Review Process** | | | | | | | |
| | Strategic Review Process | Low | Low | Low | Moderate | Moderate | L | Internal 1st & 2nd line |
| 4 | **Submission Governance** | | | | | | | |
| | Submission Process | Moderate | Low | Low | Moderate | Moderate | M | Internal 3rd line |
| 5 | **Quality & Assurance** | | | | | | | |
| | Assurance | Moderate | Low | Low | Moderate | Moderate | M | Internal 3rd line |
| 6 | **Business Plan Document production** | | | | | | | |
| | Basis of Preparation for the production of the BP document | Moderate | Low | Low | Low | Low | L | Internal 1st & 2nd line |
| 7 | **Technical Appendices** | | | | | | | |
| | Production of Technical Appendices | Moderate | High | High | High | Moderate | H | External 3rd line |

*Figure 12: Assessment template example*

## 8.5 Roles and Responsibilities

This section details the responsibilities of the different assurance providers under each section of the Three Line model described in section 6.4.1 above.

**First line assurance – data owner checks (1a)**

First line: Checks carried out by the people doing the work (1a)

**Who:** Data owners. Data owners are the people doing the work and they are responsible for ensuring that what they produce is correct and in line with the WICS' reporting requirements.

**What:** Data owners check what they have done and whether it is accurate. They record the processes adopted to develop their component of the plan using a Basis of Preparation document and produce their deliverable(s). They confirm that the Basis of Preparation covers all the required data, that the data production has followed the Basis of Preparation and other obligations and record any concerns, assumptions and risks and agree with line leader any residual risks.

**When:** Before through the creation of the Basis of Preparation, during the activity or when the activity is complete.

**First line assurance – line leader checks (1b)**

First line: Business manager with oversight responsibilities for data owners (1b)

**Who:** Line Leaders working with data owners.

**What:** They sample check the data owner's approach and calculations to confirm that the Basis of preparation has been followed, completing a sense check on the data / information / products / key deliverables. They check that robust evidence exists to support the quality of the information. They agree and record with the data owner their concerns, assumptions and residual risks. They

check that the commentary has been prepared to align and correctly explains the data / information / products / key deliverables.

**When:** When the activity is complete.

**Second line assurance - management controls (2a)**

| |
|---|
| 2nd Line management checks on approach and detail (2a) |

**Who:** Senior Leaders

**What:** Check what the first line has done and sample check whether the resulting information is correct. They review the Basis of Preparation document to confirm it will produce deliverables that comply with the WICS methodology and other obligations. They provide evidence of the checks they have undertaken, confirming whether the Basis of Preparation has been followed. They record their assurance observations, challenges and follow up actions (if any) from their checks on the production of the resulting data / information / products / key deliverables. They check that the data and commentary proposed for the SR27 Business Plan is consistent and aligned with the Long-term Strategy and Long-term Investment Strategy. They check that the assumptions, judgements and confidence grades used are appropriate, reasonable and consistent.

**When:** Following completion of First Line assurance.

**Second line assurance - risk management assurance (2b)**

| |
|---|
| 2nd Line Regulatory Assurance carry out risk assessments, ensure we are compliant with our legal responsibilities and report to the Board on their findings (2b) |

**Who:** Regulatory Assurance Team

**What:** Responsible for the overall oversight of the process on a day-to-day basis including assurance and risk assessment. They carry out specific assurance activities to check processes are compliant and have been followed, paying particular attention to dependencies in the overall planning process. They check for consistency between reported information, table commentary and narrative. They monitor risks and outstanding actions through the assurance register.

**When:** During the process.

**Third line assurance – external assurance/audit (3a)**

| |
|---|
| Third line: External independent assurance providers assure defined areas of the Business Plan relevant to their expertise (3a) |

**Who:** External assurance providers

**What:** Independently checks processes and outputs to make sure that we have followed the WICS reporting requirements, we are compliant with our obligations, have identified all our risks, key assumptions, and developed and implemented plans to manage them. They report at summary level to the ARC.

**When:** During and after development of the Business Plan.

### Third line assurance – internal audit (3b)

| |
|---|
| Third line: Internal audit check compliance with the overall assurance approach. (3b) |

**Who:** Internal audit

**What:** Internal audit sits above the risk management processes of the first two lines of assurance, ensuring that they operate effectively and advising on how they could be improved. Internal audit assesses the effectiveness of governance and risk management across the organisation, so delivery of the Business Plan and the associated assurance approach form part of the annual audit plan. They report directly to the ARC.

They check that there is an assurance approach and that it is fit for purpose. They also check that this assurance plan has been followed, making independent sample checks on outputs to make sure we are compliant with our obligations, and have identified/managed all our Business Plan reporting risks.

**When:** During and after development of the Business Plan.

### *Audit and Risk Committee

| |
|---|
| Delivers overall process assurance to the Board: |

**Who:** Audit and Risk Committee

**What:** The ARC tests that internal controls are in place and effective. They assure that the plan has been developed in accordance with Scottish Waters governance approach.

The ARC has a specific role of reporting to Board on the satisfactory implementation of the assurance plan, compliance with the regulator's reporting requirement and any material risks discovered as part of the assurance, prior to the Board making an appropriate Board Assurance Statement.

**When:** During and after development of the Business Plan and following completion of the assurance activities.

### The Board

| |
|---|
| Receives assurance from the ARC and management: Approves the Business Plan and signs the Board Assurance Statement. |

**Who:** The Board

**What:** The Board is not directly involved in conducting the assurance. It requires management to demonstrate the quality of the plan and compliance with the regulator's reporting requirements, so that it can approve the Business Plan and make an assurance statement to the WICS. Following these reports, the Board minute's its conclusions and decisions prior to submission of the Business Plan to the WICS.

**When:** Following completion of the assurance activities and reporting from the ARC.

## 8.6 Assurance process

The SR27 Assurance process was designed with support from external experts, Alium Blue, to ensure that it was fit for purpose. A risk based approach was developed to allow assurance activities to be appropriately targeted across all areas of the Business Plan. The following section covers the following different elements of the Assurance Process.

### *8.6.1 Themes and tests*

The themes and tests were derived from a review of the Ministerial Guidance and WICS Final Methodology. These were reviewed and agreed with WICS as part of the co-creation of the Assurance Plan.

*Table 3: Key themes and tests*

| Key theme | Tests |
|---|---|
| **Commanding support** | SW will be able to demonstrate that it has engaged with customers and stakeholders in shaping its business plan, having considered recommendations and feedback, and tested acceptability. |
| **Performance targets & outcomes** | SW will be able to demonstrate that its business plan will maintain and improve service performance and compliance that meets the expectations of customers and stakeholders, framed in the context of the long-term sector vision (and the LTIS).<br><br>SW will be able to demonstrate how proposed investment (inputs) will deliver outputs which will contribute to outcomes and performance measures, which will demonstrate progress towards achieving the long-term sector vision and how the outcome measures contribute towards the Scottish Government's National Performance Framework (NPF). |
| **Protecting people & the environment** | SW will be able to demonstrate that its business plan will deliver its core services, meet its regulatory and statutory obligations, protect people's health and enhances the natural environment. |
| **Resilience** | SW will be able to demonstrate that service delivery, compliance and financial resilience have been considered in building the business plan.<br><br>SW will be able to demonstrate where risks such as climate change, cyber security and long term affordability have been considered.<br><br>SW will be able to demonstrate that SW can manage their resilience risks it faces. |

| Key theme | Tests |
|---|---|
| | SW will be able to demonstrate that they will be agile and collaborate within the sector and with others to be resilient to the challenges which will face Scotland's water environment. |
| **Sustainability** | Through the interventions it proposes, SW will be able to demonstrate that it has considered the long term sustainability in shaping the business plan. The plan will demonstrate that nature based solutions/catchment management, community based solutions, demand reduction, resource recovery, and partnership working have been considered and proposed where appropriate.<br><br>SW will be able to demonstrate the impact their investment plan will have on the asset condition and the sustainability of the asset base |
| **Economic prosperity** | SW will be able to demonstrate that the plan supports the prosperity of Scotland and economic growth by providing capacity for industry and housing, renewable energy production and maintaining rural services. |
| **Cost efficiency** | SW will be able to demonstrate that the plan represents value for money (demonstrated through optioneering and cost benefit analysis) and is based on efficient costs, including any real inflationary impacts, for meeting the performance targets in the business plan.<br><br>SW will be able to demonstrate how innovation in its planning and delivery capabilities underpins its assessment of allocative and dynamic efficiency in the business plan. |
| **Fairness & Affordability** | SW will be able to demonstrate that its customers, including vulnerable customers, can afford to pay the resulting charges for the services they will receive.<br><br>SW will be able to demonstrate that costs are fairly apportioned between current and future customers, core and non-core services. |
| **Confidence in delivery** | SW will be able to evidence its track record of successful delivery and demonstrate learning from its current delivery whilst considering factors such as supply chain capability / capacity and business transformation / innovation. |
| **Input data & modelling** | SW will be able to demonstrate that its base data, analysis, interpretation of results and completion of the business plan data tables meets the reporting requirements, reflects good practice and |

| Key theme | Tests |
|---|---|
| | has been subjected to good procedural control with rigorous checks and assurance.<br><br>SW will be able to demonstrate that it has improved the evidence and analysis which has supported its decision making. |
| **Assurance** | SW will be able to demonstrate that proportionate and targeted assurance has been completed on the development of the business plan, providing confidence to the Sponsor, the Board and the WICS.<br><br>SW will be able to demonstrate to customers and industry stakeholders how it has ensured the robustness of its information and establish a high degree of confidence in its business plan.<br><br>The Board of SW will be able to sign a comprehensive and evidenced Board Assurance Statement. |

### *8.6.2 Assurance map*

An assurance map is a structured means of identifying and mapping the main sources and types of assurance in an organisation across the three lines of defence and coordinating them to best effect.

It provides clarity on how risks are being managed and where assurances come from. It helps in identifying gaps and overlaps in assurance activities. It ensures all significant reporting risks are covered without unnecessary duplication.

Below is an example of the draft assurance map:

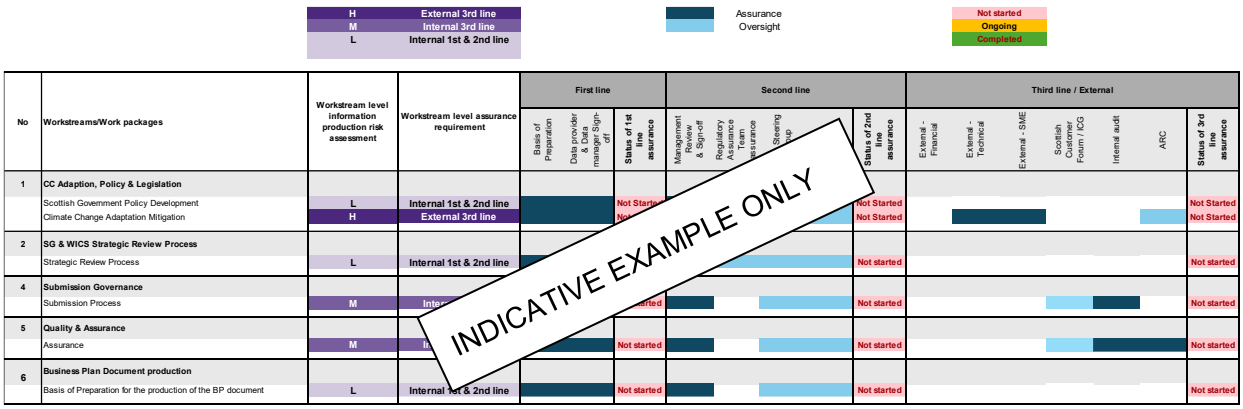


*Figure 13 : Draft assurance map*

This assurance map was developed following the second stage of the risk assessment process above.

### 8.6.3 Assurance and oversight registers

Throughout the development of the plan information has been shared with the internal and external governance groups which were detailed earlier in this Technical Appendix.

In addition to this a record of all assurance and audit activities is recorded. For the Draft Business Plan the 'SR27 DBP activities sheet' provides a record of all assurance checks, audits, quality control checks and governance sign offs. This is a more detailed version of the draft assurance map in section 6.6.2. This document identifies the owners for every item of the Business Plan Document, Technical Appendices, Date Tables and commentaries and records when the different signoffs for assurance and governance were completed.

## 8.7 Third Line Assurance Provision

### 8.7.1 Independent Assurance of Draft and Final Business Plan

The main external assurance of the Draft and Final Business Plans has been undertaken by Binnies UK. Binnies have experience of supporting clients across the UK water industry in delivering high-quality, transparent, and robust regulatory reporting to stakeholders, regulators, and the public. Binnies were appointed after a competitive procurement process undertaken under a framework agreement. The scope of the assurance procurement, the technical capability questions and scoring were co-created with WICS. This provided WICS with the confidence that the assurance would be independent and free from conflicts of interest. The output of the Binnies UK assurance is reported in their Assurance Report which will be included as part of the Business Plan Submission.

### 8.7.2 Independent Customer Group (ICG)

In the development of its Business Plan, Scottish Water is being challenged to demonstrate that plans are reflective of customer expectations. Utilising its experience and expertise, the Independent Customer Group (ICG) will draw upon evidence to challenge Scottish Water's understanding and incorporation of customers' needs and expectations in its Business Plan.

The ICG have produced an Interim Assurance Report for the Draft Business Plan which has been shared with Scottish Water and other sector stakeholders (as appropriate). The assurance will focus on the quality of the research at this stage of the process and will consider if the customer research relied upon is credible, well designed, comprehensive, robust, unbiased, inclusive and independent. The ICG will also consider whether the research follows best practice to provide best value.

The ICG will publish a final Assurance Report alongside Scottish Water's publication of its final Business Plan. The ICG will, at this stage, take an updated view on the quality of research and will also assess whether Scottish Water's Business Plan visibly reflects customer views. The ICG will be looking for Scottish Water to provide a clear rationale as to the decisions it has taken in relation to incorporating customers' views and preferences.

The ICG will also maintain a log of its challenges to Scottish Water and the responses it receives throughout the process, this will be made available to Scottish Water and Consumer Scotland at regular intervals. The ICG will publish the challenge log alongside their Assurance Report at the end of the process to demonstrate the impact of the Group.

### 8.7.3 Other assurance and advice

Additional assurance and advice was undertaken for some areas of the Draft Business Plan which was provided by other assurance providers. This assurance was targeted to areas where more specialized understanding was required or the risk assessment warranted additional checks. This assurance included:

- external analysis of capex cost data by ChandlerKBS, Arcadis and M$^2$;
- peer review of the efficiency submission by First Economics;
- external assessment of Project Investment Appraisal by Stantec;
- external assessment of Management Approaches by AtkinsRealis;
- external assurance on the financial model by EY;
- external assurance and advice on individual investment projects, programmes or scoping exercises, as appropriate;
- the support of external experts (i.e. Stantec and PA Consulting) in the creation and completion of Business Plan materials.

Reports covering these elements of assurance have been made available as part of the Business Plan Submission.

### 8.7.4 Deploy assurance/oversight

Draft assurance Audits were undertaken by Binnies during March and April 2025. The audits focused on the following areas.

- Draft and Final Business Plan Data Tables and Commentary
- Review of the robustness of the systems and processes used to produce the information;
- Identification of the key assumptions made by Scottish Water in preparing its data tables and review of the reasonableness and materiality of those assumptions; and
- Assurance of the accuracy, completeness and comprehensiveness of the data.

During the audit process any actions required to be addressed were recorded in a Risks, Assumptions, Issues and Dependencies (RAID) log. Each item was recorded and allocated the following classification:

*Table 4: Action classifications*

| Corrective action classification | Description |
|---|---|
| Blue | An opportunity for the business to improve its data and/or analysis for subsequent Business Plan submissions |
| Green | A minor concern with the data, analysis, assumptions or internal controls that would be unlikely to have an impact on the SR27 Business Plan |
| Amber | A concern with the data, analysis, assumptions, internal controls or failure to comply with the WICS methodology/guidance that could have an impact on the SR27 Business Plan |
| Red | A material concern with the data, analysis, assumptions, internal controls or failure to comply with the WICS methodology/guidance that could have a significant impact on the SR27 Business Plan |

The urgency was also recorded identifying whether it needed to be addressed for Draft or Final Business Plan or whether it was a longer term business improvement. For Draft Business Plan submission priority has been given to addressing those actions identified as red for the Draft Business Plan. Actions identified for the Final Business Plan have been included as part of the Development Plan.

For the Draft Business Plan, the information available at the audit stage was still being developed and the order of assurance sign offs has been managed to ensure that all information has been appropriately reviewed. The following stages have been implemented:

*Figure 14: Assurance stages*

Each stage ensures that the appropriate levels of assurance and governance checks have been undertaken ahead of the completion of the Draft Business Plan Board Assurance statement.

These systems of control are designed to reduce the frequency of issues and inaccuracies, significantly reduce the risk of material error, and to provide assurance on the accuracy and appropriate completeness of the material provided in the Draft Business Plan.

## 8.8 Collate assurance findings and report during process

Following the completion of the assurance of the Draft Business Plan, Binnies provided a draft and then final audit report highlighting the findings of the audit. This also includes areas of recommended improvement between the submission of the Draft and Final plans. This report was submitted to the Audit and Risk Committee along with an assurance statement from the Director of Strategy and Regulation confirming that the agreed assurance process has been undertaken. Following Audit and Risk Committee (ARC) scrutiny, the Board approved the submission of this DBP and delegated the Alex Plant as CEO to sign the Board Assurance Report (BAR) on behalf of the Board.

# Supply Chain
## Technical Appendix 011

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# 1 Executive Summary

As a regulated monopoly working on behalf of the Scottish People, it is vitally important that Scottish Water operates with a flexible and resilient supply chain, with the right capacity and capabilities, so that our customers receive the service levels, and the best possible value for money. Improving how we contract and engage with our supply chain will be the core basis of how we create great outcomes efficiently for customers; and our approach for SR27 builds on, and improves, from previous charge control periods.

This Technical Appendix (TA) brings together the evidence we have collected, and the analysis we have undertaken, to assess Scottish Water's supply chain approach. We set out our planned improvements, that will support our SR27 investment requirements, and our efficiency analysis, which is set out in more detail in the *Technical Appendix 012 – Efficiency.*

In this TA, we explain:

- The supply chain context and current track record,
- Key changes in SR21 impacting our supply chain strategy,
- Future requirements and the case for change,
- The proposed SR27 Supply Chain approach, and our market testing of this approach,
- The new Enterprise model that will complement existing delivery approaches, and
- The benefits, risks and transitional approach to deliver this change.

We conclude that although our supply chain approach has been successful in SR21, there are opportunities to improve on this, through a new dynamic integrated model that will complement the existing successful supply chain relationships.

This TA focuses on the assessment of Scottish Water's supply chain to ensure its readiness in terms of capacity, capability, and resilience in preparation for SR27 requirements. Through our market testing and independent 3rd party review processes we can confidently set out the existing approach, the case for change and underlying benefits that will be delivered.

Much of the evidence and analysis contained in this appendix has already been shared with WICS in relation to supply chain capacity, as we have sought to work collaboratively with the regulator to provide high quality and robust evidence. Where progress has not been possible by the time of publication, we have signalled further work we will undertake ahead of submitting the Final Business Plan in February 2026.

# 2 Background

## 2.1 Context

We are reliant on our supply chain to manage our existing asset base, to deliver improved levels of service for our existing customers and to deliver services to new customers. We currently operate a dynamic and agile supply chain model (see below), which has served us and our customers well during SR21.

However, the increased level of investment for SR27, and the subsequent increased demand on the potential supply chain, comes at a time when other sectors are also increasing their planned infrastructure investments and delivery.

Therefore, we are changing and improving our supply chain model for SR27, to ensure that our investment plans can be achieved, that our Ministerial Objectives are met, and that our deliver effective services and value for money for our customers.

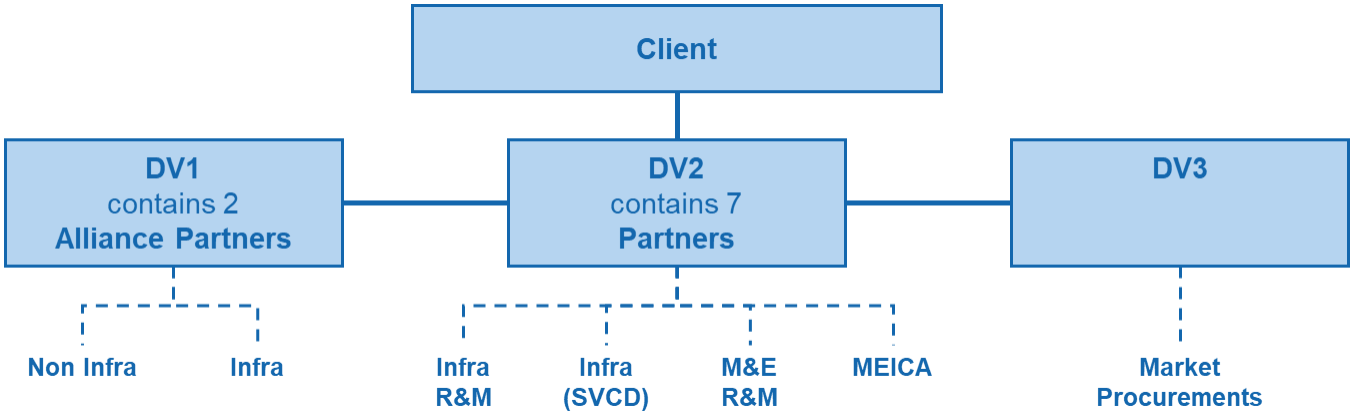


*Figure 1: SR21 Dynamic and Agile Supply Chain Model*

The above structure is further supported by:

- **Regional Contractor Services** - comprising 67 partner organisations,
- **Consultants** - consultancy support from 2 Alliances with 2 partner organisations in each, and,
- **Framework Suppliers** - 430 partner organisations across 220 frameworks

## 2.2 Our track record - How have we set ourselves up for success during SR21?

We have shown over SR21, and earlier periods, that we procure, and then work, responsibly and effectively with our supply chain to deliver positive outcomes, and value for money for our customers.

We will build on our strong position and track record here to deliver the new supply chain model required to ensure effective deliver of our planned SR27 investments.

**Our Procurement and Supply Chain Business Plan objectives for SR21**

The Procurement & Supply Chain (PSC) function within Scottish Water delivers a world class procurement service and is Platinum Accredited with the Chartered Institute of Procurement & Supply (CIPS), one of only 18 companies in the world and the only water company to have achieved this level.

To support the Scottish Water purpose and strategic ambitions, we have developed a business plan for SR21 with our mission being: "Through digitally enabled supply chain integration, we collaborate to create an efficient, sustainable and agile supply chain that delivers great value for Scottish Water and our customers, supporting a flourishing Scotland".

We will support Scottish Water's three Strategic Ambitions through delivering improvements through three key areas:

- **Procurement & Sourcing**: Ensuring Scottish Water has access to the goods and services it needs at the right time, to the right standard, representing value for money; delivered efficiently by a world-class procurement team.
- **Risk Management:** Ensuring structural, ethical, local, and global supply chain risks, including value for money, are effectively monitored, managed, and made visible to Scottish Water to enable a sustainable and agile supply chain.
- **Supply Chain Development:** Ensuring the Supply Chain remains fit for purpose through long term strategic alignment between Scottish Water & its supply chain partners.

### *2.2.1 Procurement and Sourcing*

Scottish Water spends ~£1.4 billion per year with its supply chain, across capital and operational activities and the goods and services we receive for this are a critical enabler in supporting our ability to deliver our services to customers. The supply chain model above sets out our current structure and approach, and Figure 2 below details the categories and percentage of spend that make up ~£14 billion that goes through frameworks.

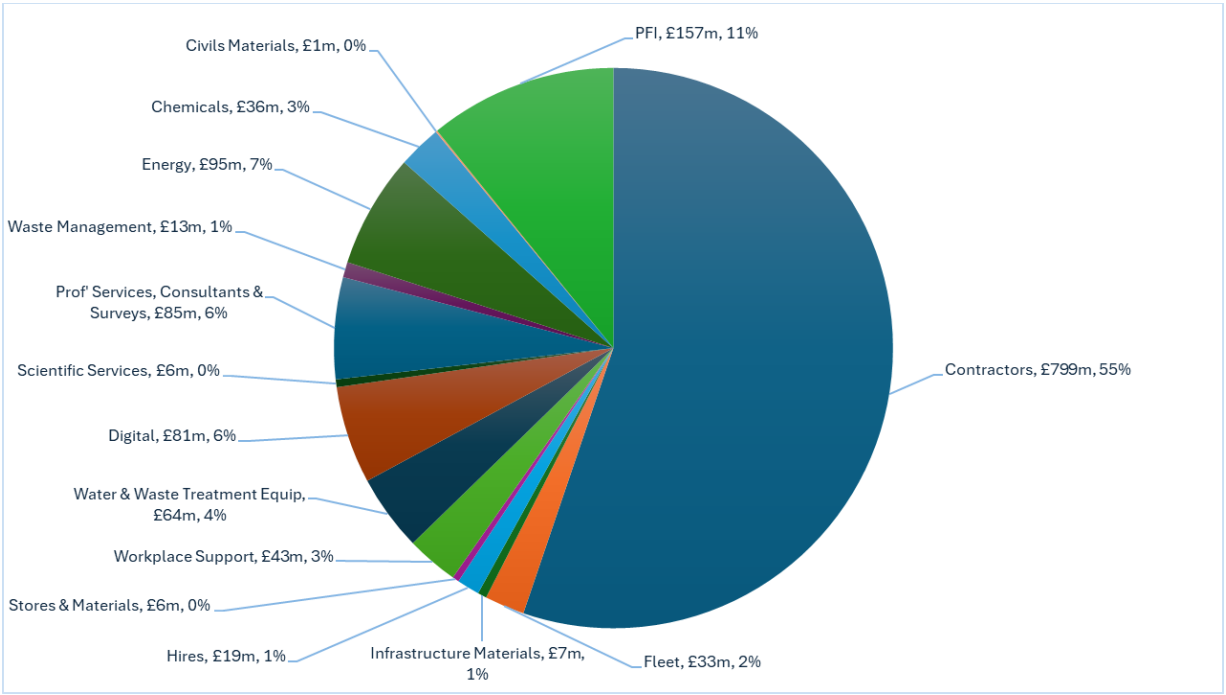


*Figure 2: Our spend profile for FY24/25*

Scottish Water has ~200 frameworks supported by ~440 suppliers, procured in compliance with the Utilities Contract (Scotland) Regulations 2016. Figure 3 below shows some key supply chain statistics.

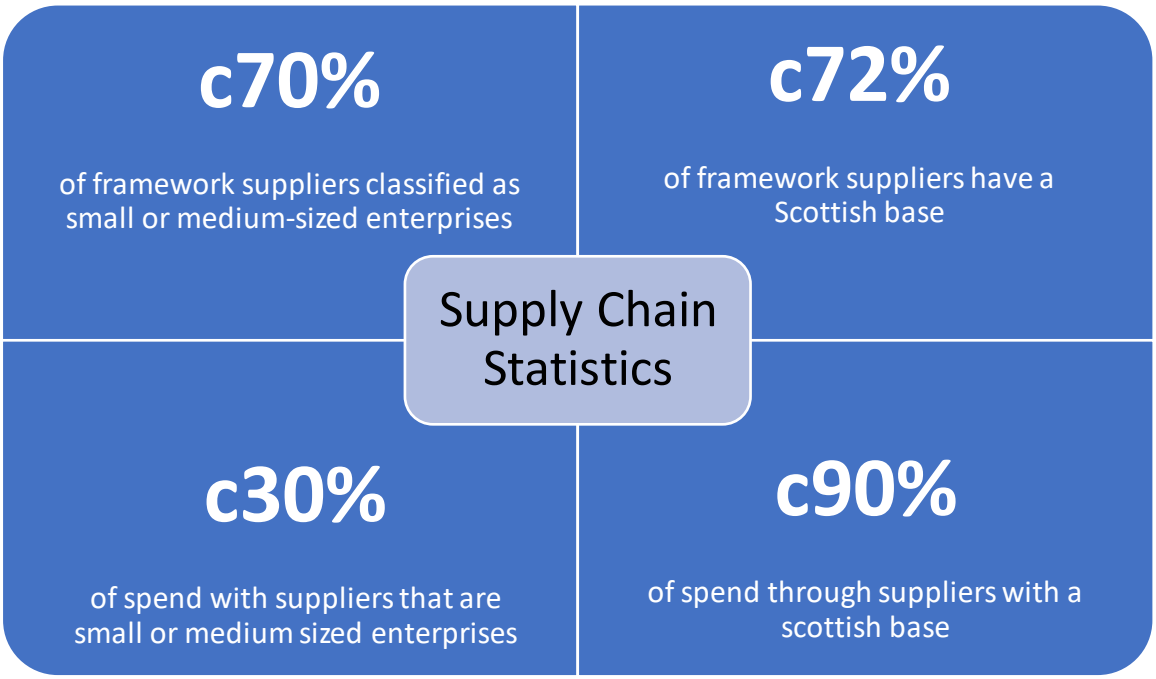


*Figure 3: Overview of highlights of our successful use of frameworks in FY24/25*

### *2.2.2 Risk Management*

Scottish Water PSC monitors and manages risk within its supply chain across three main areas: performance, structural, ethical and horizon scanning.

#### Performance Risks

PSC manages several performance risk elements across the supply chain. The commercial element to manage performance includes a range of value for money mechanisms and the ability of suppliers to deliver within agreed pricing, including the management and collection of volumetric benefits within our framework agreements.

Furthermore, PSC conduct price validation which involves annual exercises to verify that the pricing in our established frameworks is competitive within the current market. This takes place on a 3 yearly cycle to ensure all frameworks in scope are covered.

PSC also reports on 'Pound in the Ground' which is a measure which expresses the efficiency of Scottish Water's operational practices in construction projects by measuring Scottish Water's and our delivery partners' overheads for every £1 of construction. This is described separately in the *Technical Appendix 012 – Efficiency*.

In addition to the above value for money assurance activities, PSC presents a capacity and organisational health tracker covering DV1 and DV2 contractors to the Capital Investment Leadership Team on a quarterly basis. This includes a summary of the financial health of the organisations, their growth plans, and a narrative from the commercial team as to the health of

the relationship. The contractors are awarded a Red, Amber, Green (RAG) status based on this information which is used to review forward work allocation. There is a different industry landscape in relation to risk with supply chain partners having a reduced risk appetite which has been recognised by SW and fed into SR27 planning.

Trading risk, whereby there is a potential risk of supplier insolvency, is also considered within the commercial element of supplier performance and management of this is supported by a subscription with Dun and Bradstreet which provides alerts on supplier financials and changing risk profiles. Where there is a significant risk to services, Scottish Water undertakes increased performance monitoring, conducts service continuity planning, and seeks legal advice if appropriate.

In terms of wider performance measures, PSC issues a monthly supply chain risk report to key stakeholders within the Leadership group, highlighting key performance risks within the supply chain including capacity constraints, extended lead times and quality issues, whilst also detailing the mitigation measures that PSC are exploring to manage and reduce these risks. Additionally, PSC undertake integrated supply chain management (ISCM) to understand suppliers' performance and it provides an opportunity for stakeholders to provide feedback on potential supplier issues to ensure they are resolved.

#### Structural risks

We undertake an annual review of structural risks within our supply chain, considering supply chains which have no or extremely limited alternatives or competition, which could be further negatively impacted by mergers and acquisitions and / or which could be affected by geopolitical events. Risk velocity is also built into this analysis and these risks feed into our contingency planning.

#### Ethical risks

We support Fair Work First principles in supplier selection and contract management. Suppliers must comply with the Modern Slavery Act, the Human Trafficking and Exploitation (Scotland) Act, or equivalent laws. In addition, suppliers with a turnover greater than £36 million must submit annual statements; smaller suppliers sign a yearly compliance declaration.

Ethical risks in the supply chain are reviewed annually, factoring in raw material origin, supply chain tiers, and commodity type. High-risk areas may be audited or mapped; random audits check controls in lower-risk areas.

Ethical standards are outlined in the Supplier Code of Conduct linked to our Terms and Conditions.

### *2.2.3 Supply Chain Development*

Throughout SR21, we have continued to work to ensure that our supply chain remains fit for purpose, by building long-term alignment between us and our supply chain partners.

The most significant aspect of our supply chain development is the Future Supply Chain Design that we are conducting to ensure we are ready for SR27. This is described in greater details in Section 3.3.

## 2.3 What has changed since SR21

### *2.3.1 Ministerial Objectives*

The Draft Ministerial Objectives for SR27, set out how we must lead work with partners, including its supply chain, to drive progress towards achieving the Water Sector Vision;

> *"(1) Scottish Water must lead work with partners (such as stakeholders, its supply chain, academia and consultants) and engagement with customers and communities, in order to make progress towards the realisation of the long-term vision of the water industry.*
>
> *(2) In doing so, Scottish Water must apply the place principle adopted by the Scottish Government and the Convention of Scottish Local Authorities, by taking an integrated, collaborative and participative approach to decisions about a place's services and assets, in order to maximise the impact of resources and to achieve better outcomes for people and communities.*"

In addition, we must work with our supply chain effectively in order to deliver the necessary services and infrastructure to meet the Ministerial Objectives across all the other areas;

- Standards of service,
- Asset maintenance,
- Supporting Sustainable Economic Growth,
- Circular Economy,
- Drinking Water,
- Environment,
- Flooding and surface water management,
- Security and resilience,
- Climate change, adaption and mitigation, and,
- Private finance initiative funded projects.

### *2.3.2 Forecast UK investment is significant*

There is ~£490 bn of national infrastructure investment forecast in the UK over the next 10-15 years. ~£65 bn of this investment is planned in Scotland across the energy, infrastructure and utilities sectors.

This huge level of investment in UK Infrastructure creates a seller's market, constraining supply, and giving the supply chain choice where they wish to participate. They have told us what is important to them – revenue certainty**,** risk, margin, talent retention, innovation, flagship projects to support their brand.

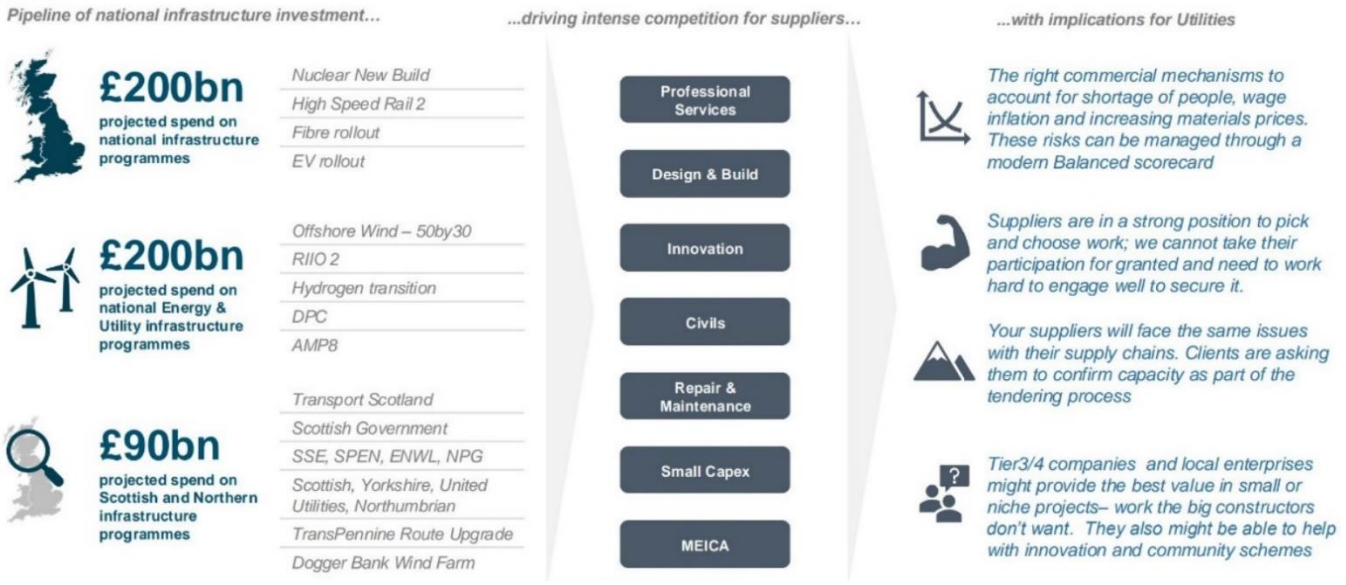


*Figure 4: UK infrastructure overview*[1]

And with many of the UK water utilities having already awarded their frameworks for their next regulatory period, it is critical that we use the right market approach to ensure we have the right supply chain arrangements in place for SR27, that can deliver the necessary capacity and capability.

The Scottish construction market is also currently busy, with a peak forecast in 2030 and consistent demand until 2035. This could lead to regional constraints on certain skills areas, such as in commissioning, civil construction and general operatives. Although we believe that this risk is manageable through working closely with partners and creating a stable forecast of work. There is also a good level of sector loyalty, and our extension of our Delivery Vehicle 2 (DV2) will provide an initial base of capacity whilst we mobilise the DV4 Enterprise that will bring additional capability.

It is estimated that we, Sottish Water, are responsible for ~14% of overall investment in Scotland and in a competitive market it is essential for us to be viewed as a good client to attract capacity with the right skills and experience. We can influence the national and regional market.

### *2.3.3 Our investment scenarios assumptions and risk considerations*

During our investment planning, we reviewed three growth scenarios for SR27 - one at £8b; one at £9b and one at greater than £10b (note these are in FY 23/24 prices). For the scenarios of ~£8b and ~£9b we believe that the supply chain would need to grow by between 1,000-1,600 people – i.e. from ~4,000 to 5,000-5,600 (not accounting for productivity gains). This would equate to approximately 2-3 additional civils and/or MECIA businesses and/or require organic growth.

Below we set out our supply chain requirement assessments of our current and potential future levels of assessment.

[1] 50by30: UK target to have 50 GW of offshore wind energy by 2030
RIIO2: Revenue = Incentives + Innovation + Outputs "2", Ofgem's price control framework
DPC: Direct Procurement for Customers, Ofwat's framework for price review
AMP8: Asset Management Period 8: regulatory investment period in England and Wales
SSE: Scottish and Southern Energy
SPEN: Scottish Power and Electricity Networks, the part of Scottish Power that owns and operates electricity networks in Central and Southern Scotland
ENWL: Electricity North West Limited
NPG: Northern Power Grid

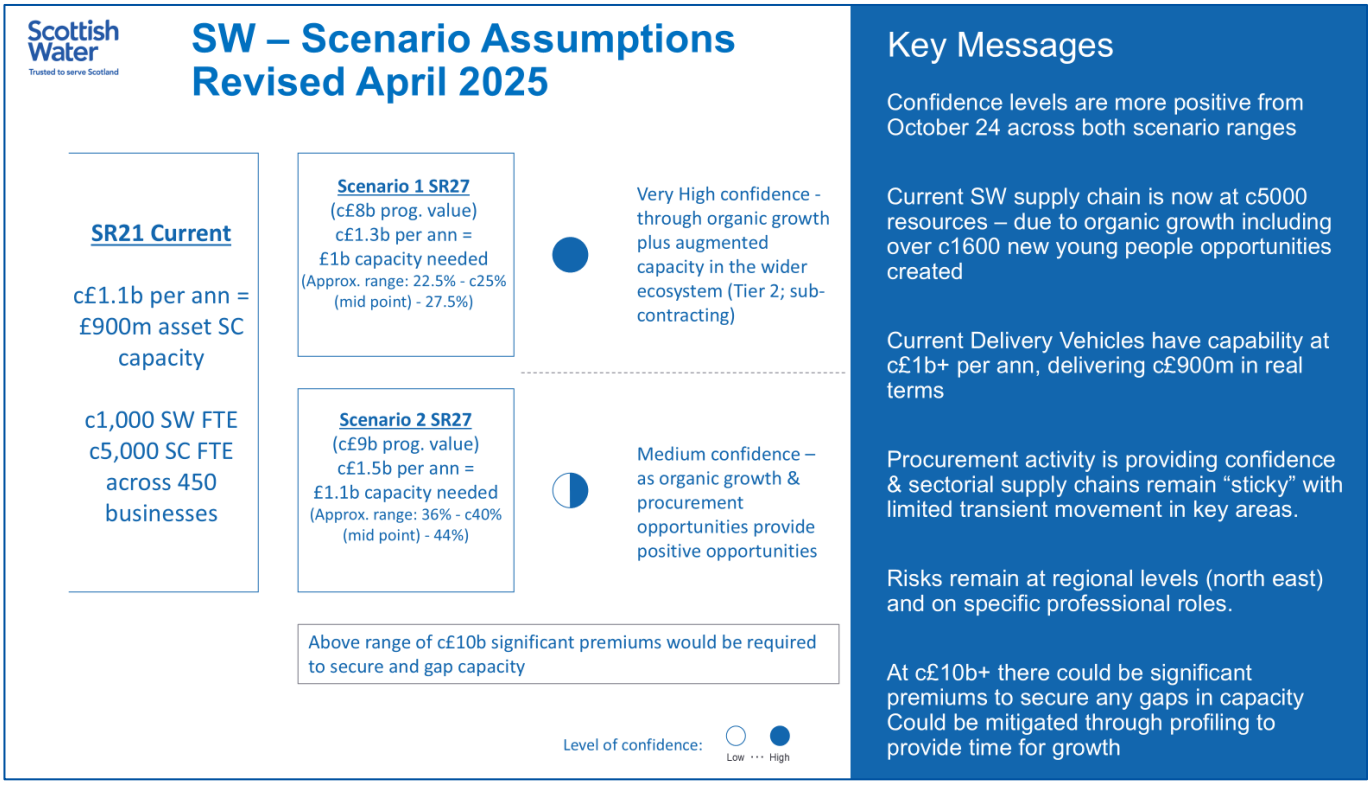


*Figure 5: Our assessment of supply chain capacity in potential investment scenarios*

If the investment is greater than £10bn, it is likely there could be cost premiums to secure the delta in required capacity. However, given these scenarios compared with wider investment, it is believed that this will have a minimal impact to the UK market as a whole.

We are aware that there will be specific constraints posed in Scotland, albeit these may be specific pinch points in certain areas and at certain times. For example, there is forecast to be capacity constraints in north-east Scotland with the power transmission upgrades, although the renewables sector is now seeing a downturn in requirements in certain areas. Figure 6 below, sets out an overview of the impact of constrained capital, rising costs, and labour shortages on Scotland's infrastructure outlook.

As part of the Business Plan review, the WICS have commissioned Turner & Townsend to undertake a review of supply chain capacity and as part of this, Scottish Water has positioned a response to a number of technical questions.

We have estimated that there is ~£200m of additional headroom in current supply chain capacity. However, it should be noted that this is based on current agreements with existing partners and does not reflect additional capacity that would be established via new agreements with existing partners and/or new agreements with new partners.

In Table 1 below, we highlight current spend by delivery route and our estimate of the potential capacity under SR21. This highlights that additional capacity primarily relates to elements of the DV1 and DV2 delivery routes. This provides us with confidence that along with some existing parts of our supply chain that will be extended, and new procurements that will add in additional capacity, we will be able to deliver the required capacity without additional market premiums.

Although to deliver additional value and provide more assurance newer supply chain approaches will be required as noted later in the document.

*Table 1: Estimated current capacity headroom by delivery route*[2]

| Delivery Route | Spend (FY24/25) | Potential Capacity (SR21) |
|---|---|---|
| **DV1 non-infrastructure** | £92m | £150m-£180m |
| **DV1 Infrastructure** | £108m | £150m-£180m |
| **Major Projects** | £41m | £41m |
| **SW Environment, Planning & Assurance** | £40m | £40m |
| **SW Delivered** | £455m | £455m |
| **SW Managed Delivery (DV2)** | £405m | £475m-£500m |
| **Totals** | £1.141b | £1.311b - £1.396b |

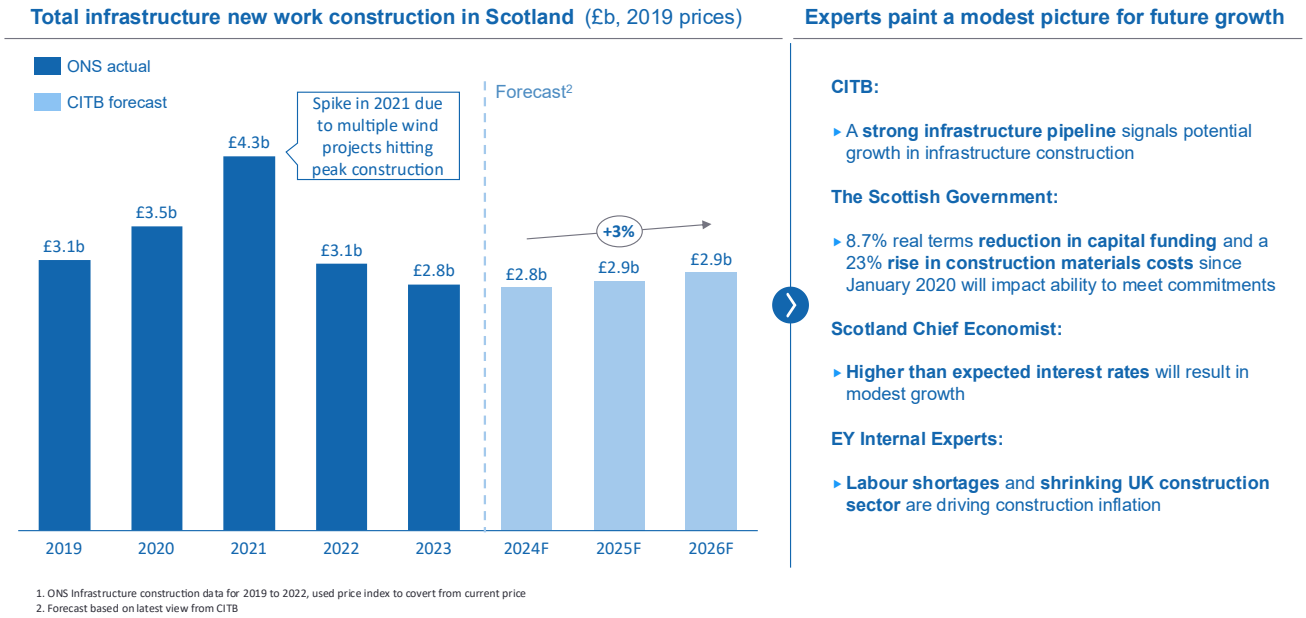


*Figure 6: Experts acknowledge the impact of constrained capital, rising costs, and labour shortages on Scotland's infrastructure outlook*[3]

There are also wider supply chain risks to consider e.g. wage inflation, increases in materials prices, lead times and labour availability. There are opportunities to mitigate these supply chain risks through the certainty of the programme which would enable us to plan and optimise resources, plant and materials and support forward planning our procurements, exploring opportunities to standardise products and make more use of digital engineering and nature-based solutions.

Whilst there is a good level of sector loyalty to Scottish Water, and we are seen to be a good client to work for (as evidenced in the recent British Water survey) the anticipated labour constraints make it essential for us to maintain this status and mitigate future impacts. Options being considered include encouraging organic growth in Scotland through skills academies for

[2] Source: Scottish Water estimates

[3] Sources: ONS, CITB, Scottish Government Infrastructure Plan Update, Chief Economist Outlook, EY-Parthenon research and analysis

graduates and modern apprentices with support from other agencies, e.g. Scottish Enterprise and the Scottish Government, to encourage new entrants and indigenous growth. It is essential that the water industry in Scotland is seen as an attractive place to work that develops talent.

### *2.3.4 We need to differentiate for SR27*

As we consider the market analysis, the risks, opportunities and our future supply chain requirements, we must ensure that the SR27 supply chain model supports our strategic ambitions and vision. When considering Great Value and Financial Sustainability we must realise and evidence value for our customers and stakeholders and ensure our supply chain remains commercially sustainable.

For Service Excellence, the supply chain we create will need to continue to deliver investment with a clearer connection on outcomes, supporting our asset management approaches. It should also deliver excellent customer service and having a collective focus on improving safety, health and wellbeing in our industry. We will also need to continue our progress in targeting a 75% Reduction in Carbon Intensity of Investment, to continue on our route map to Net Zero by 2040. This will require continually invigorating our approach to innovation, standardisation, and circular economy principles.

# 3 Our approach to delivering SR27 with our supply chain

We are recommending a bold "advanced partnering" DV4 Enterprise model for the replacement of our current DV1 delivery vehicle, and an extension of DV2 for three years, with the option to extend for a further 3-years until 2033.

The DV4 Enterprise will shift from fixed outputs to a more dynamic outcome-based set of measures, with partners incentivised against sub programme and Enterprise outcomes, and Scottish Water will have embedded resources within the Enterprise.

We acknowledge that there will be cultural and organisation adaptation risks which will need to be managed, however we need to address the growing demand on our resource, hence we are looking to find efficiencies compared to current arrangements[4].

## 3.1 Future requirements and Case for Change

Our future requirements are significant, and there are several market challenges we must address and objectives to deliver. We are well placed, as an attractive partner, to effectively work with our supply chain to deliver more efficiently and faster to ultimately deliver value for money for our customers.

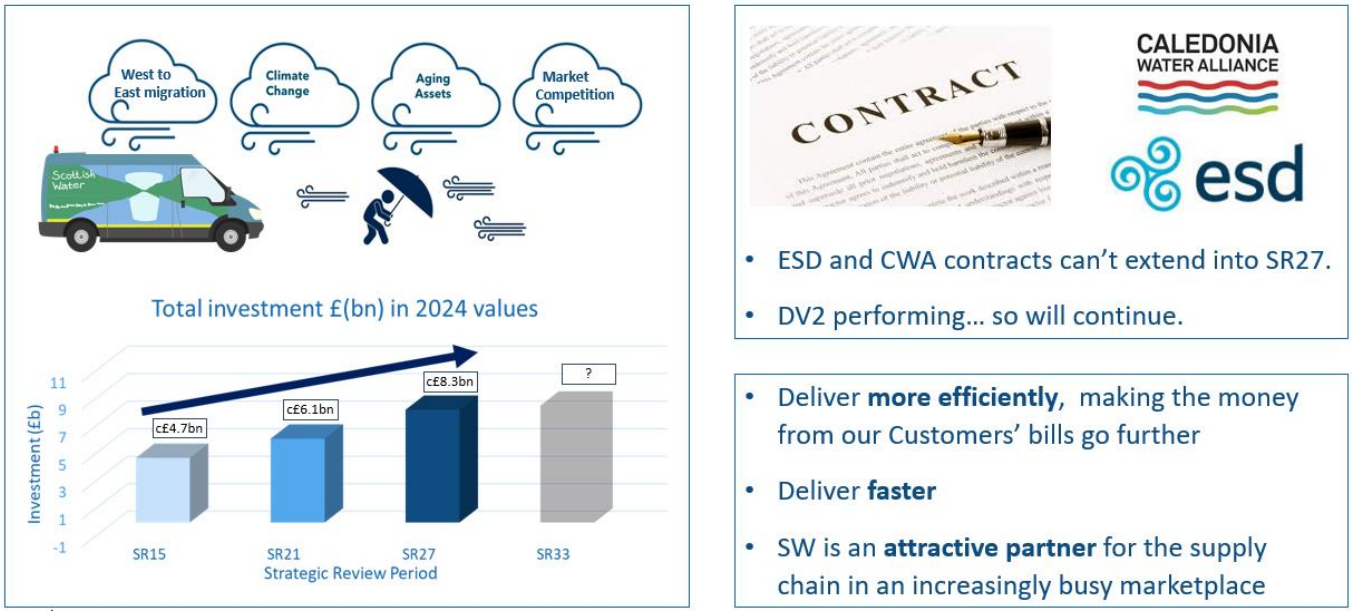


*Figure 7: The case for change*

**Firstly, the market environment is changing and being seen as an attractive partner is critical.** We are forecasting significant additional investment in SR27, set against a backdrop of existing challenges. Namely, West to East population migration, climate change, ageing Scottish Water assets, and market competition.

There are increasing market constraints due to growth in construction demand both in England & Wales and in Scotland – so not just a North to South risk of resource movement, but also across sectors in Scotland as well. Information from CECA (Civil Engineering Contractors Association), EY Parthenon, McKinsey & Company and other supply chain partners note that this is likely to

[4] Refer to the ***Draft Technical Appendix 012 – Efficiency*** for further details

lead to constraints on certain skills areas, such as in commissioning, and general operatives. This is compounded by increased market consolidation due to mergers and acquisitions and changing commercial risk appetite. Our challenges around our own unconstrained funding projections also play into these market complexities. Given this environment it will be important for us to differentiate ourselves as a client of choice.

We must ensure that we have sufficient capacity and capability available to use to deliver our plans for SR27, whether that be in-house, or through our supply chain.

With our supply chain partners there is also more opportunity for us to collectively share capabilities and be a sector that attracts talent in Scotland, potentially using the DV4 Enterprise to support a sector training academy, whilst ensuring this is complemented by best-in-class skills from the wider UK and Global markets.

**Secondly, existing supply chain expiration**. As we look ahead, a minimum of two thirds of our supply chain will require re-procurement by 2027. This was part of the SR15 & SR21 strategy to have an inflection point at this time to consider what would be needed in the future. We have no option but to consider what the right supply chain should be for the next period.

**And thirdly, we must deliver more efficiently, providing value for money for our customers.** We need to deliver on our climate change adaptation and deliver investment with the right asset outcomes at an efficient cost. For this we will need transformational change that impacts across the business.

### *3.1.1 Supporting our strategic ambition*

As we consider our future supply chain requirements, we must ensure that the SR27 supply chain model supports our strategic ambitions and vision as described in Figure 8.

When considering **Great Value** and financial sustainability we must realise and evidence value for our customers and stakeholders and ensure our supply chain remains commercially sustainable.

For **Service Excellence**, the supply chain we create will need to continue to deliver investment with a clearer connection on outcomes, supporting our asset management approaches. It should also deliver excellent customer service and having a collective focus on improving safety, health & wellbeing in our industry.

We will also need to continue our progress in targeting a 75% Reduction in Carbon Intensity of Investment to continue on our route map to **Net Zero** by 2040[5]. This will require continually invigorating our approach to innovation, standardisation, and circular economy principles.

[5] For further information, see Our Routemap to Net Zero Emissions

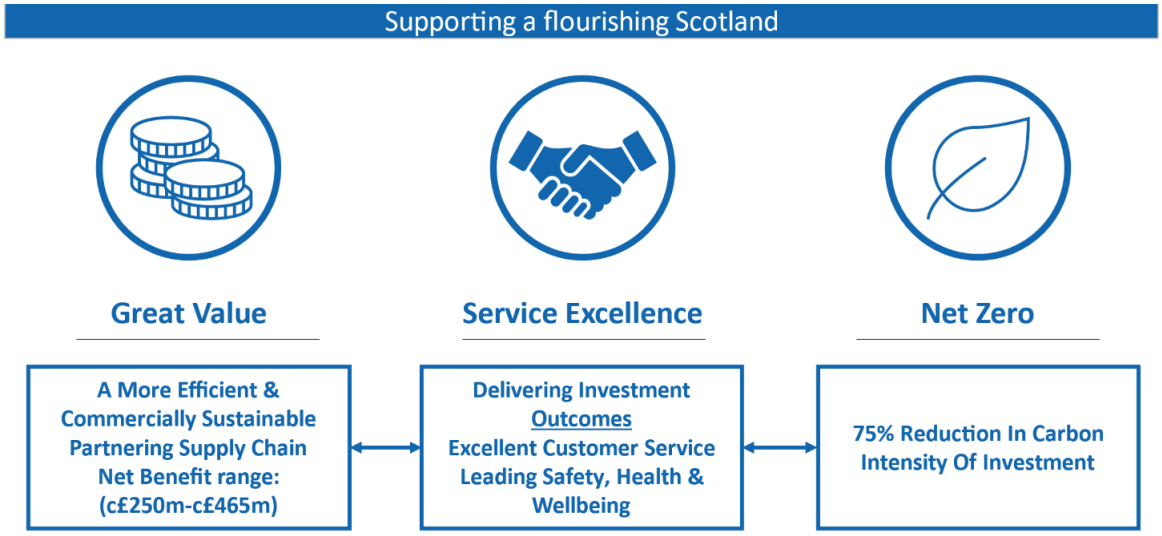


*Figure 8: The SR27 Supply Chain Model: Supporting the strategic Ambitions*

From the forecast of SR27 work, we are assuming that we will require a balance of traditional Civil infrastructure & MECIA skills, augmented by digital and emerging Blue/Green capability. For SR27 we are assuming 90% of demand will utilise traditional construction skills and 10% on newer blue/green and digital approaches. We expect this to change in SR33 to 80% traditional 20% non-traditional asset-based outcomes. The move towards more outcome-based partnering will be a driver in unlocking our enablers.

The enablers are seen as crucial to the success of the proposed supply chain design. This includes enhanced partnering capabilities and a behavioural environment supporting closer resource integration, and a trading environment that also reflects and supports this approach, to position Scottish Water as a client of choice in a busy marketplace that delivers better value-for-money outcomes. Also, as we develop our Sustainability Strategy this ties in substantively to all our ambitions in this area.

## 3.2 Testing our approach with the market

The review started around two years ago. Our learnings from the benchmarking are that leaning further into a partnering environment will support our aspirations and requirements. We believe this differentiator will be critical in a very busy market. The high-level graphic in Figure 9 shows the journey of activity we have been on during the planning for the SR27 Business Plan.

In December 2023, our Board were presented with a range of options for the future supply chain design and the outcome was to further explore the “Transform & Reform” option. EY Parthenon was commissioned to validate this option using their extensive experience, and in the context of the benchmarking, work undertaken by Scottish Water.

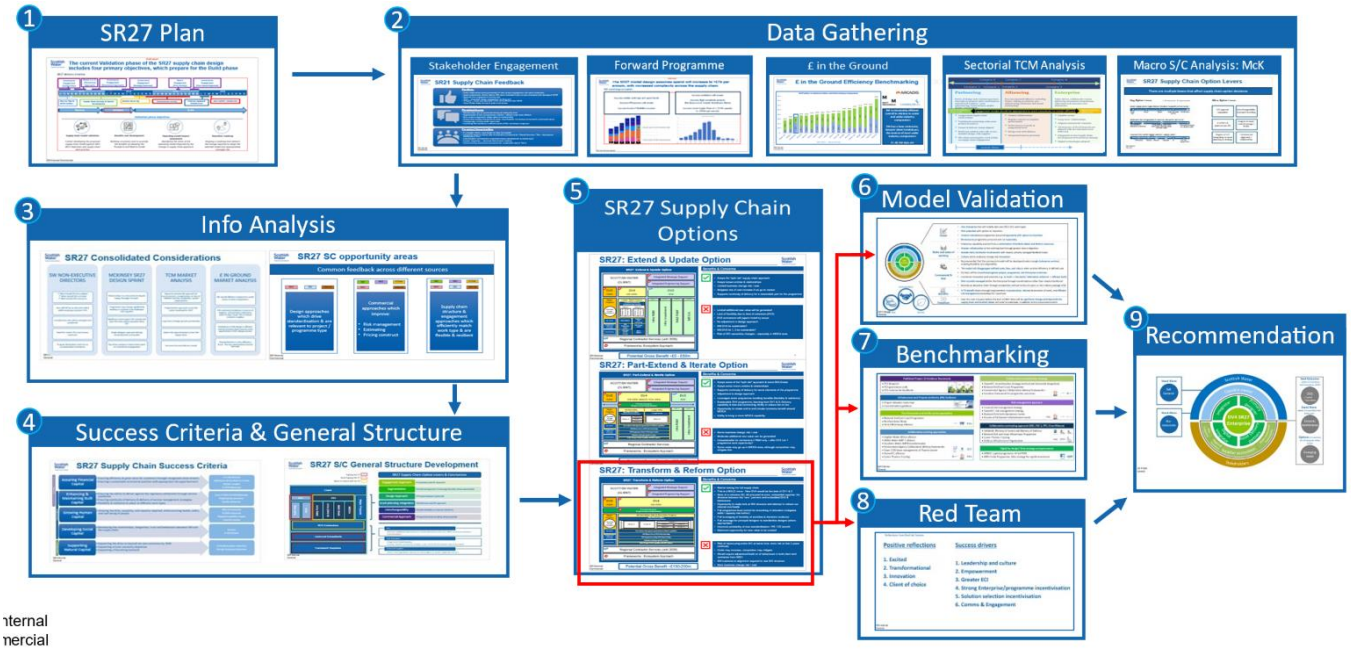


*Figure 9: Review and validation for SR27*

From the benchmarking exercise we found that Scottish Water is seen as a respected, progressive client. We have key opportunities to optimise our end-to-end cycle-time and overall productivity using lean techniques, digitisation and more integrated working. These techniques can be supported by improvements in the areas of design, standardisation, and transitioning from traditional construction to factory and production approaches. This approach could also provide health and safety benefits. Additionally, there are opportunities to keep improving the way that we trade through our commercial relationships, including how we estimate and price work and manage risk with our partners.

There is also more opportunity for us to collectively share capabilities across our supply chain partners and be a sector that attracts talent in Scotland, potentially using the DV4 Enterprise to support a sector training academy, whilst ensuring this is complemented by best-in-class skills from the wider UK and Global markets. This would help to address the known resource issues in the supply chain and creating additional resilience and sustainability of resources.

Several third-party commissions were engaged who supported on the creation of the plan and market overview options. See Figure 9 for details of the options considered, and the verification and testing undertaken.

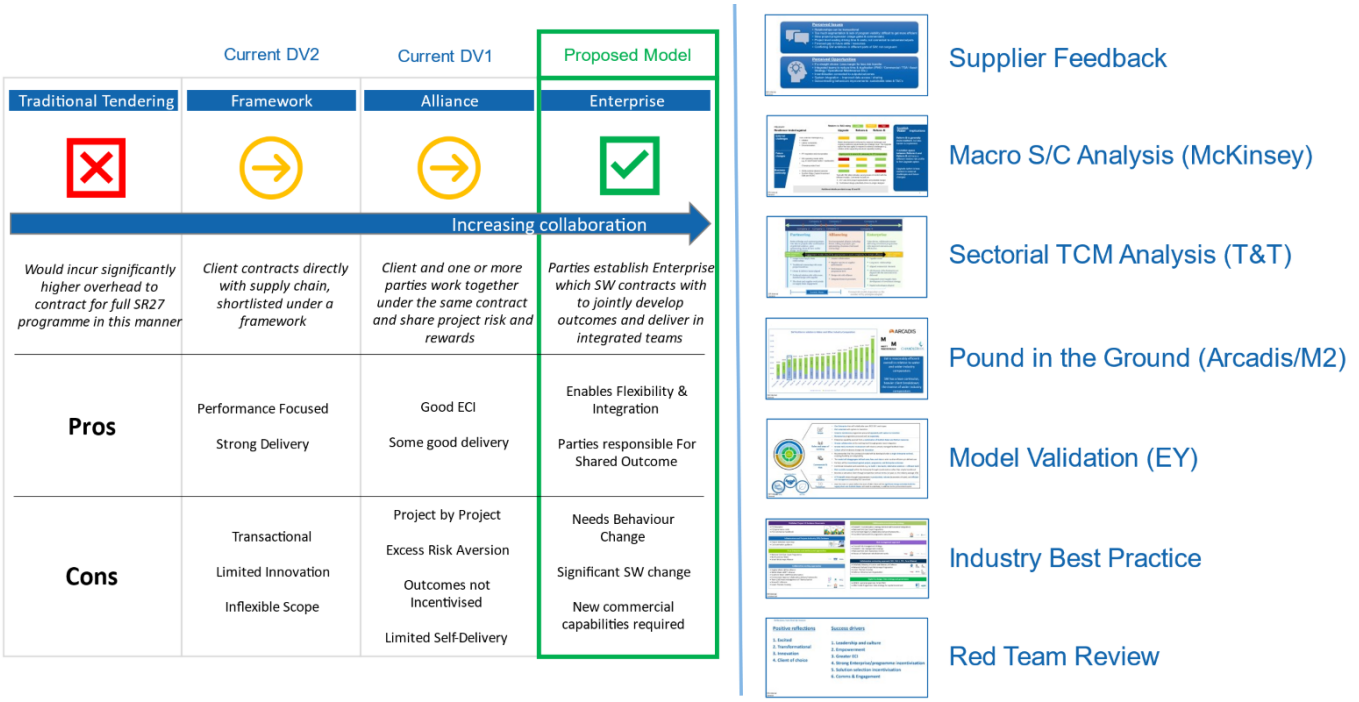


*Figure 10: Options considered (left hand side), and verification and testing approaches (right hand side)*

Several model approaches were considered during the validation phase, which was supported with a commission with EY Parthenon. To replace DV1 an Enterprise approach was considered the primary option. This model was constructively tested with a 'Red Team' which consisted of senior representatives from Stantec, Morrison Water Services, Cap Gemini and Chandlers. The intention was to gain feedback on the approach, understand any risks/concerns and further refine the final design.

Overall, the Red Team felt that this was an exciting concept, truly transformational and if implemented properly it would place us as being a 'client of choice'. They also provided feedback on areas to focus on which have been noted within our organisational readiness plan – such as the importance of leadership and culture; the correct level of decision-making empowerment for the Enterprise; the importance of ECI and of positioning programmes of work; and of communication and engagement. The specific feedback is set out below:

**Positive reflections:**

- **Excited:** The Red team were genuinely excited by the prospect of a Scottish Water Enterprise supply chain model
- **Transformational:** They believe it would deliver transformational change and allow investment to scale
- **Innovation:** They felt it would create opportunity for innovation and lean working
- **Client of choice:** The direction of travel would make Scottish Water a 'client of choice' if fully delivered

**Success drivers:**

- **Leadership and culture:** The Enterprise will need strong leaders to drive a more collaborative culture
- **Empowerment:** It would need an agreed level of empowerment from the Client to make decisions or where reach back is needed, clear governance/SLAs

- **Greater ECI:** The Enterprise will need to deliver on the promise of greater ECI throughout the project/programme lifecycle to deliver the innovation required to drive benefits
- **Strong Enterprise/programme incentivisation:** Substantial upside incentivisation from enterprise/programme fees needed to break the revenue-margin linkage and downside incentivisation needs to be limited to what they control
- **Solution selection incentivisation:** Partners should be involved early enough and incentivised to participate in solution selection conversations to drive no build → less build / alternative solutions → efficient build
- **Comms & Engagement:** Early communication and engagement with the supply chain and employees is critical to positioning the transition as an attractive opportunity

## 3.3 Our Recommended SR27 Supply Chain Design

It is estimated that we will require a total Supply Chain capacity of ~£1.3b-~£1.4b per annum (in FY23/24 prices). Specific supply chains and frameworks will continue to be procured for general Scottish Water requirements e.g., in Fleet, Property and Digital, (~£1.8b over 6 years). Further information on the **Digital** supply chain and procurement is provided in Section 3.3.23.3.2.

Two major procurements will have been launched; one will procure advanced anaerobic digestion plants to support our **Bioresources** strategy (~£400m) and the other will procure a programme of new **Ceramic Membrane** Treatment Works (~£600m) (see Section 3.3.3 for further details).

For the **DV2** framework across the two investment lots, it is proposed that an initial extension for three years up to 2030 will be negotiated (~£1.25bn) with an option to extend for a further three years to 2033. For the two operational lots there will also be the opportunity to extend, however, we will also look at what improvements/changes may be required and if there are better options for specific workstreams. This will provide us with options to consider moving DV2 activity in full, in part or not at all to the Enterprise. Further information is provided in Section 3.3.1 below.

To replace DV1 it is recommended that we procure an Enterprise delivery model (~£5bn-£9bn over the 13 years), to be known as **DV4** (see Section 3.4 below for further details). This will initially undertake mostly higher value, higher complexity programmes, as well as being able to undertake the work within DV2 by around year three. The model, including details of the roles and responsibilities of the participants in the Enterprise is detailed in Figure 11 below.

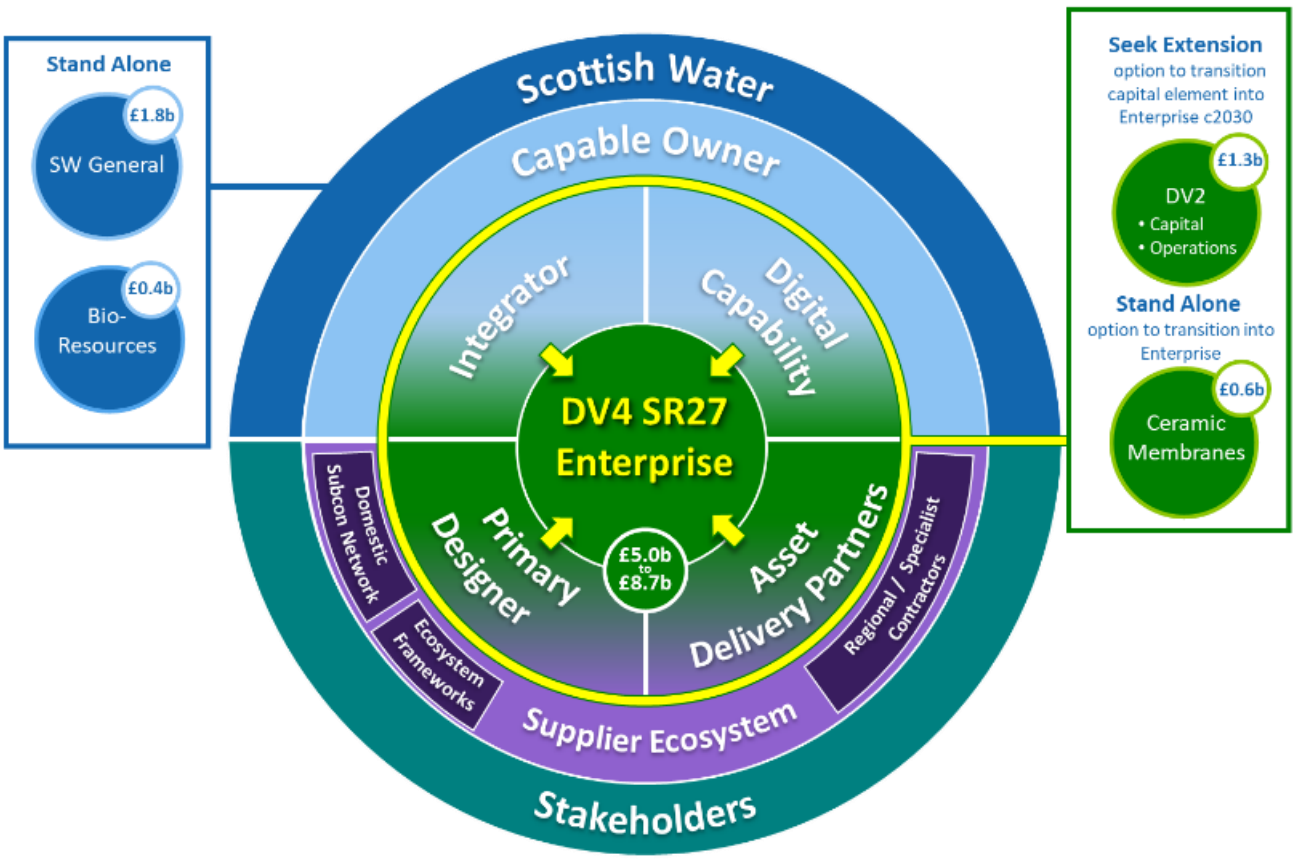


*Figure 11: SR27 Supply Chain Proposal and Roles Overview*

### *3.3.1 Delivery Vehicle 2 (DV2)*

Scottish Water intend to extend DV2 for further three years until 2030, with an option for a further extension until 2033. This is due to current performance, which is positive, and the provision of continuity of capacity from a risk management perspective whilst establishing the DV4 Enterprise.

Scottish Water has commenced extension discussions with the seven construction partners that make up DV2. As part of our due diligence process for the extension, we are conducting a Price and Performance Review for each of the partners. This will review their performance against each of our 3 strategic ambitions (service excellence, great value and financial sustainability and beyond net zero) alongside Beyond Zero Harm.

We are also undertaking a benchmarking exercise with an external consultant to review DV2 rates against industry comparisons to ensure the framework still offers value for money. The results of the Price and Performance Review and extension proposal will go through Scottish Water governance, up to Board level, with the aim to have extensions for all lots fully signed by March 2026, one year ahead of the extension start date.

### *3.3.2 Digital*

We have also launched the procurement of our new Digital Supply Chain for SR27. This will help us to deliver better business outcomes at lower costs and lower carbon emissions, it will be a more adaptive and agile model, providing new capabilities in Digital Engineering and AI and will help accelerate us towards our strategic ambitions. A current high-level view of this can be

seen in Figure 12 below. It is currently planned to have the new Managed Service in place by August 2026 to support an effective transition between SR21 and SR27.

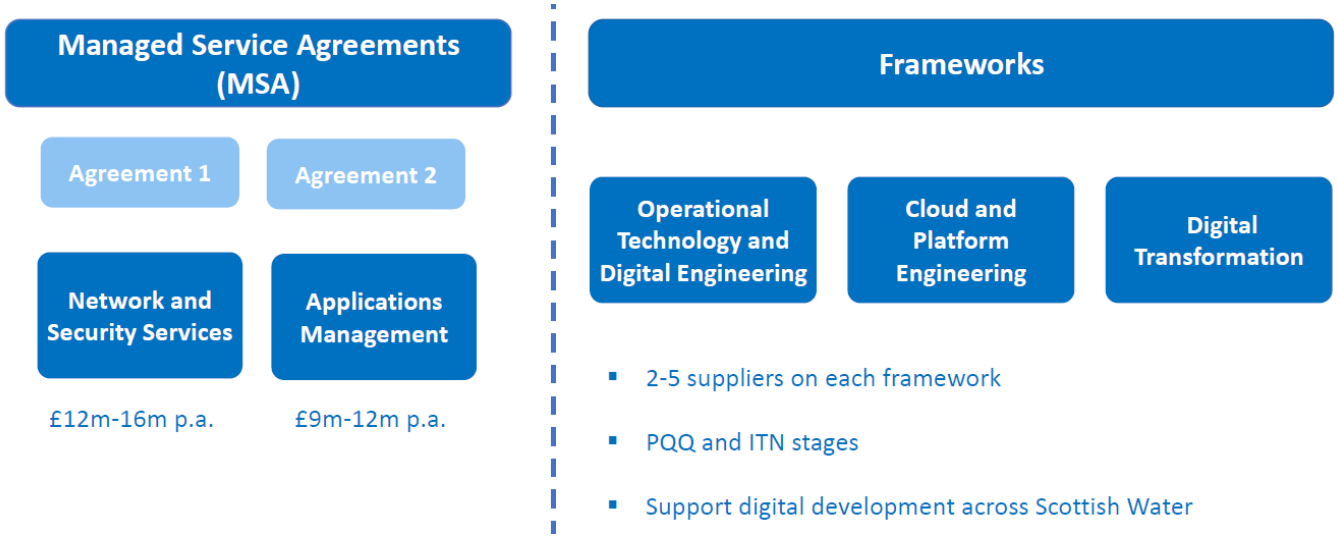


*Figure 12: SR27 Digital Supply Chain Overview*

### *3.3.3 Stand-alone and other*

Scottish Water will also procure and/or extend supply chains that will cover investment requirements for Fleet, Property and other business wider requirements, as well as specific large complex procurements for Bio-Resources and Ceramic Membrane Treatment.

## 3.4 DV4 – Our Enterprise delivery model for SR27

This section sets out our plans and activities involved in the establishment of our new enterprise delivery model for SR27, DV4. This is a dynamic programme and will keep up updating WICS and other key shareholders through till Final Business Plan submission.

### *3.4.1 Enterprise Roles and Responsibilities:*

**The Capable owner** is a subset of Scottish Water, which will set the outcomes and the programme the enterprise needs to deliver.

**The Integrator** is assigned these outcomes and is required to plan, orchestrate resources, allocate work, commercialise and review the performance within the Enterprise. This will be primarily Scottish Water teams supported by other partners.

In terms of **Digital capability** – We recognise opportunities to improve the use of Artificial Intelligence, maximise the use of our systems to ensure we improve live data integrity and other approaches that could improve productivity and outcomes. There is also opportunity on the operational technology side by exploring the value from digital engineering. We are still considering the form this will take, although there is opportunity for this to be more Scottish Water-led, augmented by capabilities from other partners.

**The Primary designer** is an important change to our current design approach. It will provide full design oversight for the enterprise and would replace our current technical consultant's framework which will end in 2027. They will work closely with Scottish Water's Environment,

Planning & Assurance Directorate (EPA) and Technical, Specification & Assurance team (TSA) on asset commissions bringing this knowledge into the Enterprise to support all specialist design in the supply chain together with the design and build asset delivery partners to further support the right outcomes being delivered. This will help us embed standardisation and explore nature-based solutions for the future. There will also be a focus on driving new innovations that will support positive outcomes on carbon, service and efficiency.

Our **Asset Delivery Partners** will require a range of capabilities such as MECIA, Civils and buildability design, where not supported by the primary designer, and will likely be a combination of medium and large partners from a trading and resource perspective that can bring the right balance of self-delivery capability that support modern methods of construction to deliver asset outcomes that work for customers.

Finally, surrounding the enterprise and all the other delivery approaches is a wider **supply chain ecosystem** where other **key suppliers**, our **regional partners** and **wider material and service frameworks** will be situated.

We also recognise that new requirements will emerge over time, such as the reach and acceleration of blue/green infrastructure solutions. These requirements and opportunities will emerge through our Climate Change Adaptation Plan and Climate Change Bill. These will have the option to be delivered within the Enterprise or as stand-alone procured partnering supply chains. It is anticipated that the range of potential partners and subsequent skills will be more diverse than current arrangements.

*Table 2: Expected number of partner and procurement timing*

| Role | Number of partners | Launch date |
|---|---|---|
| Primary Designer | 1-2 | 2024 |
| Asset Delivery Partners | 4-6 | 2024 |
| Digital Procurement | 2 + framework suppliers | 2025 |
| Ecosystem Frameworks | As Required | 2025 |
| Domestic Subcon Network | Unlimited | 2026 |
| New Regional / Specialist Contractors | TBC | 2026 |
| DV2 | As per extensions | 2025 |

### *3.4.2 Learning from industry best practice*

This has been created drawing on better practice in the market as shown in Figure 13.

*Figure 13: Examples of industry best practice*

Through the validation process we incorporated learnings gained from our experiences over the past 20 years of using different approaches and project outcomes, and the experiences of other organisations.

From National Grid we learned the importance of governance arrangements and clear roles and responsibilities within/outside the Enterprise.

From Sizewell C we learned the importance of commercials principals that will underpin the incentivisation strategy should support both horizontal and vertical integration to drive the right behaviours.

From Crossrail we learned establishing clear hierarchy of risks across the organisation, establishing ownership and creating a holistic portfolio level risk management framework, and from a wide range of references we also learned the importance of having client skin in the game and the importance of this for mobilisation and setting the drum beat of the Enterprise.

### *3.4.3 How this compares to the approach in SR21*

The DV4 enterprise approach is a departure from transactional contracting and a natural evolution in our supply chain approach. Key partners will be part of planning and prioritisation of the programme through the Integrator; standardisation will be driven effectively through the primary designer; both operational and digital technology systems will be integrated effectively through the digital integrator; and all members of the DV4 Enterprise will be jointly incentivised to deliver asset outcomes. We will lead on the Integrator and Digital aspects.

The commercial approach will change significantly. We will adopt a cost reimbursable model and move away from on-cost allowances and target costs. It will be developed under a single Enterprise contract, enabling flexibility and adaptability where partners can change over time, due to performance and/or required capability. This will be a bespoke contract based on the tried and tested New Engineering Contract 4 (NEC4) Alliance model. Partners will be incentivised against sub programme, and Enterprise outcomes and the model will incentivise innovation. It will also

disaggregate defined costs, fees, and risks to drive more efficiency in defined cost. We will also retain a level of moderation to control a fair and reasonable return to the partners based on effort and outcomes. How risk is managed and priced will be considered during the procurement. It is intended that we will take a greater role in pricing risk rather than it being simply transferred to the market. This represents a more balanced approach to risk which makes us a more attractive client whilst offering best value for our customers.

The DV4 Enterprise will be dynamic and flexible to withstand internal and external future uncertainties, allowing new entrants to be procured and join the Enterprise to ensure the right mix of capability and capacity to match our needs. This will help improve our performance and delivering Service Excellence.

The contract term will be 13 years (vs. the industry average of eight) which will enable us to become a more attractive client and build on our current steady dependable partner brand. This would be the first one in Scotland of this type and scale, aligning to our Bold ambitions.

A features comparison between the current SR21 model and the new SR27 approach is noted in Figure 14.

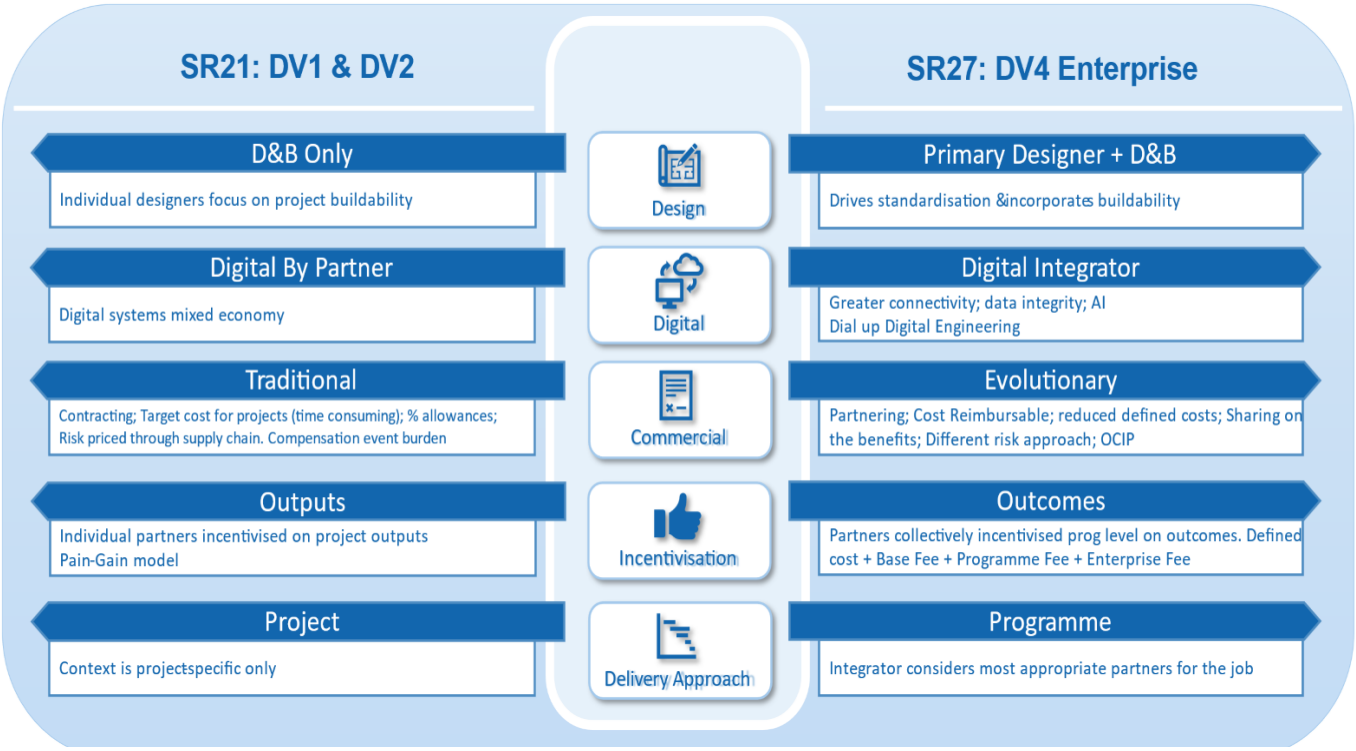


*Figure 14: SR27 SR21 Features Comparison*

The SR27 DV4 Enterprise proposal represents a step-change in approach which learns from and improves upon the SR21 DV1 & DV2 supply chain construct. Highlighted here are several examples of feature differences between the two supply chain approaches.

### Design

The existing construct uses 3rd party design partners to support EPA requirements, with a hand over to CI delivery partners at Gate 50 to offer buildability input. The interface with the TSA team is at arm's length. This is currently undertaken on a project-by-project basis, which lacks cohesion and direction. In the Enterprise, the primary designer will coordinate design end to end providing support to EPA, with a stronger interface to the TSA team, and being a key partner

commercialised through outcomes within the Enterprise. They will also support on the buildability design with the Asset Delivery Partners and specialist designers in the wider supply chain, and consequently be able to drive our standardisation and nature-based solutions and create associated benefits.

### Digital

Digital focus has been on streamlining Business to Business (B2B) data transfer and bringing in new systems to support investment delivery. In the new model there is opportunity to improve live data integrity and interfaces between the partners and Scottish Water systems, as well as using best in class tool kits to improve productivity and outcomes (digital rehearsals etc). There is also opportunity to leverage emerging benefits of AI and well as exploring the benefits of digital engineering supporting improvements in operational technology. Under the new approach this will be Scottish Water-led, with capabilities drawn in from the other Enterprise partners and the digital supply chain as appropriate.

### Commercial

It is understood that the existing commercial approach is not producing appropriate behaviours with an increasing focus on passing risk through the supply chain tiers and excessive compensation events creating an administrative inefficiency. It is generally transactional and contractual on a project-by-project basis based on NEC option C target costs pain/gain with on cost allowances. The Enterprise proposes to address these behaviours whilst still aligning to the tried and tested NEC4 alliance partnering model. This would also include a re-balancing of risk through the removal of generic risk from asset delivery partners and moving some insurances to Scottish Water's Owner Controlled Insurance Programme (OCIP). The new model will use NEC4 option E cost reimbursable focusing on reducing defined costs with incentivisation on outcomes with base level of recovery and margin and an opportunity for more reward at a sub-programme and Enterprise level based on outcome performance.

### Incentivisation

The current model is traditional in the way it uses pain-gain on a per-project basis. This lack of a holistic approach is driving inappropriate behaviours on some projects when they encounter difficulties. Instead, the Enterprise would adopt a cost reimbursable model with guaranteed base fee, allowing for a focus on reducing defined costs. Incentivisation is also applied through programme fees and Enterprise fees, giving all parties 'skin in the game' to deliver on programme outcomes rather than project-specific activities. This represents a more attractive proposition for the supply chain, who would see us as a 'client of choice'.

### Delivery Approach

The current approach sees every project in isolation which is driving some unwanted behaviours and inefficiency. The proposed Enterprise Integrator would take a programme perspective when considering how best to achieve the outcomes specified by the Capable Owner. Taking this wider context into account will lead to greater efficiency and productivity.

## 3.5 Benefits case

As we consider our future supply chain requirements and what changes might be required, we must ensure that the updated SR27 supply chain model supports our strategic ambitions and vision. This will include both financial and non-financial benefits. The implementation of an DV4 Enterprise model and the other supply chain elements are not solely focussed on financial benefits, it's also about improving our performance for our customers.

Our expectations and requirements on safety, health & wellbeing; net zero, and customer service will be set out during the procurement process and embedded within the contractual and incentivisation outcomes.

The main (non-financial, non-social value) benefits we expect from our recommended approach are:

- Deliver value for money our customers,
- Reduce delivery time leading to efficiencies,
- Lean, agile solutions driven by increased standardisation
- Increased use of the latest digital solutions and technology.

Full details of the deliverability efficiencies and financial benefits available are set out in the *Technical Appendix 012 – Efficiency*.

### *3.5.1 Implementation Cost*

It is estimated that this will cost Scottish Water ~£10m to implement this model. This will include implementing the necessary cultural, process and organisational changes.

### *3.5.2 Social value*

Wider social value will also be generated with this new SR27 supply chain design sustaining over 14,000 direct and indirect employment opportunities. Included in this is over 1,500 new young people opportunities over the 6 years. Our procurement and partnering approach will also support the continued development to deliver excellent customer service and community engagement, and have a collective focus on improving safety, health and wellbeing in our industry. It will also support the Beyond Net Zero ambitions through the new primary designer approach and focus on innovation. These expectations will be set out during the procurement process and embedded within the contractual and incentivisation outcomes. The increase in Blue Green Infrastructure will also provide wider societal benefits.

- Sustaining ~14,000 jobs & 1,500 new young people opportunities
- Volunteering, educational and local community benefit
- Using Local SME's ~80% of supply chain
- Embedding Health, Safety & Wellbeing Values
- Supporting Fair Work First
- Supporting the 75% Reduction in Carbon Intensity of Investment
- Improving Community Engagement & Legacy

## 3.6 Risk and mitigations

During the validation process, six primary risks were identified, and mitigation proposals developed. These were reviewed and validated with EY and the Capital Investment leadership team. Two key risks are worth highlighting; Firstly, the cultural adaptation required for advanced partnering approaches, and secondly, the organisational structural and process change risk. We will need to ensure it dedicates resources to manage this significant change whilst maintaining business as usual.

Additionally, there needs to be a strong leadership commitment and appetite to make these required cultural, structural and process changes. For example, teams such as the Technical

Standards Authority and their interface with the primary designer will be critical. Commissioning teams within specialist services in Capital Investment moving into the Enterprise and opportunities around early CSD engagement and commissioning, as well as potentially closer integration with digital support will all need to be considered.

*Table 3: Key Risk and Mitigations*

| Risk Description | Risk Mitigation |
|---|---|
| **Cutover risk**<br>Delay in SR27 programme ramp-up may cause investment gap | Provide flexibility through extension of DV2. Complete SR27 procurement 1 year before end of SR21 period. |
| **Resource planning risk**<br>SR27 drawing on SR21 resources may cause delivery constraints | Develop and communicate a clear transition path from current DVs to the Enterprise including specific resource requirements and backfills including 3rd party support. |
| **Culture adaptation & organisational change risk**<br>Slow behavioural change may cause benefits to be eroded | Develop a clear transformation plan for cultural adaption for partnering environment and senior leader buy-in for appropriate business structural and process changes. |
| **Communication & Engagement risk**<br>Lack of change clarity may cause loss of behavioural change traction | Develop a clear comms & engagement strategy to articulate the case for change, transition plan, and address concerns. |
| **Supply chain structural risk**<br>Market changes and consolidation may strain delivery capability | Create a mixed economy of asset delivery partners within the enterprise to afford flexibility & resilience. |
| **Market resource availability risk**<br>Supply chain resourcing constraints | Increase Scottish Water's attractiveness as a client through more collaborative early involvement, more appropriate risk balance, favourable incentivisation, culture and longer contract duration. |

# 4 Conclusion

## 4.1 Recommendation

Our SR27 supply chain approach builds on SR21 and wider market benchmarking and learnings. It recognises the case for change that our supply chain needs to be reprocured, the complexity of the market environment that we are operating within, and the need to be more efficient to deliver best outcomes and value for customers and our supply chain partner businesses.

We believe this will feel different, in a good way, bold and inspiring with a mindset of partnering, not contracting. It will also contribute positively to effectively deliver our forward plans and support a flourishing Scotland.

## 4.2 Operational readiness

Operational readiness for SR27 will involve significant change activities over the next 2-3 years for Scottish Water. The model will draw on capability from a combination of Scottish Water and third-party resources, with leadership required to drive greater collaboration and integration at the working level, digital integration, and development of a culture that embraces change and innovation.

A programme of work, led by a General Manager from Capital Investment, will coordinate detailed design and operational readiness activities ahead of contract award in early 2026 and during contract mobilisation. This will ensure that that during transition there is no disruption to SR21 delivery or business performance.

It is critical that a strategy is in place to release capacity and capability from across the Scottish Water business, augmented where necessary, by specialist third party support. This structured transition affords a great opportunity for our people to engage in a more positive experience of change. The DV4 Enterprise model will better attract and retain talent in our own organisation and support the need for us to be a “client of choice” in a challenging marketplace. It should be noted that this will involve a significant, business wide change for us and our supply chain and the level of effort required to implement and sustain this should not be underestimated.

### *4.2.1 SR27 Transition Strategy*

A programme of work to transition to SR27 will coordinate detailed design and operational readiness activities ahead of contract award to DV4 in early 2026 and align change activities associated with the DV2 extension. A General Manager within Capital Investment will work with Directorate leadership teams to ensure that during transition there is no disruption to SR21 delivery or business performance. More details of our transition strategy are set out in Figure 15 below.

The DV4 enterprise model represents a step-change in approach which learns from and builds upon the SR21 supply chain construct – moving towards delivery of programmes of work that are focussed on outcomes for our customers; employing innovative commercial arrangements that incentivise partners around aligned objectives; improving live data integrity and interfaces with partners and leveraging digital engineering and AI to improve productivity.

The enterprise model will better attract and retain talent in our own organisation and support the need for us to be a “client of choice” in a challenging marketplace. Maturing culture, behaviours and leadership strength across our business is essential for integrated working and collaboration which is at the heart of the new model.

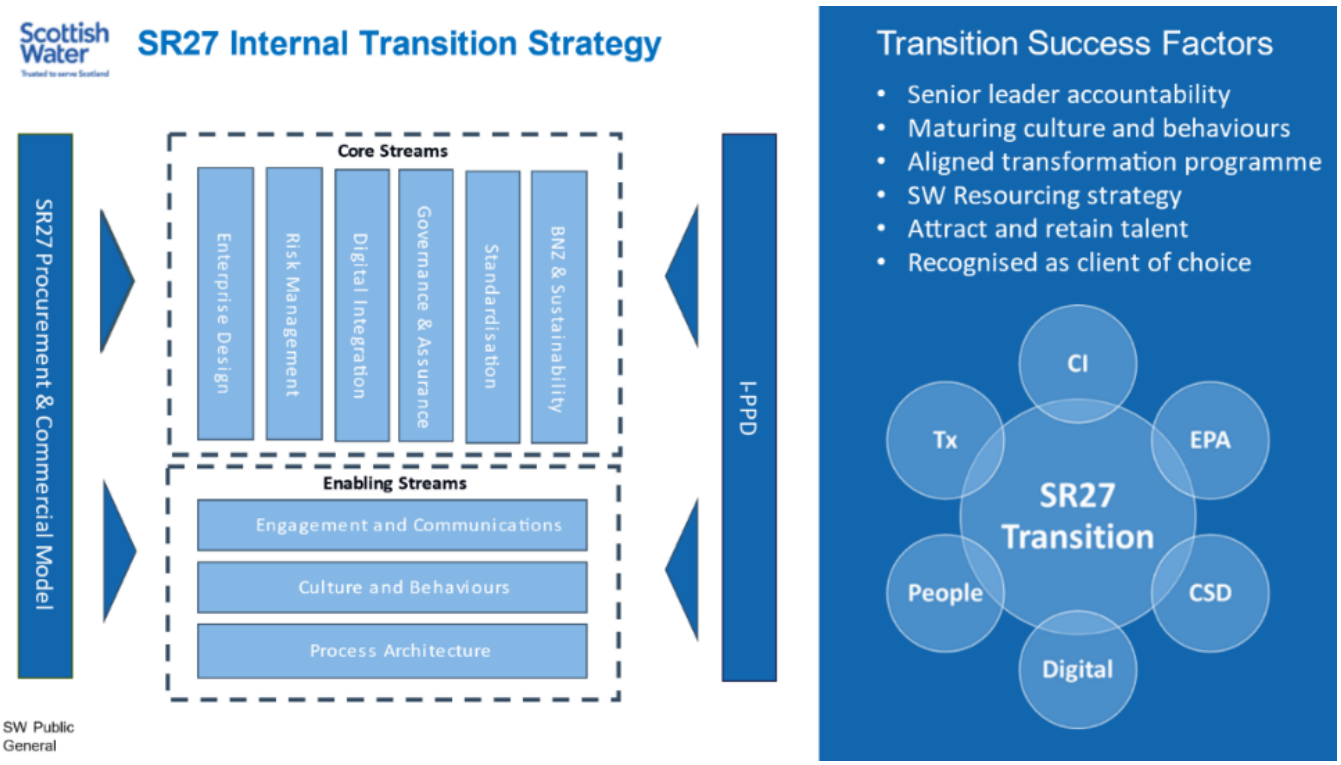


*Figure 15: SR27 Internal Transition Strategy*

## 4.3 Timeline

The overall timeline of the activities and plans described in this paper are set out below. We are currently on track, carrying out the ***Procurement Activities*** in the ***Build & Transition*** stage.

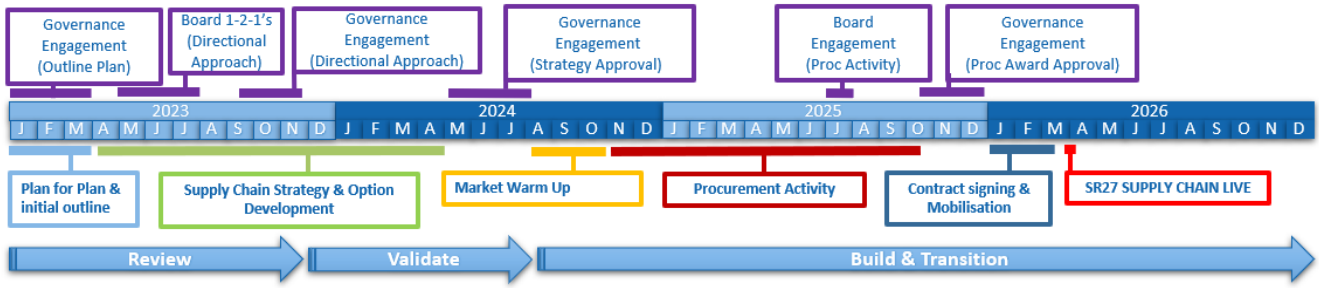


*Figure 16: Overall timeline & next steps*

# Efficiency
## Technical Appendix 012

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# 1 Executive Summary

As a regulated monopoly working on behalf of the Scottish People, it is vitally important that Scottish Water operates efficiently so that our customers receive the best possible value for money. Improving how efficiently we operate was a major focus in previous charge control periods, and significant improvements have been made.

This appendix brings together the evidence we have collected and the analysis we have undertaken to assess Scottish Water's current level of efficiency (relative to its relevant peers), the level of future efficiency improvements that we will strive to achieve during SR27 and Scottish Water's approach to estimating the efficient costs of projects in the SR27 business plan.

In this appendix, we explain:

- Scottish Water's operating cost efficiency evidence and assessment;
- Scottish Water's capital cost efficiency evidence and assessment;
- Evidence in relation to an appropriate 'Frontier' efficiency challenge during SR27;
- Proposals on the application of a 'totex' efficiency challenge in SR27;
- Evidence in relation to Real Price Effects (RPEs) and their inclusion within SR27; and
- Scottish Water's approach to estimating the efficient costs of projects in the SR27 business plan.

We conclude from the various elements of our analysis that Scottish Water is currently efficient, that a 0.8% per annum frontier challenge would be suitable for SR27 and that it would be correct to take account of RPEs when setting the SR27 price control and judging Scottish Water's performance over the period.

This appendix focuses on the assessment of Scottish Water's current efficiency (using predominantly historical data) and the technical exploration of future efficiency (relating to frontier shift and RPEs). Closely related to this are practical assessments of Scottish Water's future efficiency. Evidence on these issues are included in the following areas:

Information relating to Scottish Water's past and forecast Transformation activities is included in the Innovation and Transformation Technical Appendix.

Information relating to the assessment of large (>£6m) and very large (>£100m) projects are included in the relevant investment areas of the business plan.

Much of the evidence and analysis contained in this appendix has already been shared with WICS, as we have sought to work collaboratively with the regulator in order to provide high quality and robust evidence. We received very helpful feedback on this evidence and analysis from WICS on 28 March 2025, and have endeavoured to update and improve our submission accordingly. Where substantial progress has not been possible by the time of publication, we have signalled further work we will undertake ahead of submitting the Final Business Plan in February 2026.

# 2 Background

## 2.1 Context

Scottish Water was formed through the 2002 merger of three regional water authorities – creating a single, publicly-owned and accountable public corporation serving the whole of Scotland. As noted in our Long-Term Strategy (LTS), published in May 2025, at its formation Scottish Water's efficiency performance was poor compared to other UK water companies. Over the last 20 years we have significantly improved our efficiency – helped by effective independent regulation from our regulators.

Our economic regulator, the Water Industry Commission for Scotland (WICS) has commented on this improvement, stating that Scottish Water's customer service and operational efficiency are now "at least as good as those of the leading water companies in England and Wales."[1]

Despite this improvement, we must always push to ensure that our customers continue to receive the best possible value for money. In competitive markets, competition is the main driver of efficiency performance. Companies must push to either improve their service or lower their costs relative to competitors. Those who are inefficient risk being pushed out of the market. As a regulated monopoly, Scottish Water is not subject to this efficiency-promoting competitive tension. Instead, Scottish Water and WICS work hard to analyse and establish whether Scottish Water remains efficient relative to key peers and WICS sets efficiency improvement challenges to ensure that we continue to improve and become more efficient over time.

## 2.2 Our approach to assessing efficiency in SR27

Our plan for collating evidence and assessing Scottish Water's current level of efficiency (and appropriate future improvements) was created in collaboration with WICS and submitted in October 2024. This plan helped to shape the requirements as laid out in the WICS SRC27 Final Methodology. The final methodology requests Scottish Water to provide evidence of underlying efficiency across operating and capital spending, with a number of specific requirements.

In relation to operating efficiency (opex), WICS requires that we conduct econometric analysis by applying Scottish Water data within models developed by Ofwat, including:

- the base expenditure models used by Ofwat in its 2019 price review (PR19) (as updated by Competition and Markets Authority in the case of the four company referrals of Ofwat's Final Determinations); and
- the base expenditure models used by Ofwat in its 2024 price review (PR24), which were confirmed by Ofwat in its draft determinations on 11 July 2024.

WICS required that we make amendments to these models for capital maintenance and PFI contracts and asked Scottish Water to triangulate the results to reduce the reliance on any one model.

In relation to capital efficiency (capex), WICS requires that we utilise a combination of different techniques, including:

- using external consultants to benchmark the direct construction costs within Scottish Water's most significant cost models (which account for over 90% of the business plan cost inputs) against equivalent models from UK water and sewerage companies of comparable scale and operating model;

[1] Encouraging better performance from Scottish Water | WICS

- benchmarking of Scottish Water's indirect and on-cost levels against those of companies in England and Wales, supported by three external cost consultants;
- benchmarking against Scottish Water's outturn costs of delivering similar projects in previous years, adjusting for capital price inflation and an assessment of productivity improvements;
- benchmarking Scottish Water's enhancement cost forecasts against data from companies in England and Wales using Ofwat's econometric benchmarking of enhancement costs; and
- conducting an external review of a sample of projects from Scottish Water's plan.

In relation to frontier efficiency and real price effects (RPEs), WICS requires that Scottish Water provides an internal review of the likely scope for efficiency improvements over and above that captured in Scottish Water's baseline capital expenditure forecasts. This review would be based on evidence of the scope for productivity improvements from other comparable sectors, evidence of efficiency gains from Scottish Water's transformation programmes, and considerations for real price effects and risk allocations.

The following sections describe the work we have undertaken to meet these requirements, highlights further analysis or evidence gathering required before submission of the final business plan and proposes Scottish Water's interpretation of the evidence in relation to our current and future levels of efficiency.

As required by WICS, the major elements of our evidence and analysis in relation to opex modelling, capex benchmarking and RPE analysis was submitted to WICS in February 2025. In addition, Scottish Water commissioned First Economics to undertake a 'peer review' of our evidence and analysis – the key findings of which are discussed within the relevant sections of this Technical Appendix. First Economics were chosen as they are experienced experts in UK regulatory price controls having worked extensively with both regulators and regulated companies on assessment of efficiency. Valuable feedback from both WICS and First Economics has been received, and we have begun to incorporate this into our evidence base and findings. There are some elements that remain under development, and where we expect to update our analysis for submission of the Final Business Plan in February 2026. Where this is the case, this is noted in the relevant section. Square brackets may be used to identify areas for further development or where specific figures are likely to be updated in the final plan.

For note, some elements of the Scottish Water efficiency plan and WICS methodology requirements are presented in other areas of the business plan in order to improve the overall readability of the document, specifically:

- Our work in relation to the operating cost baseline is included in the Finance Technical Appendix;
- Our work in relation to Transformation projects, both the SR21 experience and our anticipated savings in SR27 is included in the Innovation and Transformation Technical Appendix; and
- Evidence relating to the efficient costs associated with individual projects, which are discussed in the relative key investment area documents.

## 2.3 Challenges and opportunities

Efficiency can be difficult to measure with certainty. Different companies have different mixes of costs and definitions can vary. We have taken a lot of effort to try to ensure that our analysis uses data and approaches that are 'apples-to-apples' wherever possible, but there are inevitable inconsistencies. Similarly, companies and regulators often must apply judgement when assessing data, triangulating from a number of sources and data types to build up an overall picture of efficiency. The assessments in this document reflect our best understanding of Scottish Water's efficiency position and potential.

It is well recognised (including by Ofwat, the CMA and other regulators such as Ofgem) that the stringency of the benchmark that it is appropriate to use when assessing the scope for catch-up efficiency will depend on the likely reliability of the modelling results.[2] Therefore, where we believe efficiency assessment can be more precise and reliable, such as in certain areas of econometric modelling, we have tended to focus on the upper quartile of efficiency performance as the appropriate benchmark for Scottish Water. This aligns with the requirement on English and Welsh companies, for whom upper quartile efficiency is set as the "catch up" efficiency target for their base costs. However, care is needed when interpreting individual models and results can vary significantly depending on the assumptions used.

Where we consider there less ability to be precise or data or approaches are less reliable, such as the benchmarking of capex costs, we have generally considered the average or median performance to be a more appropriate benchmark for Scottish Water. Here there is more scope for divergence across activities, categories and approaches, and so we believe that caution and judgement should be applied to help build a representative picture of efficiency.

Caution is also required when using forecasts (or when using historical data as proxies for forecasts where official forecasts are not available). This is particularly relevant in areas such as frontier shift, which considers economy-wide productivity improvement. Here, the choice of look-back period can drive very different levels of historical productivity gains over time. Using data from periods before the global financial crisis (GFC) in the late 2000s would tend to suggest higher levels of productivity gains are possible, while using data from periods after the GFC would suggest much lower levels of productivity gains are possible. Similarly, the anticipated impact of 'new' factors such as artificial intelligence may impact what appears to be a reasonable challenge over SR27. Assessing RPEs will typically involve the use of historical average and/or official forecasts, and both sets of data may be different than outturn levels of RPEs. However, this risk can be mitigated via the inclusion of an 'ex-post' mechanism that adapts the price control for outturn levels of prices.

Most opportunities in this area relate to Scottish Water's ability to outperform the frontier efficiency challenge, using general improvements and specific Transformation projects to drive higher savings that benefit our customers. As a publicly-owned company, any upside from such savings are reinvested for our customers and do not lead to increased financial returns (as might be the case in private monopolies). These opportunities are discussed in more detail in the Transformation and Innovation Technical Appendix.

The inclusion of RPEs provides an opportunity for increased effectiveness of the charge control regime, allowing the regulator to take account and adjust for movements in prices that are different

[2] See for example, CMA (April 2021) Ofwat Price Determinations: Final Report, paragraphs 4.491-4.494.

to general inflation and do not reflect changes to the efficiency performance of Scottish Water. We discuss this potential further in the RPE section below.

# 3 Our Approach to Opex Efficiency in SR27

## 3.1 Operating cost efficiency assessment

This section summarises the approaches and evidence used by Scottish Water in assessing Scottish Water's efficiency in relation to operating costs (opex), and its performance relative to other water companies in England and Wales. As agreed with WICS and laid out in its SRC27 Final Methodology, this work is primarily based on a range of econometric modelling that Ofwat and/or the CMA used in their assessments of cost efficiency at PR19 and PR24.

In our agreed workplan with WICS, we emphasised that we anticipated there to be factors that were specific to Scottish Water and that would need to be taken into consideration. These were:

- the policy focus on asset replacement in Scotland;
- the impact of the use of PFIs;
- the differing costs associated with operating across the Highlands and Islands of Scotland; and
- the differences in cost allocation approaches used in Scotland and E&W.

For example, the greater focus on asset replacement in Scotland has resulted in relatively high levels of capital maintenance in recent years compared to companies operating in E&W. Because these types of costs are included in Ofwat's modelling, this policy difference can tend to make Scottish Water appear to be less efficient (where other things would be equal). Adjusting for this allows more appropriate comparisons of underlying efficiency to be made.

The detailed economic modelling undertaken has already been shared with WICS and analysed collaboratively to help to ensure that models used are appropriate for a Scottish context. For ease of reading, this section of the Technical Appendix will focus on the high-level approach taken, the key findings of this analysis and Scottish Water's interpretation of those results. Further detailed information on the approach used in this analysis, Ofwat's models and their application in SR27 and the impact of Scottish Water-specific factors, is included in Annex A to this technical appendix.

### *3.1.1 Water*

In relation to water opex analysis, we have utilised Ofwat's updated PR24 models which seek to explain all material difference in company costs through the inclusion of variables relating to scale, population density, treatment complexity and topography. As described in Annex A, we tested a number of different approaches and assumptions when adjusting for the impact that the different approach to asset replacement in Scotland can have on modelling results (and it is these differences which give rise to the ranges referred to below).

Our analysis finds that - after appropriate account is taken of asset replacement policy - Scottish Water wholesale water operating costs are around 0-5% higher than the upper quartile level (and broadly in line with the median level), in comparison to companies in England and Wales before considering the impact that serving the Highlands and Islands can be expected to have on the efficient costs of service provision. Our analysis suggests that when the Highlands and Islands impact is adjusted for, Scottish Water's costs are in line with the upper quartile level and significantly below the median level.

### 3.1.2 Waste Water

In relation to waste water opex analysis, we have utilised Ofwat's PR19 and PR24 models other than where the extent of PFI provision of relevant waste water services in Scotland raised material comparability constraints. As with water (and described in Annex A), we tested a number of different approaches and assumptions when adjusting for the impact that the different approach to asset replacement in Scotland can have on modelling results.

Our analysis finds that – after appropriate account is taken of asset replacement policy – Scottish Water wholesale waste water operating costs are at least 1% lower than the upper quartile level (and more than 10% lower than the median level), in comparison to companies in England and Wales. Compared to water costs, the impact of operation across the Highlands and Islands of Scotland has less of an impact on waste water costs due to role of septic tanks in more remote areas.

### 3.1.3 Peer review findings

First Economics found that it was content with the emerging view that Scottish Water 'is a relatively efficient, possibly frontier-defining' provider of water and waste water services and does not therefore need to take on a 'catchup' challenge in relation to its base costs. Details of First Economics' assessment and how this has been taken into account in our analysis (including through the consideration of a broader range of options when adjusting to reflect asset replacement policy in Scotland) are included in Annex A of this document.

### 3.1.4 Scottish Water Assessment

In summary, our analysis indicates that Scottish Water's current underlying level of opex efficiency is likely to be in line with that of the leading companies in England and Wales (based on Ofwat's models with appropriate adjustments to improve comparability and reflect Scottish policy positions). As a result, Scottish Water proposes that the evidence supports no efficiency 'catch-up' requirement in relation to opex costs in SRC27. As described further in Annex A, we will continue to develop and refine our analysis ahead of the final business plan, including to take account of feedback from WICS.

# 4 Our approach to capex efficiency in SR27

## 4.1 Capital cost efficiency assessment

This section summarises the approaches and evidence used by Scottish Water in assessing Scottish Water's efficiency in relation to capital costs (capex).

Assessing capital cost (capex) efficiency is typically less suited to the econometric modelling techniques used extensively in the assessment of opex efficiency (and discussed above). As noted in the Scottish Water efficiency work plan and the WICS Final Methodology, the Scottish Water approach uses different techniques and sources of evidence to assess efficiency – and combines these approaches to reach an overall assessment of Scottish Water's current capital cost efficiency position. In the sub-sections below, we present and discuss the analysis that has been undertaken to-date, including: [3]

- Using external consultants to benchmark direct costs;
- Using external consultants to benchmark indirect costs;
- Benchmarking costs against outturn project costs; and
- Benchmarking enhancement cost forecasts versus England and Wales companies using econometric analysis.

There are inherent difficulties in achieving like-for-like capital cost comparisons with relevant peers. Scottish Water considers that that judgement should be applied when interpreting the results of this efficiency analysis. While not a precise read-across to the Direct and Indirect benchmarking assessments above, we note that Ofwat also flags issues when assessing efficiency at the company (rather than scheme) level, and that where it considers appropriate (such as in enhancement cost modelling) Ofwat 'generally sets the benchmark based on the efficiency of the median company'.[4] Taken in the round, Scottish Water proposes that the evidence referenced in this section is supportive of a 'below median' capital cost position – and that this demonstrates that Scottish Water is efficient relative to peers.

On this basis, Scottish Water proposes that the evidence supports no efficiency 'catch-up' requirement in relation to capex in SRC27. There are, however, areas of analysis where we will look to develop our evidence base ahead of Final Business Plan submission. We highlight these areas in the relevant sub-sections below.

### *4.1.1 External benchmarking – Direct costs*

**Introduction**

Scottish Water commissioned specialist cost consultants, ChandlerKBS (CKBS)[5] to benchmark Scottish Water's latest generation (termed 'R2309') direct construction cost models and 'curves' against equivalent models used by water companies in England and Wales (of comparable scale and with suitably similar approaches to delivering capital investment projects). This process was

[3] Please note – The efficiency plan and the Final Methodology include reference to an external review of a sample of projects. As communicated to WICS, upon further assessment we consider this analysis to be duplicative of the benchmarking assessments and/or other assessments with the Business Plan submission (such as the PIA review) and have not commissioned this work.

[4] Ofwat (2024), PR24 Final Determinations: Expenditure allowances – enhancement cost modelling appendix, page 28

[5] CKBS are market leaders in providing Cost Intelligence Services to the water sector with expertise in cost intelligence services, cost management, project management and supply chain management with a proven track record spanning more than 20 years advising the major water companies, regulators and contractors. CKBS have extensive knowledge and experience of the approach water and sewerage companies use to meet the various financial and regulatory requirements.

used to assess the suitability of current R2309 cost models for Scottish Water's regulatory requirements and to audit Scottish Water's current level of capex efficiency position. The CKBS report has been shared with WICS.

The R2309 cost models, which were developed in September 2023, cover new work costs at unit level and reflect the actual costs that Scottish Water has incurred undertaking investments.[6] The data in the R2309 cost models principally covers projects completed in the last previous two regulatory periods (SR10 and SR15).

We have used two key business-wide outputs, where R2309 cost models are used as an input, to provide 2 different perspectives to the assessment of cost models as follows:

- **Modern Equivalent Asset Value (MEAV AR24)[7]:** R2309 cost models are used along with Scottish Water's unit level asset inventory to assess the cost of fully replacing all Scottish Water assets through the Modern Equivalent Asset Valuation (MEAV) process used for annual asset valuation regulatory reporting, from 2024 (AR24). This source will allow an aggregated direct capex cost comparison at unit level across the benchmarking.
- **'Level 0' Model:** using the MEAV values from AR24 (our latest annual return submission) as an input, Level 0 analysis provides an indication of the steady state demand based on the expected lives of asset categories. This approach allows a comparison of the expected annual replacement expenditure whereas the MEAV provides an overall assessment of asset valuation without consideration of demand.[8]

We focus our efficiency assessment below on the 'Level 0' approach, as this is significantly more representative of the areas we will be investing in during SR27.

**Benchmarking Approach**

98 out of a total of 233 R2309 cost models were selected for benchmarking. This selection was based on:

- Those cost models that were used in the AR24 MEAV assessment (ie, those most reflective of current capex spending); and
- The identification of cost models where we have lower confidence on the basis of relying on a combination of fewer, older, estimates or 'gap' cost datapoints.[9]

CKBS benchmarked each R2309 cost model against a CKBS 'industry' average cost model and a notional upper quartile model.[10] These will collectively be referred to as 'unit cost model sets'

[6] The R2309's are a combination of estimated and out-turn costs. The estimated data-points have been uplifted by an 'equivalent factor conversion (EFC)' to bridge the gap between estimated and out-turn data to make all data-points 'equivalent' out-turn data-points.

[7] The Modern Equivalent Asset Value (MEAV) represents the equivalent replacement cost of the asset and should reflect both the most technically up-to-date new asset and the most technically up-to-date method of constructing that asset. It does not consider demand.

[8] The 'Level 0' model assesses this demand for Category 2 assets. Category 1 assets, including sewers, are excluded from this assessment as this category of assets with particularly long lifetimes (significantly more than 100 years) we assume will be repaired and refurbished in perpetuity.

[9] These models were chosen for inclusion in our analysis to help to confirm that cost models are comparable to equivalent models used by other water companies in England and Wales. This information helps us to understand and analyse variances, requirement for provision of 'gap' industry-wide data-points etc. to improve overall confidence thereby enhancing key Scottish Water business-wide outputs where cost models are used as an input. (i.e. MEAV, SR27 Business Planning, early stage estimating). This work is ongoing, with any material improvement to be included in analysis for the Final Business Plan submission.

[10] The upper quartile represents the costs achievable by the most efficient 25% of companies. This is a notional cost model that is represented by the costs at 25% of the average cost range.

below. CKBS cost models are derived from multiple sources - normalising data and applying confidence gradings as appropriate.

To assess the efficiency of Scottish Water's direct capex costs, CKBS completed the following assessments:

**Individual unit cost model comparison:** Benchmarking 98 R2309 cost models against CKBS 'industry' average cost model and notional upper quartile model, presented in graph format.

**Direct capex cost comparison:** 55[11] of the most relevant unit cost model sets were applied to AR24 MEAV data, to compare aggregated costs if Scottish Water was to fully replace all its infrastructure and non-infrastructure assets using the variance grading system shown below in Figure 1:

| Variance Percentage | Variance Grade | Variance Description |
|---|---|---|
| x < 10% | Very Low | Good alignment of inclusions and costing. |
| 10% < x < 25% | Low | Detailed investigations might identify actions that could improve cost alignments. |
| 25% < x < 50% | Moderate | Improvements could be found to better align costs. |
| x > 50% | Significant | Investigation required to establish the cause and identify the improvements needed. |

*Figure 1: CKBS variance grading system*

Source: CKBS (2025) R2309 Cost Model Assurance & Benchmarking Report

CKBS followed Scottish Water's methodology to align all cost model sets to the cost unit hierarchy code (combined process code) with no material percentage variance across cost calculations. The R2309 cost models were indexed using CPI and 'industry' models by Building Cost Information Service (BCIS) Water and Sewerage Cost Index (WSCI) to MEAV AR24 March 2024 base date. The difference in recorded CPI and WSCI inflation used could both increase or decrease variance, as R2309 cost models may be above or below the 'industry' cost models depending on the inflationary dynamics of different periods.

**SR27 capex efficiency position:** Scottish Water Analytics team created a capex efficiency percentage by applying 40[12] unit cost model sets to the 'Level 0' estimates presenting their findings across:

- Civil Engineering
- Mechanical, Electrical, Instrumentation, Control and Automation (MEICA)
- Distribution
- Trunk
- Cess / Septic Tanks

CKBS provided secondary assurance of the calculations through auditing the alignment of all cost model sets in this analysis.

### Benchmarking Results

**Direct capex cost comparison:** Overall, CKBS concluded that Scottish Water R2309 cost models were 1.3% lower to 'industry' average models and 21.1% higher than upper quartile of

[11] Covering 83.16% of the overall AR24 MEAV.

[12] 40 of the 55 used in the direct capex cost comparison. These 40 unit cost models are more representative of the areas we will be investing in during SR27.

industry measured against the AR24 MEAV, ie, if replacing all our assets. CKBS found that that in relation to non-infrastructure capex spend, R2309 cost models show good alignment with industry cost benchmarks (although there were significant variances across sub-categories). In relation to water capex spend, there was good alignment with models and less variance to peers. In relation to sewer capex, R2309 cost models showed reasonable alignment across grassland and urban surface types, but noted that there is further work to be done to investigate variances in certain rural and suburban categories.

**SR27 capex efficiency position:** CKBS audited SR27 capex efficiency calculations, through 'Level 0' model, showing that Scottish Water's most relevant R2309 cost models were on average 4.2% lower than 'industry' average models and 16.5% higher than the upper quartile of industry. This is shown in Table 1 and Table 2 below.

| Category | AR24 (adjusted) | CKBS Benchmark | Benchmark Variance |
|---|---|---|---|
| Civils | £ 83,458,916 | £ 74,847,742 | 11.5% |
| MEICA | £ 151,982,420 | £ 153,394,386 | -0.9% |
| Distribution | £ 74,891,368 | £ 96,855,831 | -22.7% |
| Trunk | £ 33,538,541 | £ 33,674,638 | -0.4% |
| Cess and Septic Tanks | £ 877,251 | £ 1,132,655 | -22.5% |
| **Total** | **£ 344,748,495** | **£ 359,905,252** | **-4.2%** |

*Table 1: R2309 benchmarking results against industry average cost performance* Source: CKBS (2025) R2309 Cost Model Assurance & Benchmarking Report

| Category | AR24 (adjusted) | CKBS Benchmark (Upper Quartile) | Benchmark Variance (UQ) |
|---|---|---|---|
| Civils | £ 83,458,916 | £ 60,626,034 | 37.7% |
| MEICA | £ 151,982,420 | £ 124,272,145 | 22.3% |
| Distribution | £ 74,891,368 | £ 81,820,370 | -8.5% |
| Trunk | £ 33,538,541 | £ 28,181,548 | 19.0% |
| Cess and Septic Tanks | £ 877,251 | £ 902,681 | -2.8% |
| **Total** | **£ 344,748,495** | **£ 295,802,778** | **16.5%** |

*Table 2: R2309 benchmarking results against industry upper quartile cost performance*

Source: CKBS (2025) R2309 Cost Model Assurance & Benchmarking Report

### Analysis of cost curve benchmarking

As noted above, we consider the Level 0 analysis to be most relevant as this approach assesses Scottish Water's efficiency taking into account of the categories of spend more applicable for SR27. Within this, we note that there are areas of variance included within the position of 4.2% lower capex costs as measured against the industry average, particularly for Civils non-infrastructure where Scottish Water costs appear to be 11.5% higher than the average within the dataset.

We are currently investigating why performance in this category would be worse than the industry average and out of line with Scottish Water's costs in other areas. Within this investigation, we are considering factors including:

- Data availability: We note that there are significantly fewer data-points available in this database for analysis of civil engineering expenditure. For example, there are only 5 Scottish Water data points available for storm water tanks, as these are long-life (c80 year) assets that Scottish Water do not build or replace regularly. As a result, data here may be dominated by esoteric cost issues rather than being reflective of Scottish Water's overall cost performance.
- We note that there may have been periods of particularly high costs for certain activities due to temporary factors – and that if activity is concentrated in these periods it may suggest a cost position that is not reflective of current trends.
- The 'Highlands and Islands' factor identified within Scottish Water's econometric assessment of opex efficiency. Recent estimated capital projects show there is a similar impact on capex cost, particularly for working on Islands. It appears logical that that this impact would most likely to be reflected in civil engineering costs, where majority of costs are closely linked to site in question. This contrasts with other cost categories, where costs may be more skewed to 'offsite'. For example, the overall cost of mechanical equipment is dominated by the 'factory door' cost of the equipment, with transportation and installation being a relatively smaller cost. This contrasts with civil engineering, such as preparing a site using labour and locally sourced materials such as concrete, where more of the costs are directly impacted by the area of operation. We continue to assess evidence in relation to a 'Highlands and Islands' effect on capex costs and will share this evidence with WICS ahead of presentation in the final Business Plan.

**Peer review findings**

First Economics found that, for the most part, Scottish Water's costs compare favourably to the consultants' average benchmarks. The one exception was civils expenditure, where Scottish Water's costs appeared to be higher than the average benchmark. First Economics interpreted this as a directional signal that further investigation is needed in this particular area.

First Economics stated that it may be that there are company- or location-specific factors that mean that Scottish Water's unit costs are naturally higher than its peers. Alternatively, further analysis may identify that there is scope for Scottish Water to match the lower unit costs that other companies appear to be achieving. In the latter case, First Economics noted that it would expect Scottish Water to take on an appropriate 'catch up' target in relation specifically to civils enhancement costs.

In relation to the appropriate benchmark for such exercises, First Economics noted that Ofwat does benchmark certain types of capital unit costs, but its PR24 enhancement cost models are not as well regarded as its base cost models. First Economics was supportive of the approach that Scottish Water took in relation to benchmarking by specialist engineering consultants and noted that the results of this benchmarking have to be treated with a good deal of caution due to the difficulties that there are in making like-for-like comparisons. As a result, First Economics agreed with Scottish Water that in this instance it is better to focus on Scottish Water's positioning versus the median/average cost benchmark rather than an upper quartile benchmark.

**Scottish Water Assessment**

CKBS stated that benchmarking the R2309 cost models had evidenced that, overall, they derive robust high-level costs suitable for use in pricing a Scottish Water business plan. CKBS found that average cost models for Scottish Water are 4.2% below industry average.[13]

[13] CKBS benchmarking report has been separately shared with WICS.

Taking account of the factors mentioned above in relation to the constraints to accurate comparison of costs in this area of assessment, we consider the benchmarking data from CKBS to support the view that Scottish Water is efficient in this area and that no capex efficiency catch-up is required during SRC27.

However, while this analysis shows that Scottish Water's costs are 4.2% lower than the industry average overall, there are significant variances across cost categories – with particularly strong performance in areas such as distribution costs and weaker performance in civil engineering costs. We are currently working with CKBS to examine variances such as this by analysing and sourcing 'gap' data points which may be able to bolster confidence in ~18 of the higher variance cost models. As noted above, we will further consider whether locational or timing factors may explain why civils costs appear to be less efficient than other categories.

If such explanations cannot be sufficiently evidenced, Scottish Water will formulate plans to improve efficiency in this area. Further evidence on these areas will be available in time for inclusion in the Final Business Plan.

### *4.1.2 External Benchmarking - Indirect Costs*

**Introduction**

Scottish Water commissioned three specialist consultants, CKBS, Arcadis and Mott MacDonald to undertake benchmarking of Scottish Water's Indirect or 'On-Costs'. This analysis was conducted in October 2023.[14]

We currently hold a sample data set of 984 projects totalling approximately £2.1b from 2015 onwards. However, to ensure the analysis more accurately reflects Scottish Water's current position, whenever we benchmark ourselves, we use all available data from the previous 3 year period only. In this instance that was 190 projects at a total of approximately £450m from April 2020 onwards, all of which was provided to the Consultants. Across the sample provided we determined that for every £1 of direct cost there is £0.72 of on-costs.[15]

We observe that there is a variation in the level of on-costs across different work types. This can be due to a number of factors such as the relative complexity of the solutions being developed, the level of external stakeholder engagement or the amount of investigations & modelling required up front to ensure sufficient understanding of the problem. It is therefore also useful to look at how representative the sample set is relative to activity across SR21. This comparison is set out in Table 3 below.

[14] This analysis has been separately shared with WICS.
[15] Across the total data set of £2.1b the equivalent figure is £0.70 of on-cost for every £1 of direct cost.

| Work Type | % by Value in Sample Benchmarked | Adjusted for approximate % by value across SR21 |
|---|---|---|
| Waste Water Infrastructure | 15.3% @ £1.89 | 16.5% @ £1.89 |
| Wast Water Non-Infrastructure | 22.9% @ £1.80 | 26.3% @ £1.80 |
| Water Infrastructure | 36.2% @ £1.65 | 22.0% @ £1.65 |
| Water-Non Infrastructure | 25.6% @ £1.68 | 35.3% @ £1.68 |
| Overall Pound in the Ground | £1.722 | £1.738 |

*Table 3: Proportional split of spend by work type*

Source: SW analysis

It can be seen above that if we adjust for the differences between the sample make up and the approximate SR21 make up (currently forecast) it adds £0.016 to our pound in the ground analysis. This suggests that the sample period will have some impact on this analysis, but that this impact is limited and should not have a material impact on our assessment of the benchmarking exercise outcomes.

It should also be noted that risk is always excluded from this type of benchmarking exercise. Risk is not an on-cost as when risks do materialise the cost is generally spread across both direct and indirect costs. In addition, there can be wide variations in the level of risk included by different organisations in their estimates due to their differing risk appetites and delivery approaches – making objective benchmarking impractical.

We are also cautious about analysis of sub-categories of costs, as the combination of sample period variance and decreasing sample size is likely to risk misleading inferences that are not representative of overall efficiency.

**Benchmarking Results**

All three consultants replicated Scottish Water's assessment of Scottish Water's Indirect costs as being at £0.72 for every £1 of direct construction cost across the sample provided, and therefore figure was to benchmark against available industry data.[16]

CKBS benchmarked Scottish Water's Indirect Costs as being approximately £0.04 below comparator companies (note, there is a drafting error in their report provided which incorrectly states this figure as £0.02).

Mott MacDonald's analysis showed Scottish Water as having lower Indirect costs than all of their comparator companies – positioning Scottish Water as being 33% below the water industry average of £1.09 for every £1 of direct cost.

[16] It should be noted that the Arcadis main report presents a figure of £0.85 for Scottish Water's Indirect costs. However, this figure was derived from their own proprietary analytics engine which was not in line with the approach undertaken by Mott MacDonald, CKBS or Scottish Water. The Arcadis appendix shows the results of their analysis using the same approach as the other two consultants and shows Scottish Water costs at £0.72.

Arcadis's analysis suggested that Scottish Water's Indirect Costs were approximately £0.13 lower than the industry average of £0.85.

These results are summarised in Table 4 below.

| Scottish Water Data | CKBS Benchmark | Mott MacDonald Benchmark | Arcadis Benchmark |
|---|---|---|---|
| £0.72 | £0.76 | £1.09 | £0.85 |

*Table 4: Summary of Indirect Benchmark Results*

Source: Scottish Water analysis of CKBS (C), Arcadis (A) and Mott MacDonald (M) data

The consultants noted that care is needed in interpreting the findings, as the programme delivery approach choices made by companies can substantially shift where costs are recorded – with no direct impact on relative efficiency. On this basis, we consider it to be most appropriate to consider the overall on-costs, rather than the split between client and contractor costs. For example, CKBS note that many large water companies adopt an alliancing approach to programme delivery that will shift the risk and accountability for programme delivery to the contracting entity. This will often increase construction on-costs whilst decreasing the client on-costs. As an example of this, within Scottish Water we allocated almost all early project development costs incurred prior to agreeing a target price with our delivery partners as Client On-costs. However, we understand that water companies that have large alliances in place may allocate a lot of the same early project development costs as Contractor On-Costs as it is undertaken by the alliance partner. This operational choice does not have an obvious impact on overall efficiency as measured by the overall cost to deliver.

**Scottish Water Assessment**

We note that the three different 'industry' figures presented by the expert consultants have a wide range of outcomes depending on the sample benchmark data available. This is because the Consultants need sufficiently detailed cost information to undertake the benchmarking and they only get this from companies that they have engaged with directly. Therefore, they are all looking at different mixes of organisations and potentially work types within those organisations. This is one of the main reasons we work with multiple Consultants to give us access to a broad dataset on which to conduct benchmarking exercises. On this basis, we consider it to be most insightful to aggregate the analysis conducted by all three consultants and assessing Scottish Water's 'On Cost' position in the round.

If we look across the three benchmark data sets produced by the consultants in October 2023, the average total On-Cost for benchmark Water and Sewerage Companies (WaSCs) was £0.8817 for every £1 of direct construction cost, which is £0.16 higher than Scottish Water's On-Costs (using the same time period).

Alternatively, looking at Scottish Water's position against all the WaSC comparator data provided by the consultants, it places us second, behind the best performing comparator of £1.63. This can be seen in Figure 2 below. It should be noted however that due to the data being anonymous, which is a requirement of the data being shared with us, it is possible that the 3 consultants have

[17] This is simply taking an average of all WaSC data points in Figure 4 including Scottish Water but excluding 'Water 4M' as it is such a significant outlier. If Scottish Water is excluded, the average of the other companies (still excl Water 4M) is £1.90.

some overlap between the WaSCs in their data sets so these may not be 11 unique comparator organisations.

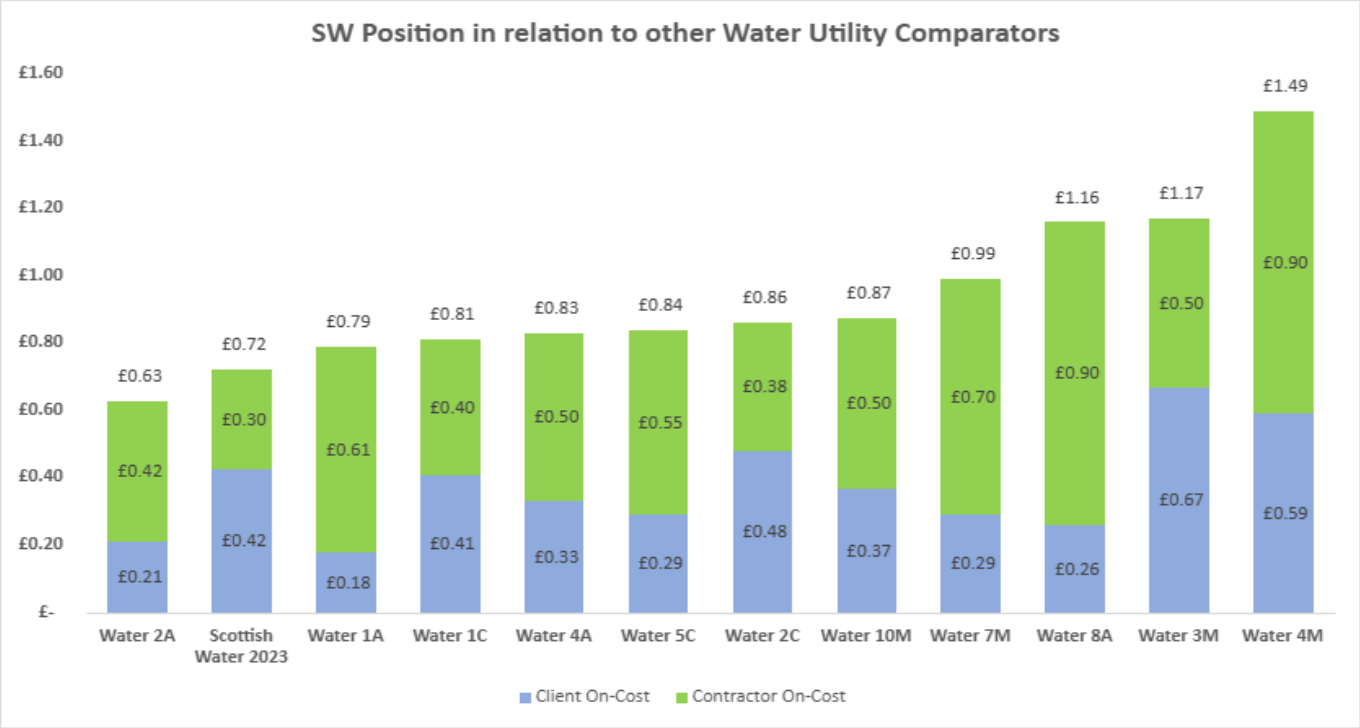



*Figure 2: Scottish Water aggregate of three benchmarking findings*

Source: Scottish Water analysis of CKBS (C), Arcadis (A) and Mott MacDonald (M) data

Supported by this analysis (and the underlying efficiency assessment of the direct construction costs upon which it the On-Costs are compared to), Scottish Water propose that there is sufficient evidence that this Indirect component of Scottish Water's capex costs is efficient and does not require a catch-up efficiency challenge.

However, we note that it may be helpful to commission updated analysis ahead of Final Determinations to respond to any feedback from WICS and ensure we can incorporate the latest data into the final business plan submission. Alternatively, it may be helpful to combine our analysis with any benchmarking conducted by WICS or their advisors in order to further improve the overall quality of the benchmarking dataset.

### Econometric Benchmarking

Econometric Benchmarking of enhancement projects (i.e., analysis of the investment information included in Data Table 9) is under development. As this analysis relates to forecast rather than historical data, Scottish Water's investment proposal for SR27 needs to be established before this analysis can be undertaken. We anticipate conducting this analysis following the submission of the Draft Business Plan with results presented in the Final Business Plan.

### Benchmarking Outturn Costs

We continue to assess our approach to benchmarking outturn project costs – a requirement of the Final Methodology.

However, there are a number of factors that limit our ability to provide a substantial and robust body of evidence in this area at this current point in the business plan development process. Scottish Water moved to a new estimating system, Benchmark Estimating Software (BES) in 2019 using a new cost coding hierarchy replacing the previously used Engineering Estimating

System (EES), while cost curves were updated to the R2309 calibrations in late 2023. As a result, there are a limited number of projects that have been completed using these data sets/systems that also have available outturn costs. As a result, we have very limited sample upon which we could accurately compare to benchmark data and comparison to a very small set of recent outturn data is likely to be misleading, as project-specific drivers are likely to dominate the assessment of overall efficiency.

Comparable projects will become available over time – and so this is an evidence base we will develop and improve. We are working to provide initial findings for submission in the Final Business Plan, but this is an area that we will continue to engage on and share evidence with WICS as we progress through SR27 – with the objective of developing a representative database for comparison in future periods.

The cost basis of projects in the SR27 plan (Gate 50 onwards and £6m or more in value) have been made available to WICS in the form of Scottish Water's Project Investment Appraisal documents.[18] We will also bring in any relevant findings from this evidence base in developing our capex efficiency position for Final Business Plan submission.

In addition, please see details on the efficient costing of the SR27 business, which are detailed later in this Technical Appendix. As noted in more detail below, Scottish Water has access to an external cost curve library, external project benchmark support via AECOM and access to peer-to-peer project benchmarking data via Turner & Townsend to help ensure that we are using efficient costs in our planning.

**Further 'Efficiency' Evidence and Planned Analysis**

*Run Rate Costs*

While not specifically a 'benchmarking' or efficiency exercise, for completeness it should be noted that we also use 'run rate' methodologies to assess costs that cannot practically be benchmarked in line with the approaches described above. This methodology is typically applied on less complex construction methodologies and other business costs such fleet and IT costs.

Given the nature of these costs, which can be more liable to vary with current market conditions, pricing via historical cost curves or other benchmarking approaches is more likely to give an inaccurate representation of the costs that can reasonably be achieved 'today' (even taking general levels of inflation into account).

Where a run-rate methodology is applied, costs are estimated by extrapolating from recent projects or programmes of similar scope and by market-testing through procurement activities.

### *4.1.3 Scottish Water Assessment*

In summary, our analysis indicates that Scottish Water's current underlying level of capex efficiency is likely to be in line or slightly better than the average company in England and Wales subject to further investigation into apparent lower levels of efficiency in relation to civil engineering. Scottish Water therefore proposes that the evidence supports no efficiency 'catch-up' requirement in relation to capex costs in SRC27.

[18] Further information on 'Gates' is explained in the Efficiency of the SR27 Investment Plan section below.

# 5 Our approach to frontier efficiency challenge in SR27

## 5.1 Frontier efficiency challenge

The 'frontier' efficiency challenge is a feature of price control regulation that allows the regulator to ensure that all companies, even those currently considered to be efficient, continue to improve over time to drive customer benefit. Economy-wide data on productivity levels is typically used when estimating an appropriate efficiency challenge level.

The setting of a frontier efficiency challenge typically involves using historical trends to support forecasts over the price control period – and so requires judgement to be applied. In the UK, this has led to recent disagreements between regulated companies and their sector regulators – with companies pointing to evidence showing significant falls in the rate of economy-wide productivity improvements since the global financial crisis (GFC) in the late 2000s, and sector regulators typically basing challenge levels higher assumptions of future productivity based on either longer-term averages or an anticipated 'rebound' in productivity in future years. This difference in perspective has been raised in the upcoming appeals of PR24 at the CMA.

### *5.1.1 Relevant evidence*

We have relied heavily on the existing body of evidence in this area, and in particular the evidence submitted in the PR24 price control process. This includes evidence from Ofwat, the regulated water companies in England and Wales and the respective economic consultants used by both. This analysis incorporates data from the European Commission's Capital, Labour, Energy Materials and Services (KLEMS) database (covering the EU, UK, US and Japan). We have considered recent data from UK-specific sources such as the Office of National Statistics (ONS) and the Scottish Government. We have also cross-checked our assumptions with the level of savings we provisionally forecast being able to achieve through currently identified Transformation projects. In the following sections, we analyse the relevant evidence in order to assess an appropriate Frontier Efficiency Challenge proposal for the SR27 Draft Business Plan.

**England and Wales Company Evidence**

A consortium of water companies commissioned Economic Insights to provide a report on the scope for frontier shift at PR24. In April 2023, Economic Insights published a report that considered a number of different periods measurement periods and comparator sets to provide a range of productivity growth estimates.[19] Relative to the analysis by Europe Economics and CEPA (for Ofwat) which is described below, Economic Insights used a different set of comparator industries – and varied inclusion across its calculation approaches.

Based on this evidence, in Economic Insight calculated several potential frontier efficiency challenge ranges, as shown in Table 5.

| Scenario | Range |
|---|---|
| Sensitivity range | 0.1% - 1.1% |
| Plausible range | 0.3% - 0.8% |
| PR24-focused range | 0.3% - 0.7% |

*Table 5: Economic Insight proposed frontier efficiency challenge ranges by scenario*

Source: Economic Insight (2023)

Economic Insight presented a 'plausible range' of 0.3% - 0.8% p.a. and recommended a 'PR24 focused range' of 0.3% - 0.7% pa, plus an overall 'sensitivity range' of 0.1% - 1.1%. In March

[19] Economic Insight (2023), Productivity and Frontier Shift at PR24.

2024, Economic Insight published a further report which stated that 'drawing on a range of data sources, the UK's actual productivity performance has declined since our April 2023 report', and that 'This might provide some reason for considering values towards the lower end of our previously recommended range.[20]

### *England and Wales Business Plan challenge levels*

WaSCs in England and Wales provided a range of frontier efficiency challenge levels in their business plan submissions, ranging from 0.45% to 0.8%. The unweighted average of the figures proposed was 0.59%. Only Thames Water proposed a challenge level below the 0.5% midpoint of the Economic Insight 'PR24' range. All other companies proposed levels at or above the midpoint of the 'PR24' range, with two companies proposing levels above this range. The efficiency challenge levels proposed by the WaSCs in England and Wales business plans is shown below in Table 6.

| Company | % per annum |
|---|---|
| Thames | 0.45% |
| South West | 0.50% |
| Southern | 0.50% |
| Welsh | 0.50% |
| Wessex | 0.50% |
| United Utilities | 0.55% |
| Hafren Dyfrdwy | 0.61% |
| Severn Trent | 0.61% |
| Yorkshire | 0.70% |
| Anglian | 0.80% |
| Northumbrian | 0.80% |

*Table 6: England and Wales WaSC frontier efficiency challenge proposals*

Source: CEPA 2024

### Ofwat PR24 Decision

Ofwat based their position on work undertaken by economic consultancies Europe Economics and CEPA. Based on a June 2024 report by CEPA, Ofwat estimated that an annual productivity challenge in the range of 0.8% – 1.2% was supported by the evidence, choosing a point estimate of 1.0%. Ofwat's Final Determination stated that that evidence may have supported a more stretching challenge of up to 1.2% per annum [21] [22]

Both CEPA and Europe Economics disagreed with the analysis by Economic Insight that underpinned the submissions of (some) England and Wales companies – questioning factors such as Economic Insights' choice of comparators, the exclusion of 'value-add'-based figures and its focus on data from the post-GFC period.

In relation to gross output measurements and the comparator set used by Ofwat and the CMA in PR19, CEPA's analysis of EU KLEMS data to 2023 showed an (unweighted) average range of 0.1% - 0.7%, with figures depending on the time period chosen. The unweighted average of the four highest performing industries was 0.5% - 1.7%. This information is shown in Table 7.

[20] Economic Insight (2024), Further Evidence on Frontier Shift at PR24, Page 6
[21] Ofwat (2025), PR24 Final Determinations: Expenditure allowances, Page 261
[22] CEPA (2024), PR24 Draft Determinations: Frontier Shift, Real Price Effects and the energy crisis cost adjustment mechanism, Page 88.

| Industry | 1996 - 2008 | 2009 - 2019 | 1996 - 2019 |
|---|---|---|---|
| Chemicals and chemical products | 1.8% | 2.5% | 2.1% |
| Construction | -1.0% | -0.2% | -0.4% |
| Machinery and equipment | 1.9% | -0.8% | 0.9% |
| Manufacturing (and associated) | 1.4% | -0.2% | 0.9% |
| Professional and Administrative (and associated) | -0.5% | -0.3% | -0.3% |
| Total Manufacturing | 1.6% | -0.4% | 1.1% |
| Transportation and Storage | -0.2% | -0.8% | -0.3% |
| **Unweighted average** | **0.7%** | **0.1%** | **0.6%** |
| **Unweighted average of 4 highest performing industries** | **1.7%** | **0.5%** | **1.3%** |

*Table 7: CEPA analysis of historical productivity growth in EU KLEMS data*

Source: CEPA 2024

CEPA also analysed KLEMS data on a value-add basis, finding unweighted average productivity growth estimates of 2.5% for 1996 – 2008, 1.5% for 2009 – 2019 and 1.7% for 1996 – 2019. CEPA state that based on its analysis of EU KLEMS data, it found that the scope for frontier productivity growth was 0.5% - 1.2%. However, CEPA concluded that there are inherent limitations in any approach that relies exclusively on analysis of historical productivity growth rates to set the potential for productivity growth over future periods given important changes in the regulatory framework and the opportunities presented by the introduction of new technologies, such as artificial intelligence. CEPA suggested a more plausible range was 0.8% - 1.2%, as 'we find no evidence to suggest that the scope for frontier shift during PR24 is substantially different from that which other UK regulators have set in recent decisions, which cluster around 1%'.[23]

### Regulatory precedent challenge levels

Ofwat, Ofwat's economic consultants and WICS have all referenced regulatory precedent when considering their efficiency challenge levels. A selection of recent regulatory decisions in this area is included in Table 8.

| Recent regulatory decisions in other sectors | Challenge Level |
|---|---|
| Ofwat PR24 | 1.0% |
| Ofgem RIIO-2 | 1.0% to 1.05%[24] |
| UREGNI GT22 | 0.8% |
| Civil Airports Authority H7 | 1.0% |
| Competition and Markets Authority review of PR19 decisions[25] | 1.0% |
| Ofwat PR19 | 1.1% |

*Table 8: Recent regulatory precedent levels of frontier efficiency challenge*

Source: CEPA 2024

This evidence demonstrates that there is now a body of regulatory precedent that is clustered around a 1% efficiency challenge.

### Other evidence on productivity

Scottish Water analysis of data provided by the UK ONS also shows that there has been a significant change in the trend of overall productivity growth in the UK since the GFC. Immediately prior to this period, productivity growth was trending at ~1.9%. Since 2010, trend growth has been

[23] CEPA (2024), PR24 Draft Determinations: Frontier Shift, Real Price Effects and the energy crisis cost adjustment mechanism, Pages 79 – 81.
[24] The initial proposal in RIIO2 was 1.25% but this included a 0.2 percentage point 'innovation uplift' that the CMA found to be an error, so the effective figure was 1.05%.
[25] CMA (2021), Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations Final report, March 2021, p233

only ~0.7% (see Figure 4). Labour productivity (note, not total productivity) growth in Scotland has fallen in a similar way, dropping from a 5-year average growth level of 1.7% between 2008 – 2013 to only 0.4% between 2018 and 2023, as shown in a chart from the most recent Scottish Economics Insights report (see Figure 3).

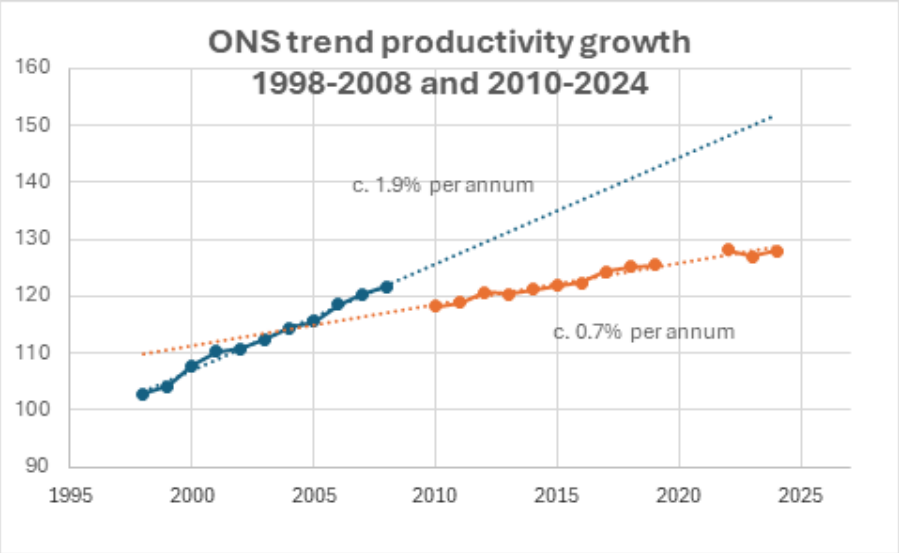



*Figure 3 ONS data on trend productivity growth*

Source: Scottish Water analysis of ONS data.

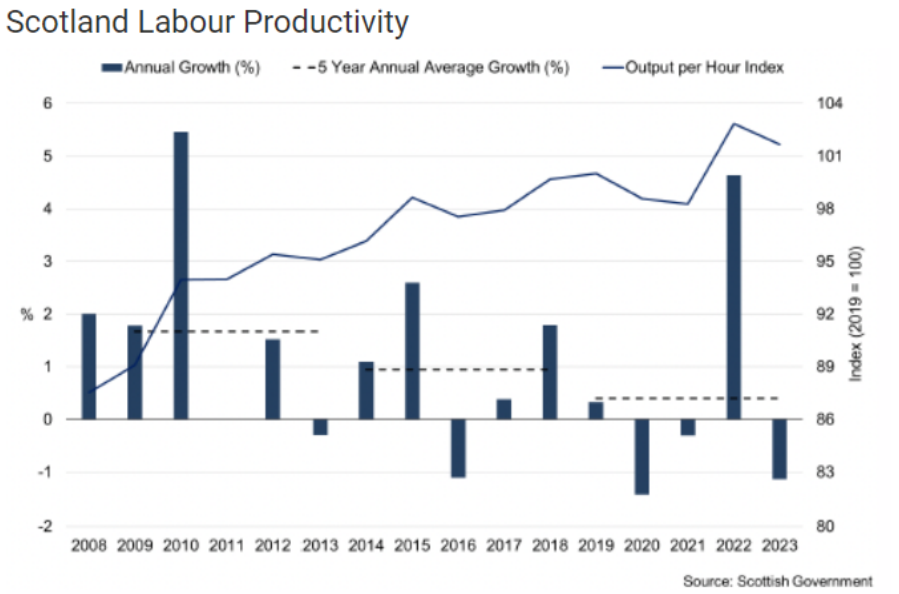



*Figure 4 ONS data on trend productivity growth*

Source: Scottish Government (2024)

### 5.1.2 Peer review evidence

First Economics noted that it had become common practice in UK regulation for regulators to expect infrastructure companies to improve their productivity at a rate of 1% per annum. First Economics stated that that this 'rule of thumb' is based on the productivity growth achieved in comparator industries prior to 2008. First Economics stated that water companies and their contractors are not immune from the factors that have driven lower productivity growth, and that there was 'ample reason' for Scottish Water to incorporate annual productivity improvement of noticeably less than 1% per annum into its SR27 plan.

### 5.1.3 Scottish Water assessment of the evidence

It is clear from the evidence provided by both companies and regulators that productivity trends have fallen materially since the GFC in the late 2000s. As a result, focusing on data from as far back as 1996 may not be representative of likely productivity levels during SR27. The latest productivity data actually shows a deteriorating trend for the UK – in February 2025, the UK Government noted that 'the pre-pandemic trend of sluggish productivity growth has continued, if not further deteriorated'.[26] On this basis, even if the 1% figure used by regulators in recent years was 'correct' at the time of those decisions, a lower figure may now be appropriate.

More generally, while we consider regulatory precedent to be extremely important – we believe that the objective evidence holds greater weight. We note CEPA's analysis that the range justified by KLEMS data alone would sits in a range of 0.5% - 1.2% (0.85% midpoint), while the unweighted average for the 2009 – 2019 period would be 0.1%. Even focusing on the unweighted average of the 4 highest performing industries in CEPA analysis would suggest an annual figure of only 0.5%.

It can be seen that estimates based on historical data are clearly influenced by the time period considered and the industries included as comparators. Regulators have also tried to 'unpick' this data to understand how broader trends may have impacted specific regulatory sectors. Scottish Water encourages a very careful approach when attempting to disaggregate the factors that have and have not impacted the water sector. Scottish Water operations cover a range of activities and the organisation relies heavily on partners who may have their own exposure to productivity drivers/constraints. The differing views taken by Ofwat (and their economic consultants) and the English and Welsh water companies (and their economic consultants) highlight the difficulties of estimating an appropriate frontier efficiency challenge level. High level, largely subjective assessments of which factors will likely contribute or detract from Scottish Water's potential productivity would seem to risk the application of spurious accuracy to this analysis.

In addition, some of the factors flagged as likely to drive future UK productivity growth (by Ofwat and their economic consultants) included rising interest rates and investment in infrastructure (with HS2 specifically mentioned). As examples demonstrating the difficulties involved in predicting future improvements in productivity, since publication of those reports, the Bank of England base rate has been cut three times[27] and plans for HS2 have been substantially downgraded.[28]

In assessing an appropriate and stretching frontier efficiency challenge for Scottish Water during SR27, we have taken into consideration a range of factors, including:

- Our assessment of current opex and capex efficiency described above, which suggests that Scottish Water's current costs are efficient and that no catch-up efficiency is required (subject to some further investigation in relation to certain categories of capex costs);
- Our assessment of data and analysis generated as part of the PR24 evidence base, including Economic Insight's analysis of a 0.3% - 0.8% plausible range and CEPA's 0.5% - 1.2% KLEMS data-based range;
- Recent regulatory precedent with decisions (including Ofwat's PR24 decision) clustered at or around 1.0%;
- Recent UK-specific data from the ONS suggesting trend productivity growth of c0.7%; and

[26] House of Commons Library (2025), Productivity.
[27] The Bank of England policy rate has fallen from 5.25% at the time of the report's publication in June 2024 to 4.5% in April 2025.
[28] HS2: update following cancellation of Phase 2 - NAO report

- Supporting evidence from Scottish Water's SR21 Transformation programme and provisionally anticipated savings during SR27 – further details of which can be found in the Transformation and Innovation Technical Appendix

The combination of evidence could reasonably support a range of point estimates of an appropriate frontier efficiency challenge, and as a result judgement must be applied. We also note that this issue is a feature of the current appeal of the PR24 determination to the Competition and Markets Authority (CMA), and that the CMA may provide updated thinking on this topic (although the current timeline suggests that the CMA's Final Determination will not be published until after the submission of Scottish Water's Final Business Plan).

On balance, and recognising Scottish Water's role as Scotland's publicly owned water network, we are proposing that a stretching 0.8%[29] frontier efficiency challenge level would be appropriate for the SR27 period. We consider that a 0.8% p.a. improvement would be at or above the level that would be justified by contemporary productivity data, but recognise that it is extremely important that Scottish Water continues to achieve material efficiency gains in order to provide Scottish customers with great service at an appropriate and efficient cost.

We also propose that the frontier efficiency challenge should apply across most spending categories (ie, both opex and capex) but should not apply to cost areas completely out of Scottish Water's control (such as the regulator's charges, interest costs, PFI costs and local authority rates). We discuss the practical application of a 'totex' efficiency challenge further in the section below.

## 5.2 Applying a 'totex' efficiency challenge in SR27

This section explores how the frontier shift efficiency challenge should be applied in SR27. It sets out reasons why WICS should adopt a 'totex' (total expenditure)-based frontier efficiency challenge for Scottish Water for SRC27 and discusses how such an approach could be applied and relevant performance monitored. We conclude that a 'hybrid' model with some segregation of opex and capex challenges may be a preferable solution that manages the risk of unintended outcomes.

### Options for applying a frontier shift challenge

The frontier shift challenge provides an important means through which the regulatory framework can incentivise ongoing efficiency improvements throughout SR27 and reflect the scope for achieving those improvements in the amounts that our customers pay. However, its effectiveness in generating desirable incentives for improvement will depend on both:

- **The level at which the efficiency challenge is set**: in particular, the extent to which the assumed cost savings are likely to be achievable through the securing of genuine efficiency improvements.
- **How it is applied**: what is the challenge applied to, and how will performance in meeting it is likely to be assessed, can affect the behaviours the challenge is likely to encourage.

Our assessment of the appropriate level at which to set a frontier efficiency challenge for SR27 is set out above. Our focus in this section is on how the frontier efficiency is applied. However – as highlighted further below – the level at which the challenge is set can affect the likely importance

[29] Net of any spend-to-save or transformation expenditure.

of decisions on how that challenge is applied, because it can affect the risks of unintended consequences under different approaches.

We have identified three broad options for applying the frontier shift challenge:

- **Option A – Disaggregated**: under this approach, the frontier shift challenge would be applied separately to each relevant category of costs. Importantly, this approach would include the challenge effectively being applied to opex on a stand-alone basis, with performance subsequently assessed on that basis also.
- **Option B – Totex-based**: under this approach, a single frontier shift challenge would be applied across all of Scottish Water's planned expenditure (other than some specific excluded items, such as business rates), and performance would be assessed on that same expenditure basis.
- **Option C – Hybrid**: under this approach, a totex-based frontier shift challenge would be applied, but a 'backstop' challenge would also be applied to opex. As set out below, this could provide a means of guarding the risks associated with options A and B.

We highlight the key risks associated with these options below before setting out our assessment that Option C looks likely to provide the most effective means of managing and balancing those risks.

### *5.2.1 Identifying key risks*

Our assessment of the above options has been informed by consideration of the following two key sources of risk:

- Risks of undesirable behaviours being encouraged
- Circumvention risks

These are discussed in turn below.

**Risks of undesirable behaviours being encouraged**

Our assessment is that the key risks here relate to the potential for undesirable opex reduction incentives to emerge. That is, while there will be scope for some degree of opex efficiency improvements over time, there is a risk that incentives to reduce opex could encourage behaviour that goes beyond this and results in reductions that would not benefit customers. For example, it may encourage short-term responses that could tend (if pursued over time) to 'hollow-out' relevant capabilities in an undesirable way or discourage efficient responses that would otherwise have resulted in an increase in measured opex. While we would seek to guard against such behaviours emerging through the strategic and management approaches we adopt, we consider it important to try to structure the regulatory framework such that it can be expected to operate 'with the grain' of desirable incentives and behaviours, and to avoid the emergence of tensions which could undermine those efforts.

We note that in its SR27 Methodology WICS identified that there are circumstances in which it can be efficient for opex levels to increase (after account has been taken of relevant inflationary pressures), for example, because of opportunities to use operating cost-based solutions that would be more efficient than more traditional capex alternatives, or to support other desirable opex-demanding activities (such as partnership working or spend to save initiatives). We welcome WICS's comments on providing the scope for such initiatives to be identified and taken into account through relevant change procedures, and consider that for the arrangements to be

supportive of such approaches, it will be important that the overall framework is not unduly focused on an opex-reduction (rather than a broader efficiency) benchmark.

Option B – the use of a totex-based approach – provides one way of addressing the above concerns. It maintains a clear focus on the need to deliver material cost reductions over time (other things equal), but provides greater flexibility in terms of how improvements in cost efficiency might be delivered. It guards against the risk of encouraging undesirable reductions in opex by allowing the frontier shift challenge to be met in a broader range of ways that may include a greater focus on delivering capital rather than operating cost efficiencies. The benefits of adopting this kind of more flexible approach are widely recognised by economic regulators, and we note that Ofwat applies a totex-based approach.

Our assessment of the appropriate level of frontier shift challenge to apply in SR27 is 0.8% incorporates the evidence base that was generated in Ofwat's PR24 process (and assumes that this is a totex-style target). Importantly, though, that evidence seeks to assess the overall extent to which water companies might be expected to achieve ongoing efficiencies, by reference to observed productivity levels over time and in other sectors that can provide a relevant comparator. That is, the PR24 evidence provides a basis for judging what an appropriate totex-based frontier shift challenge might be. That does not imply that the same level of ongoing efficiency improvement should be expected, or required, across all categories of cost. In particular, it does not imply that it would be appropriate to require that same level of cost reduction from opex.

Our assessment – including based on our experience with developing transformation initiatives during SR21 – is that the balance of where it will be possible to deliver cost efficiency improvements from is likely to be tipped towards capital as opposed to operating expenditure. As a result, we would expect a totex-based assessment of the scope for Scottish Water to deliver ongoing efficiency improvements to overstate the likely scope for opex efficiency improvements to some extent. This raises a further source of concern in terms of the risk that a separately applied opex-based frontier shift challenge could be set at a level that may tend to encourage undesirable behaviours.

**Circumvention risks**

Applying a totex-based frontier shift challenge to Scottish Water may, however, raise other concerns related to circumvention risks. The opex-related concerns that were described above stem from the scope for the frontier shift challenge to generate powerful cost reduction pressures, with that making it important to consider the risks that those pressures encourage undesirable behaviours. A concern with a totex-based approach is that in providing more flexibility in terms of how the required cost reductions can be delivered, it may end up effectively weakening the overall cost efficiency challenge that is being faced.

The underlying concern here is that the arrangements might allow Scottish Water to manage the constraint that a totex-based frontier shift challenge would put on expenditure in part by effectively reducing the scope or quality of what the capex programme delivers in some way that is difficult to monitor. The risk therefore is that monitoring difficulties could allow the intended frontier shift challenge to effectively be circumvented to some extent. Mitigating this risk is the increased clarity in SR27 in relation to investment planning, identified and forecasted outcomes and the construction of an updated performance framework that incorporates and targets these outcomes.

In addition, the regulatory approach in Scotland facilitates a high degree of openness, engagement with the regulator and stakeholders and scope for broad scrutiny. However, we

recognise that the deliberately flexible and evolving nature of the capex programme will inevitably leave some risk that a totex-based frontier shift challenge could end up being dampened to some extent as the programme evolves, but would expect this to lessen over time as the framework develops.

### 5.2.2 Our proposed approach

Option C – the hybrid approach – provides a means of taking the above risks into account in a balanced way. It involves two frontier shift challenges being set, and being used for performance monitoring:

i. **A totex-based challenge**: this would set out the overall ongoing efficiency challenge to be applied when setting Scottish Water's expenditure allowances and that would be used when assessing performance through SR27.

ii. **A separate opex challenge**: this would provide a backstop in that it would ensure that a material frontier shift challenge was applied to opex, but would not be the primary basis for setting the frontier shift challenge (which would be the totex-based challenge).

Critically, the opex challenge could be set at a lower level than the totex challenge such that the arrangements would provide the desirable benefits that flexibility provides for (and mitigate the risk of encouraging undesirable opex reduction activity), while providing a safeguard against that flexibility unduly dampening pressures to improve opex efficiency. This would recognise that the evidence base has been focused on a totex- rather than an opex-based question, and that – given the risks of undesirable outcomes resulting from applying the challenge to a narrower category of costs (ie opex) – a relatively high evidential bar (in terms of what level of opex reduction is likely to be achievable and efficient) should be required if setting the level of a separate opex-based challenge.

The case for adopting this kind of two-tier approach to the frontier shift challenge is likely to depend to some extent on how stretching the challenge is. That is, the more stretching the challenge, the more important the scope for flexibility is likely to be in terms of how that challenge can be met, and the greater the risks of undesirable outcomes emerging if that challenge is applied on a stand-alone basis to opex.

### 5.2.3 How would this approach be applied in practice

The separate opex challenge described above could be applied in a broadly similar way to the efficiency challenge that was applied to Tier 1 costs in SR21. That is:

a) A defined level of allowed opex can be determined when the SR27 price control is set, that takes account of the assumed stand-alone frontier shift challenge to be applied to opex.

b) This would provide an opex baseline against which future outturn levels could be compared, after relevant adjustments to reflect CPI, relevant real price effects, and other adjustments that may be required for consistency (eg to reflect scope changes differed from what had been assumed in the baseline).

In principle, this same approach could be used to apply and monitor performance against a totex-based frontier efficiency challenge. The key difference is that step (b) raises a range of more difficult issues that would need to be addressed, because (in line with the comments on circumvention risks above) the potential for (in)consistency issues to arise is much greater when capex is included in the assessment. In practice, though the complexity of this is not something that is introduced by the inclusion of a totex-based frontier shift. That is, there is a need in any event for an effective means of showing what the capex programme is delivering and for how

much in a context where the programme itself is flexible and involving. We are engageing with WICS to try to improve the framework for doing this, and the application of a totex-based frontier shift challenge would form part of that broader assessment because it would have been applied when the baseline expenditure allowances were set (against which outturn spend will need to be assessed after appropriate consistency adjustments are made to reflect the factors noted in (b) above.

# 6 Our approach to real price effects in SR27

## 6.1 Introducing real price effects

This section summarises the approaches and evidence used by Scottish Water in assessing the historical scale of RPEs and considers how these might best be applied during SR27.

The base measure of inflation in SR27 is the Consumer Price Index (CPI), the commonly used measure of inflation in the UK. CPI is measured and published by the Office of National Statistics (ONS).[30] CPI is a weighted sum of a basket of goods and services purchased by households, with the weights reflecting the proportion of those goods and services in a consumer's overall expenditure. The ONS also publishes the price indices for each of the goods and services that make up this basket.

As noted in WICS final methodology, there is now extensive regulatory precedent of economic regulators recognising that companies may face input price inflation that is different from general economy-wide consumer price inflation. Appendix 7 of the Final Methodology provides examples of the regulatory precedent in these areas across previous SRCs by WICS, decisions from Ofwat and the CMA in the England and Wales water sector and decisions from Ofgem in the electricity and gas transmission and distribution price controls in Great Britain. In addition, a similar approach has been taken by the Utility Regulator in Northern Ireland.

In each case, the regulator has sought to identify cost categories:

- that make up a significant proportion of total opex and/or capex; and
- which have had a price profile that is markedly different from the reference inflation index.

In some cases, regulators have made an ex-ante (upfront) adjustment to the price settlement so that the likely negative impacts of RPEs on companies' opex or capex cost allowances are mitigated. In other cases, regulators have deployed "in-period" or ex-post (at the end of the control period) true-ups to adjust allowances or the assessment of achieved outcomes once outturn inflation is calculated. In each case, the regulator's assessment of a regulated company's efficiency performance takes account of the impact of RPEs.

Some of the components of CPI are also present in Scottish Water's opex and capex cost bases, although their contributions to Scottish Water's overall expenditure are very different. Other components have no clear read-across. For example, electricity and gas costs form around 3.9% of the aggregated CPI, while energy costs comprise around 12% of Scottish Water's opex costs. Consequently the (efficient) rate of cost inflation experienced by Scottish Water may be very different from inflation measured via CPI. In addition, Scottish Water's opex and capex cost inflation levels are likely to be different from each other.

To calculate the rate of historical opex inflation that we have been experiencing, we can examine published price indices for the kinds of underlying labour, materials and services that we purchase, combined with weights derived from actual operating costs.[31] To calculate historical capex inflation, we can use relevant published price indices combined with the weights used by Ofwat to reflect the cost mix in the water industry as a whole.

[30] Inflation and price indices - Office for National Statistics

[31] This evidence base can be further developed by Scottish Water to incorporate the average industry cost mix.

To calculate forecasts levels of RPEs for both opex and capex that would apply over the course of SR27, we can include forecasts of key costs where they are available. However, as only a limited number of cost categories have official or suitable forecasts available, even forecast levels are likely to rely in part on using historical levels as a proxy for the future. As discussed in more detail below, neither historical averages nor forecasts are likely to provide accurate representations of future outturn RPEs levels. Estimates based on historical averages are dependent on the look back period used. Longer-term averages may better represent a 'through-the-cycle' figure but may be less representative of current market conditions. Shorter-term averages may better reflect recent market trends but may suffer recency bias and fail to capture the impact of business and economic cycles. This highlights the potential benefit of including forecasts (where available), although here too it is far from certain that forecasts represent unbiased estimators of future outturn levels of inflation, as they tend to anchor to recent trends and policy positions. The difficulty of accurately predicting RPEs in advance can be addressed by combining ex ante (in advance) and ex post (after the event) approaches, and we discuss this in further detail below.

### *6.1.1 Opex RPEs*

Scottish Water has previously engaged with WICS to explore the historical opex inflation rates that Scottish Water has experienced. This prior work and analysis are summarised here for convenience.

In common with other water companies, the principal areas which contribute to Scottish Water's inflation rate being higher than CPI are Labour, which comprises over 40% of opex, and Energy. Labour's share of costs has remained relatively stable over the last 6 years, while the share of energy costs has somewhat increased.

Scottish Water has used ONS published price indices to calculate the effective inflation rate for these significant cost items:

- The cost of labour has increased at 3.21% per annum since 2000, and
- The cost of energy has increased at a rate of 6.09% per annum since 2000.

The comparable rate of CPI inflation over the same period was 2.56%.

Other cost items have also increased in price at a faster rate that CPI, but as they comprise smaller proportions of total opex, or have a smaller differential from CPI, they contribute less to the overall difference in the inflation we experience.

This assessment is broadly similar to the conclusions set out by Ofwat in their PR24 Final Determinations.[32] [33] As noted by Ofwat, water companies do not have complete control over these price levels – in each case the companies are price-takers. While management can mitigate some effects, e.g. by hedging electricity prices and managing internal energy demand, there is a limit to extent that Scottish Water can avoid these effects entirely and these 'overweighted' categories have led Scottish Water's cost inflation to have been higher the CPI. In aggregate we calculate that opex costs have inflated by around 0.7% per annum more than CPI since 2000. This calculation excludes PFI costs, which are modelled separately. This is set out in Figure 5 below.

| Opex cost element | ONS index | Annualised rate 2000-24 |
|---|---|---|
| Labour | EARN01 - K5CD | 3.21% |

[32] Ofwat (2024 A), PR24 Final Determinations – Real Price Effects and the energy crisis cost adjustment mechanism, December 2024 On-line.
[33] Ofwat (2025), PR24 final determinations: Expenditure allowances, February 2025, p13. On-line.

| | | |
|---|---|---|
| Energy | D7DT | 6.09% |
| Chemicals[34] | FSQ7 | 2.19% |
| Materials | DOBU | 2.86% |
| Others | Assumed to be CPI | 2.56% |

*Figure 5: Rates of cost inflation by opex category – 2000 baseline*

Source: Scottish Water calculations based on ONS data

As noted above, the scale and likely impact of RPEs is very dependent on the time period considered. Averages that include high weights to periods of very high energy or labour price inflation will show higher RPE estimates, while averages with high weights to periods of falling energy or labour costs (either in absolute or relative terms) will display low or even negative RPEs relative to CPI. For example, a similar exercise would suggest opex RPEs over the 10-year period from 2014 – 2024 would be 0.54% and over the 5-year period from 2019 – 2024 would be 0.83%.

Figure 6 below shows the evolution of the opex costs that SW actually faces relative to the evolution of CPI over the same period. As can be seen, a significant delta has emerged over the SR15 and SR21 periods, albeit it has somewhat reduced over the most recent years.

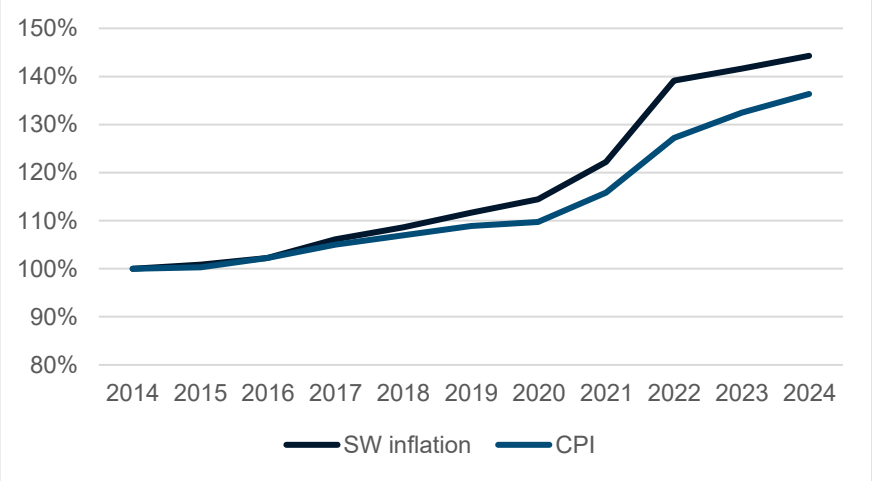



*Figure 6: Cumulative opex cost divergence over time*

Source: Scottish Water analysis of ONS data

We have also compared the opex cost splits used by companies in England and Wales under PR24, and note that they are broadly comparable to Scottish Water's spits. The tables below show this relationship across averages from 2000, 2014 and 2019.

| | **Typical cost shares** | | | **Average inflation per year** | **Contribution to cost increases** | | | |
|---|---|---|---|---|---|---|---|---|
| **Opex cost element** | **WaSCs** | | | | **WaSCs** | | | **SW at E&W weight** |
| | **Firm 1** | **Firm 2** | **SW** | **2000-24** | **Firm 1** | **Firm 2** | **SW** | |
| Labour | 33% | 36% | 43% | 3.23% | 1.07% | 1.16% | 1.39% | 1.11% |
| Energy | 9% | 11% | 12% | 6.09% | 0.55% | 0.67% | 0.73% | 0.61% |
| Chemicals | 4% | 3% | 6% | 2.37% | 0.09% | 0.07% | 0.14% | 0.08% |
| Materials | 21% | 22% | 19% | 2.86% | 0.60% | 0.63% | 0.54% | 0.61% |

[34] The relevant price index for chemicals started in 2009 so this data refers to the period from 2009 to 2024.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Others/CPI | 33% | 28% | 20% | 2.56% | 0.85% | 0.97% | 0.51% | 0.91% |
| **Total** | **100%** | **100%** | **100%** | | **3.16%** | **3.51%** | **3.32%** | **3.33%** |

*Figure 7: Weighted average opex inflation scenarios – 2000 baseline*

Sources: England and Wales cost shares illustrate the range of values in the water and sewerage companies' data submissions for PR24; SW = Scottish Water. SW cost shares are from internal analysis; and inflation data is SW analysis using ONS published data.

Note: "Firm 1" and "Firm 2" refer to illustrative companies with the cost shares shown in the table. Together these companies illustrate the range of cost shares declared by the England and Wales water and sewerage companies in PR24. "SW at E&W weight" uses the average of Firm 1 and Firm 2 cost shares.

| | Typical cost shares | | | Average inflation per year | Contribution to cost increases | | | |
|---|---|---|---|---|---|---|---|---|
| **Opex cost element** | **WaSCs** | | | | **WaSCs** | | | **SW at E&W weight** |
| | **Firm 1** | **Firm 2** | **SW** | **2014-24** | **Firm 1** | **Firm 2** | **SW** | |
| Labour | 33% | 36% | 43% | 3.19% | 1.05% | 1.15% | 1.37% | 1.10% |
| Energy | 9% | 11% | 12% | 5.99% | 0.54% | 0.66% | 0.72% | 0.60% |
| Chemicals | 4% | 3% | 6% | 2.45% | 0.10% | 0.07% | 0.15% | 0.09% |
| Materials | 21% | 22% | 19% | 3.25% | 0.68% | 0.71% | 0.62% | 0.70% |
| Others/CPI | 33% | 28% | 20% | 2.89% | 0.95% | 1.10% | 0.58% | 1.03% |
| **Total** | **100%** | **100%** | **100%** | | **3.32%** | **3.69%** | **3.43%** | **3.51%** |

*Table 9: Weighted average opex inflation scenarios – 2014 baseline*

Sources: England and Wales cost shares illustrate the range of values in the water and sewerage companies' data submissions for PR24; SW = Scottish Water. SW cost shares are from internal analysis; and inflation data is SW analysis using ONS published data.

Note: "Firm 1" and "Firm 2" refer to illustrative companies with the cost shares shown in the table. Together these companies illustrate the range of cost shares declared by the England and Wales water and sewerage companies in PR24. "SW at E&W weight" uses the average of Firm 1 and Firm 2 cost shares.

| | Typical cost shares | | | Average inflation per year | Contribution to cost increases | | | |
|---|---|---|---|---|---|---|---|---|
| **Opex cost element** | **WaSCs** | | | | **WaSCs** | | | **SW at E&W weight** |
| | **Firm 1** | **Firm 2** | **SW** | **2014-24** | **Firm 1** | **Firm 2** | **SW** | |
| Labour | 33% | 36% | 43% | 4.49% | 1.48% | 1.61% | 1.93% | 1.55% |
| Energy | 9% | 11% | 12% | 8.80% | 0.79% | 0.97% | 1.06% | 0.88% |
| Chemicals | 4% | 3% | 6% | 3.22% | 0.13% | 0.10% | 0.19% | 0.11% |
| Materials | 21% | 22% | 19% | 4.96% | 1.04% | 1.09% | 0.94% | 1.07% |
| Others/CPI | 33% | 28% | 20% | 4.12% | 1.36% | 1.56% | 0.82% | 1.46% |
| **Total** | **100%** | **100%** | **100%** | | **4.80%** | **5.53%** | **4.94%** | **5.07%** |

*Table 10: Weighted average opex inflation scenarios – 2019 baseline*

Sources: England and Wales cost shares illustrate the range of values in the water and sewerage companies' data submissions for PR24; SW = Scottish Water. SW cost shares are from internal analysis; and inflation data is SW analysis using ONS published data.

Note: "Firm 1" and "Firm 2" refer to illustrative companies with the cost shares shown in the table. Together these companies illustrate the range of cost shares declared by the England and Wales water and sewerage companies in PR24. "SW at E&W weight" uses the average of Firm 1 and Firm 2 cost shares.

| Time period | SW Opex RPI | SW Opex RPI (E&W average weightings) |
|---|---|---|
| 2000 – 2024 | 0.76% | 0.77% |
| 2014 – 2024 | 0.54% | 0.62% |
| 2019 - 2024 | 0.82% | 0.95% |

*Table 11: Comparison of Opex RPEs at SW and England and Wales example cost mixes*

Sources: England and Wales cost shares illustrate the range of values in the water and sewerage companies' data submissions for PR24; SW = Scottish Water. SW cost shares are from internal analysis; and inflation data is SW analysis using ONS published data.

Note: "Firm 1" and "Firm 2" refer to illustrative companies with the cost shares shown in the table. Together these companies illustrate the range of cost shares declared by the England and Wales water and sewerage companies in PR24. "SW at E&W weight" uses the average of Firm 1 and Firm 2 cost shares.

### Feedback on our analysis and next steps

Following feedback from First Economics and WICS, we are undertaking further analysis to identify reliable forecasts for key opex costs. This analysis could be used to replace or complement the long-term averages used to calculate the 'historical' 0.7% opex RPE estimate that has been identified in the analysis previously shared with WICS. In addition, as shown in Table 10, any historical estimate is also dependent on some cost allocation assumptions – other approaches lead to slightly different estimates and this approach can be further considered.[35]

It is likely that labour costs will have the most comprehensive available forecasts, with the potential to incorporate estimates used within the Office of Business Responsibility (OBR)'s latest Economic and Fiscal outlook or evidence within HM Treasury's Economic Evidence to the Pay Review Bodies reports. Other categories are likely to be harder to forecast using objective and/or official sources that are regularly updated. It is likely that long-term averages will continue to provide the best source of estimate for categories such as chemicals, materials and 'other', while some forecasts or the use of forward agreements may help to improve the estimate of energy costs over the SR27 period.

We note that the inclusion of an ex-post 'true up' mechanism within the RPE methodology (discussed in further detail below) would help to mitigate the risk to customers of differences between ex-ante RPE estimates and outturn RPEs – as any upfront inaccuracies are adjusted for such that consumers should not lose out. In addition, any inflationary 'benefit' that Scottish Water did receive would be either invested to provide additional benefits or returned to customers in the form of lower price increases in subsequent periods.

We will take into account feedback received from both First Economics and WICS and provide updated analysis and evidence on ex ante RPE estimates in our Final Business Plan.

[35] For example, using the cost categories used by Ofwat in Table 6 shows that the weighted difference between Scottish Water opex costs and CPI would be 0.60% for "Firm 1" and 0.95% for "Firm 2" based on inflation averages since 2000.

### 6.1.2 Capex RPEs

Scottish Water have carried out a similar assessment of the historical rates of capex cost inflation. While the English and Welsh water companies provided information on capex RPEs in the data tables they provided for PR24, Scottish Water do not directly collect or report on the individual capex cost categories as we do for opex, and we do not ask our contractors and partners to report on the split of costs that they incur. Consequently, we have used the indicative proportions by cost categories as set out in companies' PR24 data submissions[36] to assess that the areas that inflate at a rate materially different to CPI are:

- Labour, which accounts for between 35% - 45% of undertaker's reported capex costs; and
- Materials, which accounts for between 28% - 38% of their costs.

Both Labour and Materials costs have seen inflation levels in excess of CPI over the period 2000-2024. We also note that chemicals and energy have inflation rates that are higher than CPI, but that these categories are relatively smaller proportions of capital costs and have had a less material effect on the capex cost inflation that Scottish Water has faced.

To facilitate comparisons with the Construction Output Price Index (COPI), the following analysis uses data since 2014, as COPI underwent a methodological break in 2014 that makes prior data incomparable.

These inflation rates can be combined with a typical cost structure for a water company, to provide an indication of the inflation that such a company would face. Compared with an average CPI rate of 2.89%, the additional inflation faced by a water company suggested by this exercise is 0.29% - 0.39% per annum. This is shown below in Table 12.

| Capex cost element | Typical cost shares | | | Average per year | Contribution to cost increases | | |
|---|---|---|---|---|---|---|---|
| | Firm 1 | Firm 2 | Firm 3 | 2014-24 | Low | High | Average |
| Labour | 35% | 38% | 45% | 3.15% | 1.12% | 1.21% | 1.43% |
| Energy | 3% | 4% | 5% | 5.99% | 0.18% | 0.24% | 0.30% |
| Chemicals | 2% | 2% | 2% | 2.45% | 0.05% | 0.05% | 0.05% |
| Materials | 28% | 30% | 32% | 3.25% | 0.91% | 0.97% | 1.04% |
| Others | 32% | 26% | 16% | 2.89% | 0.92% | 0.75% | 0.46% |
| **Total** | **100%** | **100%** | **100%** | | **3.18%** | **3.23%** | **3.28%** |

*Table 12: Weighted average capex inflation scenarios (England and Wales data) – 2014 baseline*

Source: Capex cost shares are taken from the English and Welsh water and sewerage companies data submissions in PR24, and are available on their web-sites. Inflation rates for the different cost items are taken from ONS data, and are calculated in the same way as the corresponding data for the opex RPE analysis.

WICS has requested that Scottish Water explore the possibility of 'indexing' capital projects to the new infrastructure COPI – in line with Ofwat's proposals.[37] Recent figures for CPI and COPI (and its component indices) are set out below in Table 13.[38]

[36] Undertakers' data submissions are available on their websites.

[37] WICS (2024 B), Strategic Review of Charges 2027-2033: Final Methodology Appendices, page 96

[38] The current COPI dataset has a methodological break in 2014, so that dataset cannot be tracked back to 2000 (as is possible for some other indices used in this paper).

| Index | 2014-25 | 2019-2025 |
|---|---|---|
| CPI | 2.89% | 4.12% |
| COPI | | |
| All construction | 2.90% | 3.93% |
| All new works | 3.39% | 4.56% |
| All new works - infrastructure | 3.21% | 4.80% |
| All repair and maintenance | 1.99% | 2.72% |
| Inflation experienced by companies with illustrative cost structures | 3.18%-3.28% | 4.60%-4.77%% |

*Table 13: CPI versus COPI inflation rates since 2014*

Source: Scottish Water analysis of ONS data

Note: The inflation experienced by companies with illustrative cost structures is calculated using the methodology used to produce the data in Table 11 and the corresponding opex RPE tables i.e. the inflation rate for each cost line over the period is multiplied by the proportion of total costs in that cost line, and summed to get an aggregate inflation. The same weights are used for each period, but the inflation rates for each cost line are different in the two periods.

From this table we note that RPEs calculated as the difference between 'new works – infrastructure' and CPI would have been 0.32% on average between 2014 – 2024, while the difference between the headline COPI and CPI would have been only 0.01% over the same period.

Across the calculation methodologies discussed above, capex RPEs have historically been in the range of 0.29% - 0.65% If required for an ex-ante estimate, and acknowledging the variability in the data between both assessment approaches and timeframes, Scottish Water would suggest a reasonable capex RPE point estimate based on historical averages alone of around 0.5%.

As noted above in relation to opex RPEs, feedback from First Economics has highlighted the potential to include forecasts when setting RPE levels. To ensure that these forecasts are as reliable as possible, and subject to feedback from WICS, we will look to incorporate these forecasts into our estimates closer to the submission of the Final Business Plan in February 2026.

### Ofwat's approach in PR24

For note, Ofwat's approach to capex RPEs is to consider these cost drivers separately, as set out in Table 14 below. Rather than determine RPE adjustments for opex and capex in aggregate, they have made adjustments for each cost line, in some cases providing for both an ex ante and an ex post adjustment.

| Cost area | *Ex ante* adjustment | *Ex post* true-up |
|---|---|---|
| Labour | Yes – based on OBR's earnings forecast | Yes – based on ONS ASHE manufacturing wage index for opex, and the construction wage index for capex |
| Energy | | |
| Opex | Yes – based on Ofwat calculations | Yes – based on DESNZ energy price index for large industrial users |
| Capex | No | No |

| | | |
|---|---|---|
| Chemicals | No | No |
| Materials | | |
| Opex | No | No |
| Capex | No | Yes – based on the difference between CPIH and COPI (new infrastructure) |

*Table 14: Ofwat capex RPE by cost driver*

Source: Ofwat PR24 Final Determination

**Assessment and next steps**

As noted above in relation to opex costs, both First Economics and WICS noted that Scottish Water could complement or replace the historical averages with forecasts in areas such as labour and energy costs. As above, we note that other costs areas may not have adequately reliable forecasts and long-term averages may remain the most appropriate ex-ante estimate. We will incorporate forecasts where feasible for the Final Business Plan. As above, we note that the risks to consumers associated with forecast error are mitigated by the inclusion of ex-post adjustments – although there are obvious benefits from having forecast RPEs that predict outturn costs as effectively as possible.

WICS have also asked Scottish Water to consider the use of published indices in order to index capital projects costs. We note that Ofwat use a number of indices for its ex-post true up mechanisms (such as the COPI (new infrastructure) for capex material costs. We continue to consider the pros and cons of using a single measure index relative to a constructed range of indices (which may better capture differences in cost mix) and will continue to engage with WICS on this matter in preparation for the submission of our Final Business Plan.

If one index is to be used as a proxy for capex RPEs, our initial analysis suggests that the COPI 'New Work Infrastructure' measure may be the closest match the actual capex inflation faced by Scottish Water. This is illustrated in Figure 8 below.

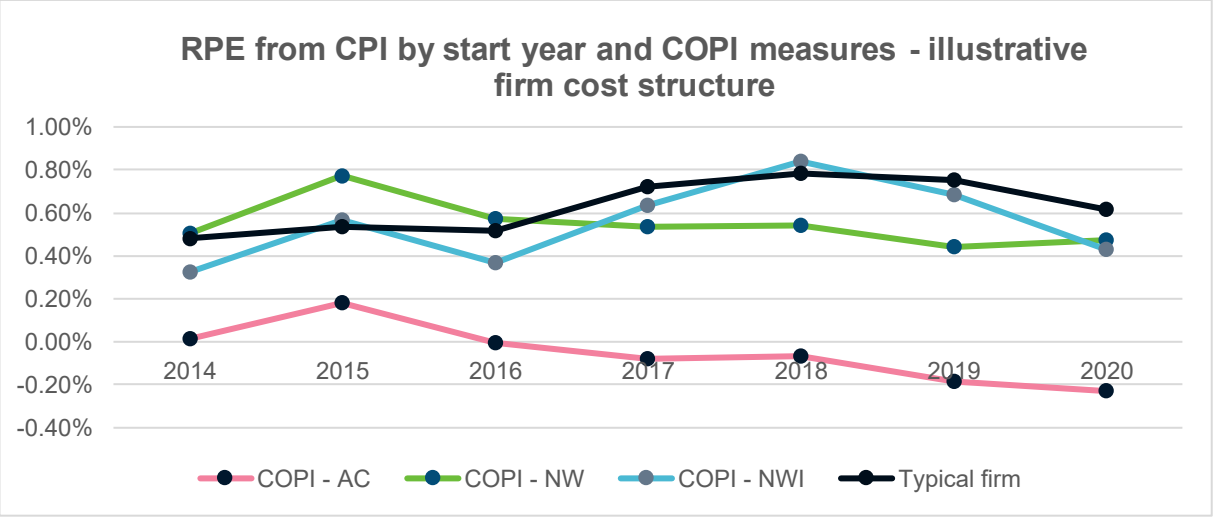



*Figure 8: Comparison between different COPI measures and capex inflation for illustrative firm*

Source: Scottish Water analysis of ONS and Ofwat data

The alignment between COPI new work infrastructure and actual capital inflation is maintained when the capex cost structure is varied as shown below in Figure 9.

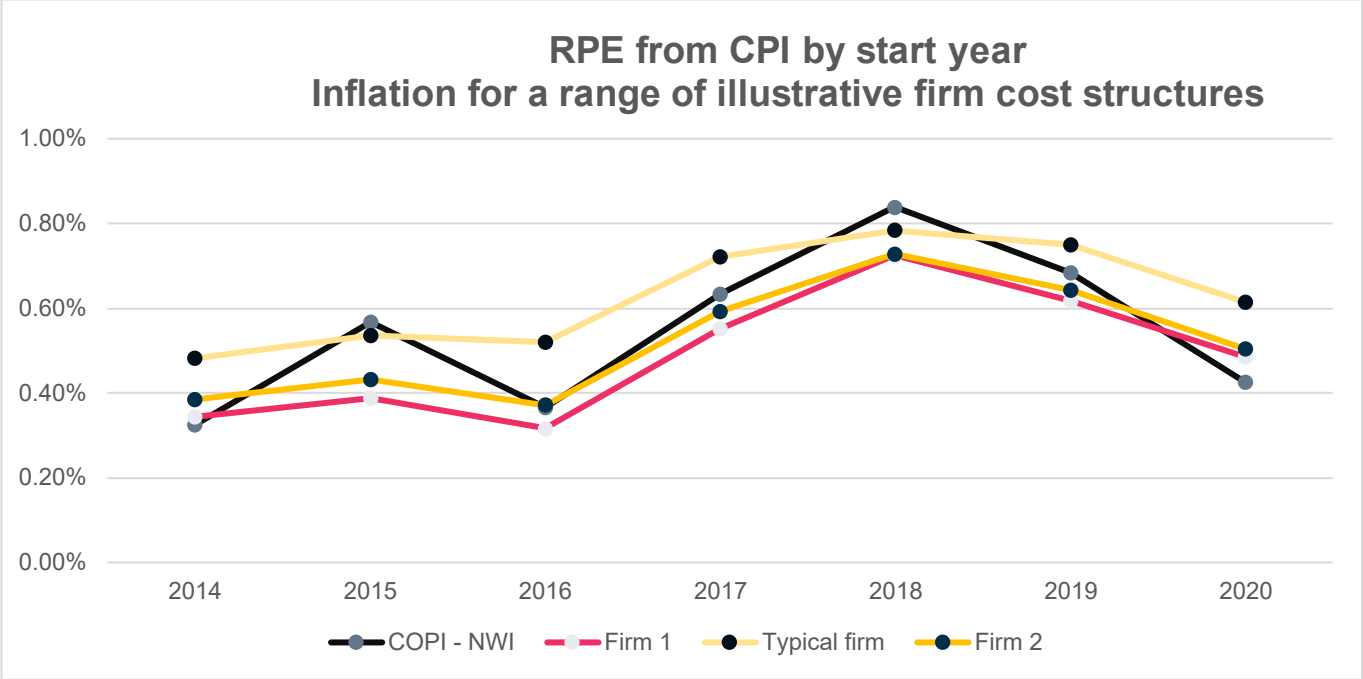



*Figure 9: Comparison between COPI new work infrastructure and capex inflation for different firm cost structures*

Source: Scottish Water analysis of ONS and Ofwat data

## 6.2 RPE Implementation Options

Scottish Water considers that appropriate objectives when applying an RPE measure should be:

1) to seek to ensure that an efficient company can reasonably expect to have sufficient funds to deliver the outputs required within the Final Determination; and
2) to establish a reasonable basis for identifying the scale of exogenously driven cost growth over the price control period

Ofwat and other relevant regulators have recently used a combination of mechanisms to help to deal with the effects of RPEs, and that the approach used has often varied between price control periods.

In the sections below we consider the potential use of cost-focused and revenue-focused adjustment methodologies. We note that the there is an inevitable uncertainty in forecasting costs drivers and the level of the future RPEs. We note that there are publicly available forecasts for some of these indices, and Ofwat and the water companies have provided forecasts in regulatory decisions and data submissions. SW is undertaking its own analysis to underpin our business plan submissions.

**Cost-focused adjustment**

Cost-focused adjustments acknowledge ex ante that the costs to deliver the determination may vary in a way that does not match the path of CPI (and thus there may be over or under collection of funds relative to the cost of delivery). This type of approach could be operationalised by making projections of RPEs over the period 2027-33 and factoring an appropriately sized allowance into the final determination such that there would be a reasonable expectation that the price control would provide sufficient funds (on average) for the agreed outputs to be delivered. In addition, the regulator could define the RPE calculation methodologies on an ex-ante basis and assess

Scottish Water's performance taking into account the outturn level of RPEs on an annual or whole control period basis.

The cost-focused approach has the benefit of relative simplicity for Scottish Water, the regulator and customers over the price control period, and does not require changes to the charge path to adjust for RPEs during the price control. The key downside of a cost-led approach is that if RPEs are greater than the level of any ex-ante RPE adjustment that has been made, there will be insufficient funds to achieve the price control required outputs.

**Revenue-focused adjustments**

Revenue-focused adjustments seek to 'true-up' revenue allowances either in-period by adjusting the charge profile (i.e. the "K" factor) or ex-post by logging up (or down) any under- (or over-) recovery of costs driven by outturn RPEs. This approach has the benefit of ensuring that the regulated company retains access to the funds (in real terms) needed to achieve the requirements of the regulator's final determination.

The potential downside of this approach is that in may lead (in the case of ex-post true-ups) to a delay in investment, as Scottish Water's funding is dominated by charges and it does not have the access to alternative capital sources that are available in other regimes. This risk could be mitigated by the use of in-period adjustments, although this potentially reduces charge path certainty for consumers.

**Scottish Water Assessment**

It is now established regulatory practice to take account of the category-adjusted cost inflation faced by regulated companies when setting price controls. Scottish Water has collated evidenced on the historical trends of opex and capex inflation across reasonable measurement timeframes. To minimise the potential negative impact of these differentials, we consider it to be important that RPEs are taken into account within the SRC27 price control process.

Scottish Water considers that cost-led adjustments are likely to be the most simple and effective way to deploy RPE adjustments in SRC27, and that these are likely to be preferable to revenue adjustments that change the anticipated charge path for customers.

Between Draft and Final Business Plan, we will work with WICS to establish the most effective approach to integrating RPE adjustments. If an ex-ante level setting is preferred, historical observations will be combined with forecast evidence in order to present reasonable estimates of RPEs over the control period. If an outturn RPE adjustment is included, we would be keen to develop an agreed RPE calculation methodology that can be followed through the control period, which may be different between opex and capex if WICS has a preference to use a single index to track capex cost inflation (such as COPI new infrastructure).

As no decision has yet been made on the appropriate estimate or implementation approach for RPEs, we have not included them in the efficiency adjustments to the SR27 plan. We have however made some simplifying assumptions and a 0.5% capex RPE when assessing the impact of efficiency gains over the SR21 period (in order to calculate the SR27 capex 'base line' position). This is discussed further in the sections below. This approach will be updated for the Final Business Plan.

# 7 Efficiency of the SR27 Investment Plan

## 7.1 Context

This section summarises the approaches and evidence used by Scottish Water to assess Scottish Water's efficiency in relation to capital costs (capex) during SR27.

Our plan for collating evidence and assessing Scottish Water's current level of capex efficiency in SR27 across direct and indirect costs (£ in the ground) has been set out earlier in this Technical Appendix. Opex efficiency over SR27 is discussed in more detail in the Finance Technical Appendix.

### *7.1.1 Tools used when costing the SR27 plan*

The Draft Business Plan includes capital investment of £8.3bn. There is ~1800 individual budget lines, underpinned by our costing process and methodologies. These budget lines are validated by our in-house Cost Intelligence team using a variety of methods, depending on need and the maturity of the activity where costs are being estimated. Our tools and approaches include:

**Cost Intelligence Team Tools:**

*Cost curves*

The R2309 cost models are based on historical levels of spend (as discussed above in relation to capex efficiency). The R2309 cost models, released September 2023, cover new work types at unit level and reflect the actual costs that Scottish Water has incurred undertaking investments principally in the last two regulatory periods (SR10 and SR15).

A Cost Model is an algebraic equation derived from historic data and used to estimate the cost of a process component based on a given yardstick. Each Cost Model is an equation representing the best fit regression line obtained from each process component dataset of Yardstick Values and Costs;

We create and use Cost Models to allow Scottish Water to produce Capital Project Estimates for Investment/Business planning using our Benchmark Estimating Software (BES) BES and High-Level Pricing Tool (HLPT). We also use the information in the cost curves to inform our asset stock valuation process (MEAV) that are used in regulatory and financial reporting and various internal planning models.

As a general principle, as the cost models themselves have been assessed and show Scottish Water's outturn costs (in the period covered) to be lower than industry average, the tools that are built on these cost models are deemed to provide cost estimates that are reflective of efficient costs. Below, we discuss the further updates that are made to estimates in the Business Plan to take account of further efficiency improvements made over SR21 and anticipated to be made in SR27.

*Related models*

A series of internal models use the information in the cost models as an input:

- **The High-Level Pricing Tool (HLPT)** makes use of the Cost model suite to evaluate specific project details for projects at an earlier stage of development. This includes the application of

delivery vehicle specific Prelims[39], for instance supervision and administration, contractor's design, management fee and Optimism Bias.

- **Benchmark Estimating Software (BES)** is the corporate costing tool used for detailed estimating of projects at later stages of development. The software houses the current framework rates for both Scottish Waters procured Delivery partners and Scottish Water's procured material providers. BES uses this granular level of detail to provide robust Bills of Quantities for Projects, either as evolutions of the HLPT cost assessment or as new estimates.
- The primary prediction models that use the Cost model outputs are Asset Stewardship Model (ASM), Asset Risk Models (ARM) and Strategic Intervention Model (SIM). These models utilise corporate data to develop statistical models to forecast deterioration and the interventions that will be required as a result of deterioration. The models enable Scottish Water to understand how different factors will influence deterioration and assess the impact policies will have on demand. These analytical model output at an asset level, and typically the forecasts are aggregated to different levels based on need (e.g., management approaches). No additional risk or optimism bias adjustments are made at this stage.

*Run Rate estimates:*

Run Rate methodologies are used to assess costs that cannot practically be benchmarked in line with the approaches described above – which generally rely on long-term historical costs adjusted for inflation. This methodology is typically applied on less complex construction methodologies and other business costs such fleet and IT costs.

Given the nature of these costs, which can be more liable to vary with current market conditions, pricing via historical cost curves or other benchmarking approaches is more likely to give an inaccurate representation of the costs that can reasonably be achieved 'today' (even taking general levels of inflation into account).

Where a run-rate methodology is applied, costs are estimated by extrapolating from recent projects or programmes of similar scope and by market-testing through procurement activities.

*Informed Judgement:*

Costing based on assessment of similar activities and budgeted allocation. This method is typically used for solutions that either have no precedent (new technologies and innovation) or are difficult to quantify (inspections and repairs).

SR27 Business Plan contains a mixture of named high profile projects (e.g. Glenfarg, Daldowie) and budget categories. As SR27 starts, actual projects designs, scopes, needs will evolve and move through Scottish Water's Project Investment Appraisal with a process to ensure we are proving efficiency throughout project lifecycle.

**Optimism Bias**

Optimism bias is a calculated factor adjustment applied to early-stage estimates in the HLPT, to account for lack of design maturity and scope uncertainty. This evidence-based factor is calculated by comparing cost movement over a range of actual out-turn projects to their early stage estimates priced by Cost Intelligence Estimating teams. It is reviewed regularly and can be tailored based on certain information e.g. delivery vehicle, region.

[39] Prelims are all the on-costs associated with delivery of the capital construction covering Delivery Vehicle costs (i.e. supervision and administration, accommodation and storage, design management fee), Scottish Water overheads (i.e. plan, prepare deliver, land, legal costs), risk etc.

The project maturity determines the likely confidence of pricing generated, driven by the certainty of scope and level of detail available, As the project progresses these are refined firming up the LBE (Latest Best Estimate). To account for immature scope at early-stage Optimism Bias is applied and to allow for the level of detail at the point of estimating request estimate grading classes are applied.

Optimism Bias looks to redress the tendency to under-cost project budgets, due to immature scope at early stages. It is derived from the HM Treasury Green Book approach for appraisal of public spending. Examples of these are detail changes, limited buildability input, lack of insight to site conditions including temporary works, etc.

### *7.1.2 Building an efficient SR27 Business Plan*

Our approach for SR27 is built on the capex efficiency assessment above, which suggest that capex costs are currently below industry average (in aggregate, and subject to further assessment of specific cost categories).

The Arrowhead of Cost Certainty (fig.10) demonstrates how confidence ranges narrow as a project matures. Projects are categorised using the Project Grading definition that explains the level of detail to determine an Estimating Class. These are based on the class estimating framework published by the Association for the Advancement of Cost Engineers.

Our approach to costing individual projects adapts to the relative maturity of the scope of the project and the planning process. We assess this maturity according to an ascending series of project lifecycle points know as 'Gates'. The maturity in the level of scope and cost certainty as a project develops is shown graphically below in Figure 10.

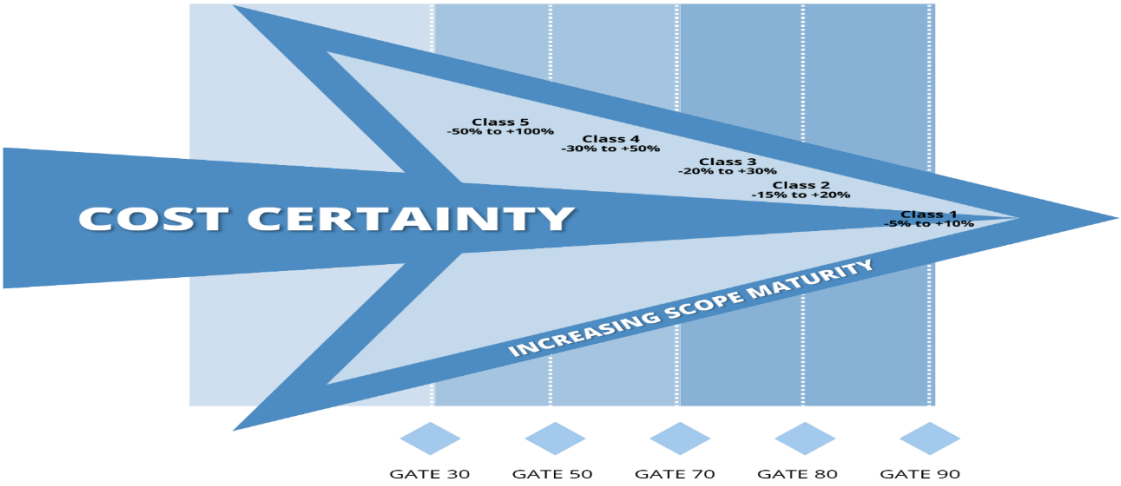



*Figure 10: Evolution of Cost certainty as project matures*

Source: Scottish Water

**Scottish Water Project Lifecycle process**

Scottish Water makes use of multiple tools in the costing approach, as well as supplementary information, to form a robust view of the cost of a project at each 'Gate'. As projects progress through the Gates, our information on scope and project specific factors becomes more accurate and precise, and so the tools that we use vary accordingly. Figure 11 lays out the typical life cycle of an investment appraisal and highlights the tools typically used at each stage.

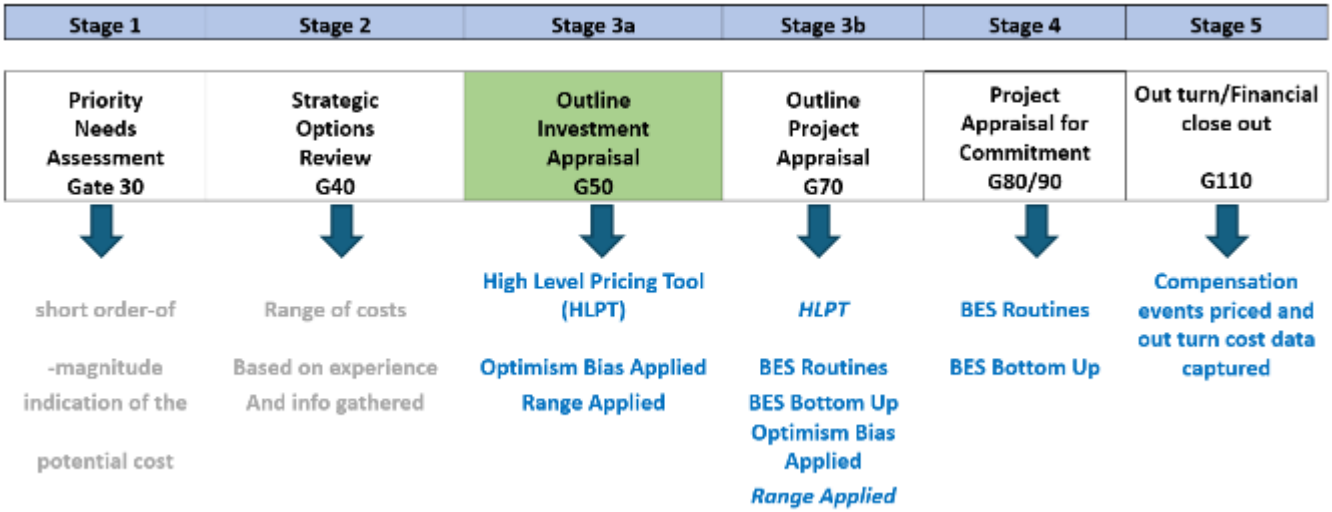



*Figure 11: Scottish Water's Lifecycle Costing Process*

Source: SW analysis

Note: Compensation events are a mechanism to pay contractors extra time and/or money for dealing with unexpected changes.

### *Stage 1 Gate 30: Initiation*

Gate 30 is the initiation step where project priority needs are assessed. Cost estimates can be created using a combination of cost models, analytics prediction models and expert input from the Cost Intelligence team. The costs of projects are aligned to the SR27 Business Plan and follow Scottish Water internal Project Investment Appraisal (PIA) processes.

### *Stage 2 Gate 40: Option Appraisal / Stage 3a Gate 50: Option Confirmation*

At Gates 40 and 50 projects are primarily costed using the HLPT, which uses R2309 cost models used for business planning to maintain link between stages.

At this stage, adjustments are made to build in project-specific factors, including:

- graded optimism bias adjustments based on historical cost movement between Gate 40 and Gate 110. This mechanism is reviewed periodically and the adjustment altered to account for the improving dataset;
- site-specific scope requirements identified as well as land purchase and specific third-party cost considerations; and
- Confidence grading based on the level of available information.

### *Stage 3b Gate 70: Project promotion*

As projects develop and the exact scope matures, cost estimates are updated through a combination of:

- updates HLPT cost estimates reflecting increasingly accurate information about the project;
- Bottom-up pricing of inputs, using bills of quantities, delivery vehicles labour, plant, material costs using Scottish Water's BES tool; and
- Optimism bias adjustments, but at lower levels of variance reflecting the increased certainty of the project scope;

Where applicable, we can use external benchmarking or other inputs in order to improve the quality of or cost estimates as project details are confirmed. Project specific risk register costs are also included at this stage.

### *Stage 4 Gate 80: Commitment Project approval / Gate 90: Commitment Delivery approval*

At Gate 80, projects are more developed and will predominantly use the more detailed and sophisticated BES system to develop a full Bill of Quantities valuation including:

- Market quotes for specialist equipment and materials
- Primary contractor involvement providing a buildability challenge on identified, developing temporary work scope and site-specific information.

### *Stage 5 Gate 110: Outturn/Financial Close out*

This stage of the process captures the agreed scope and final cost of the project. This is priced in BES with final quality assured unit level datapoints added to our existing model dataset to support next the generation of cost models.

## 7.2 Scottish Water's approach to pricing risk

Scottish Water takes a formulaic approach to pricing risk within investment projects, based on market testing and contractual arrangements with our current supply chain partners. This approach will remain similar under Delivery Vehicle 2 (DV2), but will develop for DV4 as we move to an enterprise model with a more mature and integrated approach to incentivisation and risk sharing.

Currently, Scottish Water takes responsibility for elements such as the high-level scope and base data associated with a project, the validity of initial asset condition surveys, the risk of non-approval by statutory bodies and changes in law, policies and procedures. Scottish Water is also exposed to the costs of changes in WICS, SEPA or DWQR requirements. Our delivery partners take responsibility for elements such as design and construction, ground conditions, contamination, legislative changes relating to employment and health and safety, subcontractor performance and any pricing errors or omissions in delivery partners pricing and design.

Under this approach, both parties take account of and price their respective risks. Scottish Water's approach is to mitigate risks where possible or ensure that these risks are reflected in the cost of work carried out in the earlier stages of a project.

Our approach is to provide our delivery partners with a standard 3% risk allowance to cover the cost of the factors described above, with additional adjustment made to reflect the specific features of each project (if appropriate). For example, we may need to factor in the cost of risks associated with access restrictions, any specific planning restrictions and any temporary works required to deliver a project.

While risks should be increasingly well understood and accurately priced as we go through the Stage/Gate process described above, some uncertainty is likely to persist late into planning and execution of projects. For example, at Gate 90 we are still likely to face risks in relation to the impact of adverse weather conditions and other operational constraints to the timing of projects. We assess the level of risk to be included at Gate 90 based on historical data. For our larger projects, we can also deploy addition tools and analysis, such as Monte Carlo simulations, to assess and price remaining risks at this Gate.

At Gate 90, each project has fully costed risk register which is used throughout the construction phase of a project to manage and mitigate remaining risks through to Gate 110 (close out) .Depending on the size and nature of the project, the combined risk provision at G90 is generally between 5% and 10%, and we understand that these levels are in line with normal industry practices. These remaining risks are then actively tracked and managed through to the completion of the project.

More information on our developing approaches in relation to DV4 are available in the Supply Chain Technical Appendix.

## 7.3 Capex efficiency to market across all Gates

Scottish Water's Cost Intelligence teams have several tools available to assess and monitor the efficiency and appropriateness of our costs estimates as capital projects move through the project lifecycle.

Scottish Water has a team dedicated to Project Investment Appraisals (PIA's). These investment appraisals help decision makers in the Investment Group[40] to understand the potential effects, trade-offs and overall impacts of options by providing an objective evidence base for decision making across all Gates.

Cost Intelligence supports this PIA process by providing estimates, as outlined above, for each of the Gates and can also provide a Process Change Analysis (PCA) showing both the cost and scope change between the Gates as the project matures.

In addition to this internal governance/sign-off, Cost Intelligence can provide further external support tools to test project efficiency to market as follows:

- comparing costs to an external cost curve library (provided by AECOM)
- utilising external project benchmark support from AECOM
- utilising additional peer-to-peer project benchmarking data (collated and provided by Turner & Townsend)
- utilising expert cost consultant framework support where additional skills or experience would be additive to Scottish Water's internal assessments.

This offering can be provided for all projects, but is likely to be used for high profile, high value projects.

## 7.4 Further efficiency adjustments in the SR27 Business Plan

As noted above, the R2309 cost curves that underpin a large element of our price estimates are based on outturn project costs from SR10 and SR15 (indexed for inflation). This means that there will be additional efficiency improvements achieved over the course of SR21 that will need to be captured in order to reflect the best estimate of efficient costs within the SR27 Business Plan. In addition, we need to incorporate the efficiency improvements expected during SR27, specifically

[40] The Investment Group (IG) is an internal governance body accountable for approving the Investment Strategy. It provides assurance that the Total Investment Portfolio is balanced and on course to deliver the Investment Strategy, from both a near and long-term perspective. It is accountable for amending the Investment Strategy to ensure agreed outcomes are achieved for customers.

the 0.8% pa frontier efficiency challenge referenced above. For the Draft Business Plan, we have made a number of simplifying assumptions in order to assess the 'post efficiency' cost of our plan.

These assumptions will be updated and reassessed for the Final Business Plan, incorporating feedback from WICS in areas such as frontier efficiency and RPEs as well as more sophisticated modelling of efficiency improvements across various maturities of projects within the plan.

In total, we have made an efficiency adjustment of £442m to convert our pre-efficient cost estimates to the 'post-efficiency' figures presented in the Business Plan and Data Tables. This is made up as follows:

- Average capex efficiency improvement over SR21 of 1%, as discussed in more detail in the Innovation and Transformation Technical Appendix. Within this we make the following assumptions:
    - 50% of project costs are estimated using cost models with data from SR10 and SR15, and so 100% of the anticipated SR21 efficiency gain needs to be captured – ie, a 6% saving.
    - 50% of projects are costed using other methodologies that more quickly update for efficiency gains already achieved (such as run rates), and that we are roughly half way through the price control period, such that 50% of the 1% pa efficiency gains need to be captured in this adjustment, ie a 3% saving.

  As a result, we apply a 4.50% (50/50 weight of 6% and 3% savings) efficiency improvement adjustment.
- A capex RPE 0.50% pa assumption for SR21, applied in a similar weighted approach as described above, offsetting efficiency improvements by a total of 2.25%.
- Based on the two calculations above, we apply a net efficiency benefit from SR21 of 2.25% (based on 4.5% minus 2.25%), applied to the pre-efficient investment plan of £8.75bn - amounting to £197m of savings from SR21 not yet captured in our cost estimates.
- To this £197m figure, we add on the impact of a 0.8% pa frontier efficiency challenge during SR27, applied as 2.80% (the average total saving required across the period). Applying this total efficiency benefit to the pre-efficient investment plan of £8.75bn amounts to a further £245m of required savings.
- £197m of 'SR21' savings and £245m of SR27 anticipated efficiency improvements leads to an overall adjustment of £442m to our pre-efficient cost estimates.

For note, our overall efficiency challenge calculations are applied to approximately £11.1bn of totex, with approximately £2.3bn of total opex costs excluded as not suitable for efficiency challenge (including costs such as taxes, rates and regulatory fees where there is no reasonable scope for efficiency improvement). No capex costs are excluded when calculating the efficiency improvement required in SR27.

For the purpose of this early stage exercise, we have not applied an RPE adjustment for SR27. We will engage further with WICS to understand which approach the regulator would like to take when incorporating RPEs into SR27 (ie, cost versus revenues adjustments and ex ante and/or ex post adjustments). Similarly, we have not tried to 'phase' savings across the plan – as this feels premature ahead of greater clarity on the scale and make-up of the Business Plan that Scottish Water will ultimately implement over SR27, and we await engagement with WICS on both the scale of frontier challenge that will be set and the way that this will be implemented (ie, whether on a totex, opex versus capex or hybrid basis).

These assumptions will be updated and improved such that the Final Business Plan should include a more comprehensive and sophisticated assessment of how efficiency gains and offsetting RPEs will be captured within the Business Plan and SR27 control. However, we are confident that the assumptions made are sufficient to present a meaningful indication of the post-efficiency adjustment funds that will be available to invest in Scottish Water's SR27 Draft Business Plan.

## 7.5 Continuous Improvement

We are constantly looking to improve confidence and refinement of our cost model offering by increasing the quantity and relevance of quality approved data included. As more up-to-date data becomes available, the models will reflect actual modern equivalent replacement, changes in delivery methods (e.g. slip line/modular construction off-site), customer partnership working, SR21 delivery partnerships, aid understanding extent of transformation initiatives (e.g. getting to site/off site in ½ the time), impacts of net zero commitments etc and provide the opportunity to retire older data.

Over time, this larger selection of data will enable more meaningful, refined and detailed cost models to be created to support future business-wide requirements.

It is not expected that there will a further full cost curve release for the Final SR27 Business Plan submission but we are assessing unit cost range variances, identified by CKBS, and supplementing with 'gap' datapoints with a view to issuing a limited release. We will update our Final Business Plan submission for any additional data and evidence that is available.

Scottish Water is also developing and encouraging the development of standard design and Proven Design. This allows us to develop cost model and builds that represent these typical interventions solutions and embrace the innovations of the delivery partners.

Scottish Water has engaged with multiple companies to provide benchmarking data and comparisons in a reciprocal manner. This provides another source of cost evaluation, allowing for a more comprehensive evaluation of cost.

# 8 Conclusion

## 8.1 Summary of efficiency position in SR27

In the sections above we detail the efficiency evidence and analysis we have used when considering Scottish Water's efficiency position for SR27. Our work on econometric modelling of opex spend and benchmark of capex spend suggests that Scottish Water is, in the round, currently operating efficiently versus key peers (once appropriate adjustments are made to ensure comparability and take account of Scotland-specific factors). However, in addition to this 'in-the-round' assessment, we have highlighted areas for further investigation and analysis. Scottish Water will look to address any sub-categories of costs where Scottish Water performance is below median.

We have also considered what ongoing or frontier efficiency challenge that Scottish Water should be subject to. Here we have considered a variety of evidence and views, and have concluded that current trend data is not supportive of the recent regulatory precedent of a c1% efficiency challenge. We consider a figure of 0.8% to be ambitious but realistic and appropriate for SR27. We have laid out a range of ways that this efficiency challenge could be applied, and will engage with WICS further on this ahead of Final Business Plan submission. We have also investigated the presence of RPEs, finding it likely that Scottish Water's (efficient) costs are likely to deviate from broader CPI inflation over the course of SR27. To best enable Scottish Water to deliver the agreed investment programme and to help WICS accurately assess Scottish Water's performance, we propose that RPEs are taken into consideration on both an ex-ante and ex-post basis, and will continue to engage with WICS on how this feature can be best integrated into the price control.

# Annex A: Supplementary information on opex benchmarking

## Introduction

In this annex, we set out how we have assessed Scottish Water's current level of operating expenditure (opex) efficiency to understand its performance relative to other water companies in England and Wales drawing on a range of econometric modelling that Ofwat and/or the CMA used in their assessments of cost efficiency at PR19 and PR24.

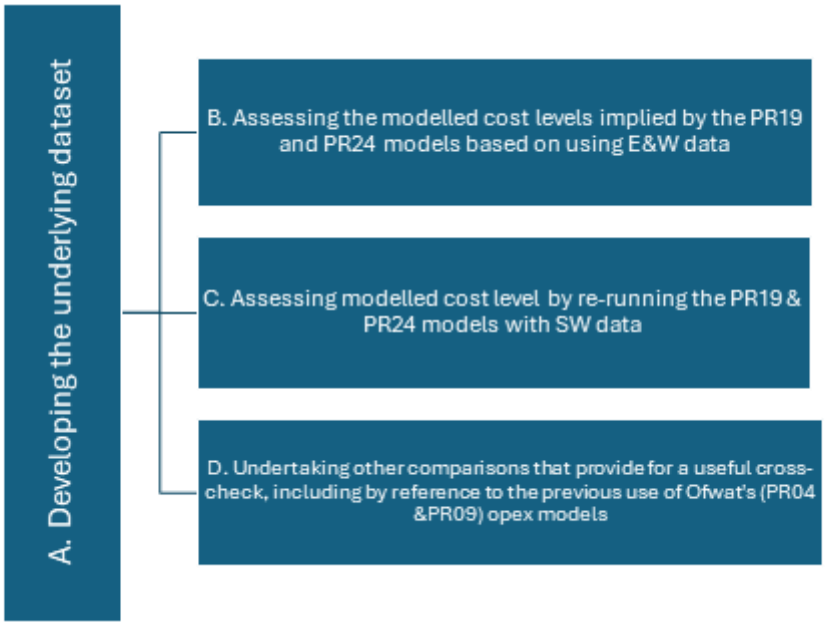
### *Our approach*

In line with WICS's expectations in its SR27 Methodology, we developed a workplan for assessing the case for an opex catch-up efficiency adjustment which sought to draw upon econometric benchmarking that has been undertaken by Ofwat and/or the CMA when seeking to assess relative efficiency across water companies in England and Wales. This analysis has focused primarily on using the 'base cost' econometric benchmarking models that Ofwat and the CMA applied at PR19, and the equivalent models that Ofwat applied in its recent PR24 Final Determinations. Ofwat defines 'base costs' as comprising opex and capital maintenance, and – as set out further below – our analysis has included consideration of factors that might affect the inferences that it is likely to be reasonable to draw from the results of this modelling when assessing Scottish Water's relative efficiency with respect to opex (including the policy on asset replacement that has applied in Scotland since 2015) .

As a cross-check, we have also considered how Scottish Water's opex levels have evolved relative to companies in England and Wales since 2015. This recognises that in its analysis for the SR15 price review, WICS identified Scottish Water's performance with respect to cost efficiency as broadly on a par with that of the leading companies in England and Wales, following significant improvements during SR10.[1] The catch-up efficiency challenge that had been set at SR10 was informed by the WICS's use of Ofwat's PR04 and PR09 econometric opex benchmarking models. Those models have not been used by Ofwat for around 15 years, and – as above – our primary focus has been on Ofwat's (and the CMA's) more recent modelling. Nevertheless, considering relative movements in opex levels since 2015 provides a way of taking the results of that earlier benchmarking work into account indirectly to some extent, as well as more generally giving a view on how the scale of changes in Scottish Water's opex over the past c10 years compares to that of companies in England and Wales.

The diagram below summarises the key different steps involved in our modelling work. The first step (A) was to work with WICS to develop an agreed underlying dataset that could be used to generate model results. Where possible we have used available data from Scottish Water's Annual Returns and Regulatory Accounts. For a small number of the metrics required to run Ofwat's models it has been necessary to make a number of assumptions in order to generate usable values. For these metrics we have worked with WICS and agreed practical approaches that have allowed the models to be run, with potential reliability issues then able to be considered when results are being interpreted.

**Overview of key modelling steps**




We have used the PR19 and PR24 base cost models in two different ways, as reflected in (B) and (C) in the above diagram:

- We started by considering the models as calibrated using England and Wales data, and considered what they would imply for the relative efficiency of Scottish Water's costs, given the relevant levels for Scottish Water over the past five years of the different explanatory variables used in those models. This provided a relatively 'hands off' way of using the models.
- We have also re-run (and as a result recalibrated) the models with the relevant Scottish Water cost and explanatory variable values added to the dataset, and (as set out further below) with some different variants considered. This provided a flexible way of identifying how sensitive the modelling results were to the inclusion of Scottish Water data and to some relevant adjustments.

While there are a wide range of possible modelling approaches that could be adopted, we note that Ofwat's framework has been developed following considerable consultation and has been subject to review by the CMA (including in relation to matters such as the most appropriate functional form to adopt when modelling). While that framework was developed by reference to circumstances in England and Wales, we have considered it likely to be more productive and informative to focus our attention on seeking to identify and appropriately test and interpret the results implied by these existing models than to seek to develop a wide range of alternatives (beyond the matters that we have considered below).

As shown as (D) in the diagram (and noted above), we also considered the evolution of opex since 2015 as a cross check.

In our workplan for opex efficiency, we identified six cross-cutting issues as meriting careful consideration in the modelling process and/or when model results were being interpreted and assessed:

- **Capital maintenance levels**: given the policy on asset replacement that has been applied in Scotland since SR15.
- **The implications of PFI contracts**: as a significant portion of waste water services in Scotland are, and have been, provided by third parties under long-term PFI contracts.

- **Impacts of geographic dispersion**: testing the extent to which the models can be expected to take account of nature of the geographic dispersion of the population in Scotland and impacts this can have on the efficient costs of service provision.
- **Cost allocation issues**: and how they might impact on the weight that should be put on different model results.
- **Special factors**: whether there are other factors that might justify specific (positive or negative) adjustments being made to, or when assessing, model results.
- **Model reliability considerations**: how the likely reliability of different model results should affect interpretations with respect to relative efficiency.

We show how we have taken these issues into account (where relevant) in our assessment of water and waste water cost efficiency below.

We have found it appropriate to treat our overall catch-up efficiency assessment as having two steps:

1. Assessing whether or not the range of evidence considered supports the view that it would be appropriate to apply a catch-up efficiency adjustment when setting Scottish Water's opex allowances for SR27.
2. If a catch-up efficiency adjustment is identified as appropriate in relation to water or waste water opex, assessing what the scale of that adjustment should be.

These steps are separated to try to avoid the risk of applying an unduly mechanistic approach in a context where there are a range of different factors and sources of evidence that are relevant to consider. This is particularly so in relation to waste water services, where – as described further below – the significant role that has been played by PFI providers over time raises some material comparability challenges. While, through engagement with WICS, we have sought to identify practical and reasonable ways of taking these issues into account in our quantitative assessments, we nevertheless consider this to be relevant context when seeking to interpret the results of those assessments, and related sources of information.

Our overall assessment is that the evidence set out below does not support the view that it would be appropriate to apply a catch-up efficiency adjustment when setting Scottish Water's (water or waste water) opex allowances for SR27. As a result, we have not found it necessary to address the second step described (of calibrating the scale of adjustment that would be appropriate). We set out the key evidence and considerations which have underpinned that assessment below.

## Our assessment of water costs

After providing an overview of Ofwat's wholesale water models below, we describe how we have used them, the main results we have found, and some supporting analysis we have found helpful when seeking to interpret and cross check those results. We then set out our overall assessment with respect to catch-up efficiency.

### *Ofwat's wholesale water base cost models*

We focused our attention on Ofwat's wholesale water base cost models, with this allowing for the benchmarking of a high proportion of relevant water service costs while avoiding significant comparability issues that would be expected to arise in the consideration of retail services (including because of the extent of differences in billing and metering arrangements).

Ofwat's wholesale water models seek to explain differences in relevant costs between companies by reference to the following four underlying factors, which have been identified as providing a reasonable reflection of relevant engineering and economic drivers:

- **Scale**: costs would be expected to increase with scale
- **Density**: more densely populated areas can provide scope for lower unit costs and the more efficient utilisation of resources (eg with reduced travel times and duplication of depots and spare parts). However, companies in highly dense areas can also face a more complex operating environment and factors that can tend to increase costs (eg higher property and labour costs and congestion).[2]
- **Treatment complexity**: water treatment costs will be affected by the types of treatment that are required.
- **Topography**: this can have a material impact on pumping requirements.

At PR19, Ofwat (and then the CMA) used five wholesale water models which sought to take account of the above cost drivers. Two of those models sought to directly assess wholesale water costs (and differed because they used a different metric to seek to take account of treatment complexity). The other three models assessed costs on a more disaggregated basis: two assessed what Ofwat refers to as Water Resources Plus, which includes water resources and treatment costs (and as with the wholesale water models, they differed in the metric they included for treatment complexity). The other model assessed the costs of treated water distribution. The metrics included in these PR19 models are summarised in the table below.

***Explanatory variables included in PR19 base cost models: wholesale water***

| | WRP1 | WRP2 | TWD1 | WW1 | WW2 |
|---|---|---|---|---|---|
| Ln (number of properties) [Scale] | X | X | | X | X |
| Ln (length of mains) [Scale] | | | X | | |
| Ln (weighted average density) | X | X | X | X | X |
| Ln (weighted average density)$^2$ | X | X | X | X | X |
| % of water treated at complexity levels 3-6 | X | | | X | |
| Ln (weighted average treatment complexity) | | X | | | X |
| Ln (number of booster pumping stations per length of main) [Topography] | | | X | X | X |

Source: information from: FM_WW2_FD.xlsx

For PR24 wholesale water modelling, Ofwat used the same basic approach as at PR19 but sought to identify whether there were other explanatory variables that were likely to help better capture the underlying engineering and economic drivers of cost it had identified (ie scale, density, treatment complexity, topography). Ofwat's PR24 models include different metrics in relation to two of those underlying drivers: density and topography.

Ofwat's PR19 models used a density metric which calculated the weighted average density across the different Local Authority Districts (LADs) – or proportions of them (where a LAD crossed company boundaries) – that had been identified as falling within each company's service provision area. Having identified some accuracy concerns over its PR19 LAD-based weighted average density metric, one of the explanatory variables Ofwat decided to use for PR24 was a

LAD-based weighted average density metric that was determined using more granular underlying density data, categorised by what are referred to as Middle Super Output Areas (MSOAs). In practice, this means that Ofwat can be viewed as having included its five PR19 wholesale water models within its set of PR24 models (albeit with a more refined basis for calculating LAD-based weighted average density figures). Given this, we focused our attention only on the PR24 models and treated this as effectively encompassing the consideration of Ofwat's PR19 models.

Ofwat's set of PR24 models also included the following alternative density measures:

- An MSOA-based weighted average density measure (that is, rather than using MSOA data to generate a LAD-based measure, that data was used to directly calculate weighted average density figures).
- The number of properties per length of mains: Ofwat noted that this is an intuitive measure that does not rely on ONS data, but also that is less exogenous than (than its other density metrics) and may not capture density differences between companies as well.[3]

As was shown above, Ofwat's PR19 modelling sought to reflect relevant differences in topography between companies by including the number of booster pumping stations per length of main as an explanatory variable. Ofwat's set of PR24 models included this metric, but also (as an alternative in some models) included Average Pumping Head for Treated Water Distribution.

Including the above variants (and in different combinations) across the different levels of aggregation used in Ofwat's modelling (that is, as above, Water Resources Plus, Treated Water Distribution and Wholesale Water), resulted in the increase from the 5 wholesale water models used at PR19 to the 24 models used at PR24.

### *Identifying relevant data for Scottish Water*

In order to apply the models, it was necessary to identify data for Scottish Water in relation to:

- Relevant costs; and,
- Each of the explanatory variables used in Ofwat's models.

We engaged with WICS to develop an agreed set of data in relation to the above that could be used when running the Ofwat models.

With respect to relevant costs:

i. In line with Ofwat's approach, we excluded a small number of cost lines from the measure of base costs to be used for modelling (most notably, local authority rates).

ii. Ofwat includes a small number of enhancement cost lines in its analysis such that it refers to its modelling as 'base plus' (ie to reflect that some costs are included in addition to base costs). We engaged with WICS to agree a practical means of seeking to reflect this (in particular in relation to growth).

iii. Ahead of 2021-22, Scottish Water's Regulatory Accounts (Table M18) did not report costs in way that showed outturn capital maintenance levels for Wholesale Water (or indeed, Water Resources or Distribution). Information on outturn levels of capital maintenance had been reported in Table G1 of the Annual Return, but that information does not provide a breakdown of Water Service capital maintenance between Water Resources and Distribution, and significant portion (around 10-20% between 2011-12 and 2020-21) of capital maintenance is attributed to 'Management and General' and not allocated between water and waste water. We engaged with WICS to agree reasonable allocation assumptions that would allow relevant cost figures to be identified for Water Resources Plus, Distribution, and Wholesale Water for each of the years included in Ofwat's analysis.

With respect to the explanatory variables used in Ofwat's models:

- Other than for Ofwat's weighted average density metrics, all of the inputs we used when applying or re-running Ofwat's wholesale water models were calculated on the basis of Scottish Water's Annual Return information. For the number of booster pumping stations it was necessary to interpolate between published information in 2010-11 and 2015-16, but otherwise all relevant data was drawn directly from published Annual Returns.
- We engaged with WICS to agree an approach that followed Ofwat's generation of MSOA-based weighted average density figures, but used Intermediate Zone data for Scotland, and allowed for what look to be reasonable equivalents to Ofwat's LAD-based and MSOA-based weighted average density metrics to be generated.

We viewed the cost allocation issues highlighted above – that is, the need to use some relatively crude assumptions to identify separate capital maintenance figures for Water Resources Plus and Distribution ahead of 2021-22 – as providing support for the view (explained further below) that we should focus our attention on what Ofwat's models might imply for wholesale water costs overall (rather than seeking to draw inferences from the results of Ofwat's disaggregated models when viewed in isolation). While we consider wholesale water and waste water costs separately below, we also note that – given the need for an allocation assumption to generate separate water and waste water base cost figures ahead of 2021-22 – it is likely to be appropriate to consider the implied efficiency position across water and waste water together as a cross-check on the potential implications of this.

There are two cost allocation issues (over and above points noted above) that we identified as having a potentially material bearing on the comparisons described above:

- Allocations of capex between capital maintenance and enhancement
- Scottish Water's attribution of repair and renewals spend over time.

We note that the Regulatory Accounting Guidelines in England and Wales appear to have been interpreted in a way that could result in some expenditure that would be classified as asset replacement expenditure by Scottish Water (and therefore treated as capital maintenance in our assessment) being classified as 'enhancement' by companies in England and Wales. For example, in its PR19 submissions, Yorkshire Water described its interpretation of enhancement expenditure for AMP7 (ie the forthcoming regulatory period) as being: *AMP7 efficient expenditure if enhancement activities are undertaken less AMP7 efficient expenditure if enhancement activities are not undertaken*.[4]

However, this would imply that asset replacement (which may be needed to support the delivery of an enhancement, but which does not itself directly provide for that enhancement) would be classified as enhancement unless the company would have expected to have undertaken it in the absence of the enhancement: so asset replacement spend that was brought forward as a result of undertaking enhancement projects would – on this interpretation – be classified as 'enhancement'. This could differ from the Scottish Water approach, which begins by assessing asset replacement spend, and only identifies capital expenditure as enhancement where it results in the provision of something additional.

We have not been able identify the extent to which this interpretation is applied in E&W and might impact on how capex is classified. We note, though, that where applied it would tend to distort the comparison between Scottish Water and companies in E&W by resulting in the relative scale of Scottish Water's recorded base costs being overstated to some extent. We note that our opex only modelling runs (described below) provide a way of testing the extent to which this might affect the identified results (although separately identifying and comparatively assessing opex

levels inevitably raises other allocation questions in a context where a totex framework has been applied in E&W over the last 10 years).

Scottish Water refined its approach to identifying and attributing repairs and renewals spend in SR21 and we consider this to have provided a more accurate basis for identifying opex levels from 2021-22 onwards. However, that means that there is a degree of difference between the way in which Scottish Water's opex figures have been prepared pre- and post-2021-22. The effect of this change was to reduce Scottish Water's reported opex to a limited extent, and in line with that, we consider that the opex figures ahead of 2021-22 are likely to be overstated to a limited degree.

We have not explicitly taken this into account in our econometric modelling (although recognise this alongside other potential sources of 'noise' when interpreting results). However, because Scottish Water continues to report what its level of opex would be on an SR15 basis (ie the basis that applied before the refinement), then this allows the scale of the difference to be identified and taken into account in 2021-22 through to 2023-24. Given this, and in order to try to provide for consistency over time, we take this issue into account when comparing relative movements in opex over time against companies in E&W (as not to do so would tend to dampen the Scottish Water increase to some extent). As highlighted below, we do this by assessing Scottish Water's relevant opex over time consistent with the SR15 basis of preparation.

### *Our approach to using the PR24 wholesale water model results*

Each of Ofwat's models allows a modelled level of cost to be generated for each company for each year in which relevant data is available, and for this to be compared to the company's outturn level for that year. This relationship can be described by what Ofwat refers to as an 'efficiency score', calculated as outturn cost divided by modelled cost: a value of 1 would arise if the level of outturn costs was equal to that predicted by the model; a value of less/more than 1 would arise if outturn costs were lower/higher than that predicted by the model.

Ofwat used the results of its 24 PR24 models to generate what it refers to as a 'triangulated' view of the efficiency score for wholesale water for each company. This involves using the different models (taking account of their scope and similarities/differences) to generate an overall weighted average efficiency score across the whole set of models. Ofwat then assessed the need for a catch-up efficiency challenge by reference to the distribution of these triangulated efficiency scores across companies over the most recent 5 year period for which data is available (ie 2019-20 2023-24). In particular, it identified the upper quartile (UQ) level of efficiency score (the level which 25 per cent of companies had a lower score than), and used this as its benchmark. That is, company efficiency scores were compared to the UQ level.

We have adopted the same general approach below when presenting modelling results of focusing on the 'triangulated' view across the set of Ofwat's 24 wholesale water models. The use of this averaged view recognises that specific models may tend to under- or over-recognise relevant factors, and combining results across a range of models which adopt different approaches can help generate more balanced results overall, and lessen the risk that identified differences in efficiency scores between companies result from limitations in the modelling process as opposed to differences in underlying efficiency.

In line with this, when presenting results below, we show how Scottish Water's implied efficiency scores compare to the UQ and to the median level (the level of efficiency score that half of companies have a higher and half a lower value than). As we noted in our workplan for opex

efficiency, it is well recognised (including by Ofwat, the CMA and other regulators such as Ofgem) that the stringency of the benchmark that it is appropriate to use when assessing the scope for catch-up efficiency will depend on the likely reliability of the modelling results, such that the use of a UQ benchmark would typically imply a relatively high degree of confidence that identified differences between modelled and outturn cost levels relate to efficiency rather than, for example, to limitations of the modelling related to the omission of a relevant variable. We discuss the relevance of this to the interpretation of different model results in our overall assessment below.

### Our modelling results ahead of any adjustments: wholesale water

The table below summarises our initial base cost modelling results for Scottish Water using the two approaches that were described above: identifying the levels of modelled cost implied for Scottish Water based on Ofwat's coefficients; re-running and re-calibrating the models after adding Scottish Water cost and explanatory variable information to the dataset. The efficiency scores (and comparisons) shown follow Ofwat's FD approach of determining and using (for the purpose of identifying the relative rankings of companies) average efficiency scores over the 5-year period 2019-20 to 2023-24 (and the same approach is used in all subsequent tables showing efficiency scores). As can be seen in the table, under both approaches, this initial assessment implies that Scottish Water's relevant costs are materially higher than the UQ or median benchmark.

***Summary of base cost modelling results for wholesale water ahead of any adjustments***

| | Using Ofwat's coefficients (E&W data only) | Re-running the models to include SW data |
|---|---|---|
| Scottish Water's Efficiency score | 1.31 | 1.25 |
| • Relative to the median level | 1.23 | 1.17 |
| • Relative to the UQ level | 1.32 | 1.27 |

Source: SW analysis

Notes: All scores here and in subsequent tables calculated on the basis of the most recent 5 years in line with Ofwat's approach.

This starting point (which implied that Scottish Water's costs may be around 30% than the upper quartile performance in E&W) is unsurprising given the focus that there has been on asset replacement in Scotland since SR15. In particular, we note that a consensus emerged during the SR21 review process over the need for higher levels of asset replacement expenditure, and Scottish Water's levels of capital maintenance have increased since then in line with that intended policy change.

This means that one would expect Scottish Water to have had relatively higher levels of capital maintenance (which, as noted above, is included in Ofwat's measure of base costs) in recent years for deliberate policy reasons. WICS explicitly recognised this issue in its SR27 Methodology, and in our workplan we set out three different ways in which we planned to take it into account:

i. Considering what post-modelling adjustments might be appropriate when the base costs results implied for Scottish Water when using Ofwat's coefficients are being assessed, in order to reflect the different policy approach to asset replacement in Scotland.

ii. Re-running Ofwat's models but making a pre-modelling adjustment to SW's base cost data that aims to neutralise the effect of capital maintenance on SW's efficiency score. In particular, re-running the models after replacing SW's outturn capital maintenance spend with the median and the lower quartile level across E&W companies.

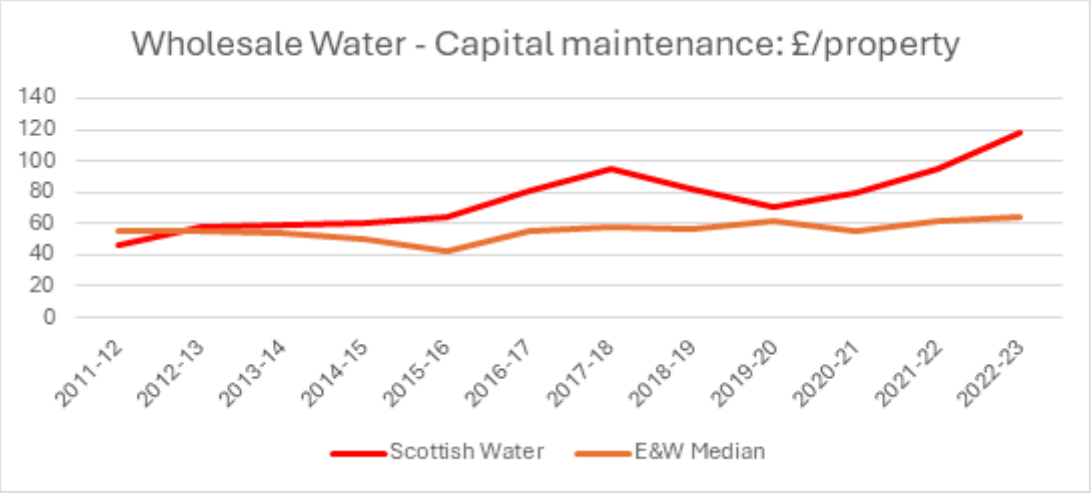
iii. Re-running Ofwat's models but using only opex levels as the relevant measure of costs (and therefore stripping capital maintenance spend out for all companies).

These approaches – and their impact on identified efficiency scores – are considered in turn below.

**Post-modelling adjustments to take account of asset replacement policy in Scotland**

A comparison of the scale of asset replacement activity between Scottish Water and companies in E&W would ideally be based on relevant activity levels, such that the extent of relevant asset replacement could be compared directly. In practice, however, the scope for undertaking this kind of direct comparison in a reliable and informative way is currently very limited. While there is comparative data available on mains renewal rates (and we note that Ofwat made use of this data in its FD cost adjustment claim process), as discussed further below, this does not provide a reliable basis for seeking to calibrate the overall wholesale water impact of Scottish Water's asset replacement activity, which has affected a much broader range of assets. In the absence of practical and effective activity-based options for comparing asset replacement activity, we have focused our attention on comparisons between capital maintenance spend levels.

The graph below compares Scottish Water's capital maintenance levels since 2011-12 with the median level for water companies in England and Wales. The comparison is presented on £/connected property basis to take account of relevant scale differences, with the number of connected properties having been the primary scale driver Ofwat has used in its wholesale water base cost modelling. The relationship with the median level is relevant to consider as this would be expected to have impacted on the level of capital maintenance that will have been treated, implicitly, as efficient within Ofwat's calibration of modelled costs.




Source: SW analysis based on SW Annual Returns and Ofwat's PR24 wholesale water modelling dataset from: PR24-FD-CA03-Base-costs-water-model-1.xlsx

In line with that, identifying the difference between Scottish Water's levels of capital maintenance per property and the median levels in E&W provides a basis for making a post-modelling adjustment to seek to control for the impact of Scottish Water's asset replacement policy on implied efficiency scores (some potential alternative approaches to making this adjustment are considered below). The left-hand column in the table below shows (as in the table above) the unadjusted view of Scottish Water's implied efficiency score based on Ofwat's PR24 wholesale water models, using Ofwat's coefficients. The next column then shows how those efficiency

scores change when Scottish Water's capital maintenance levels are assumed to be consistent with the median level of capital maintenance per property observed in E&W.[5]

**Impact of post-modelling adjustments on results using the PR24 wholesale water models (£/property basis)**

| | PR24 models triangulated – Ofwat coefficients | With Scottish Water capital maintenance set in line with E&W: | |
|---|---|---|---|
| | | Median £/property | Lower Quartile £/property |
| Scottish Water Efficiency Score | 1.31 | 1.03 | 0.95 |
| • Relative to median level | 1.23 | 0.99 | 0.91 |
| • Relative to the UQ level | 1.32 | 1.04 | 0.97 |

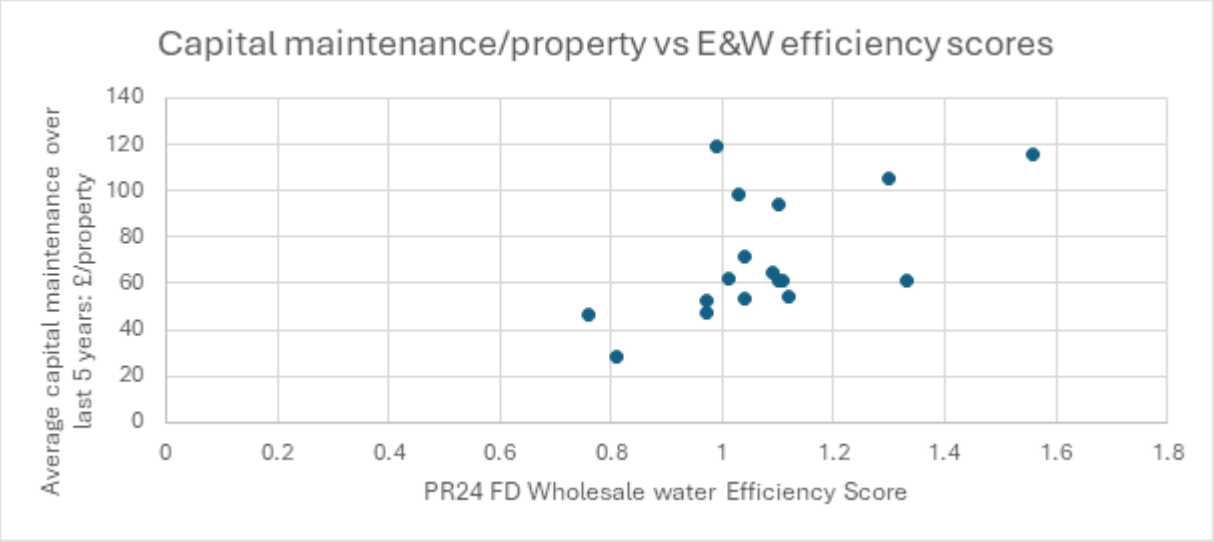
Source: SW analysis

This adjustment was made by removing Scottish Water's actual capital maintenance spend from its total level of base plus costs for each year, and adding back an amount[6] calculated as follows:

- For each company in E&W (using Ofwat's PR24 FD cost assessment dataset),[7] the level of capital maintenance per property was identified for each relevant year.[8]
- The median level of capital maintenance per property in E&W each year was multiplied by the number of connected properties that Scottish Water served in that year in order to generate a form of 'normalised' value for Scottish Water.

The table above provides an indication of the extent to which adjusting for capital maintenance differences – in light of the different asset replacement policy that has applied in Scotland – can have a major bearing on Scottish Water's efficiency score and on its implied relative efficiency. That is, Scottish Water changes from appearing to have costs that are 23% higher than the median to costs that are just below the median, and that are only 4% (as opposed to 32%) above the upper quartile.

In practice, though, consideration of differences in capital maintenance levels between companies also has relevance for the question of whether UQ is likely to provide an appropriate benchmark, or whether the median would be more appropriate in this context. The graph below highlights the extent to which lower efficiency scores can be associated with companies that have relatively low levels of capital maintenance per property. It is notable that four of the five companies that were identified as most efficient in Ofwat's PR24 Wholesale Water base plus cost analysis (with efficiency scores below the UQ level) had levels of capital maintenance per property that were in the lower quartile for E&W. Given this, there looks to be a material risk that the upper quartile benchmark would not provide a reasonable reflection of efficient costs that included undertaking levels of capital maintenance consistent with the median level per property that has been observed in E&W in recent years.




Source: SW analysis based on PR24-FD-CA03-Base-costs-water-model-1.xlsx and PR24-FD-CA05-Base-costs-water-model-3.xlsx

The relevance of that for assessments in E&W would depend on how one interprets the implications of observed capital maintenance levels when assessing forward-looking allowances, in a context where there has been, and will continue to be, considerable scope for there to be differences between the levels of base cost funding that companies can recover in a given regulatory period, and the actual levels of costs that they incur in that period. That is, companies (in E&W) may benefit as a result of underspending their allowances in some years but may then have to fund shortfalls in others. It is notable, for example, that while Southern Water's level of capital maintenance per property has been well above the E&W median level in recent years (and indeed has exceeded the level spent by Scottish Water over the past 5 years), Ofwat has explicitly noted that Southern Water's associated totex overspend can be explained by the costs it has incurred delivering its turnaround programme. The scope for this kind of highly material under- or over-spend does not arise under the framework within which Scottish Water operates given its public ownership and the limited extent of its equity buffer.

Given this, as well as considering the effects of an adjustment based on the median level of capital maintenance per property in E&W, we have considered how the implied efficiency scores would be affected by an adjustment to bring Scottish Water assumed capital maintenance spend per property in line with the Lower Quartile (LQ) level observed in E&W each year. We have viewed this as an alternative way of taking account of the risk – highlighted above – that upper quartile efficiency scores may be materially affected by the performance of companies with relatively low levels of capital maintenance spend. As noted above, one way of taking account of that risk would be to put more weight on the median (rather than the UQ) efficiency score when comparing performance. The alternative of adjusting Scottish Water's capital maintenance levels to reflect LQ levels in E&W provides a way of recognising this risk while continuing to focus attention on the UQ efficiency score benchmark. As was shown in the right hand column of the above table, on this basis (ie with a LQ capital maintenance per property based adjustment to capital maintenance), Scottish Water's efficiency score is below the UQ level (even before the geographic dispersions issues described below are taken into account).

In its feedback on our analysis, WICS has raised questions over the whether some of the different combinations of capital maintenance per property and efficiency scores for companies in England and Wales (that can seen in the scatter graph shown above) may affect the appropriateness of seeking to 'normalise' Scottish Water's capital maintenance levels in the ways described above, and whether it may be appropriate to consider other adjustment methods. We are continuing to consider whether there may be more appropriate approaches that could be adopted, in light of

the comments from WICS, and the outcome of that further work will form part of the assessment in our final business plan.

### *The impact of alternative options when making a capital maintenance adjustment*

Given the scale of the capital maintenance adjustments made under the median and LQ approaches described above (which result in reductions to Scottish Water's assumed base plus costs of 20-30%) we considered whether there might other approaches that could be viewed as more appropriate. We viewed this as important to consider given the extent to which differences in approach might affect identified efficiency scores.

We began by considering capital maintenance levels per connected property (as above) because it looked to provide a reasonable way of taking account of differences in scale between companies. Underpinning this was the fact that Ofwat used 'number of connected properties' as the primary scale variable in most of its PR24 wholesale waste water models. That is, this approach can be understood as broadly aligning with the basis upon which Ofwat took account of differences in scale between companies in its modelling.

However, feedback during the peer review process raised questions over whether there might be ways of better reflecting the relationship between relevant costs and scale that were being captured in Ofwat's models, and in line with this we considered some potential alternatives. It is notable that in 6 of its 24 wholesale water models – the treated water distribution models – Ofwat used a different scale variable: length of mains. This raises the question of how the use of this variable might affect the capital maintenance adjustment described above. The table below shows the impact on the assumed level of capital maintenance of adjusting the Treated Water Distribution value by reference to the E&W median spend per length of mains rather than per property. The per property approach is retained for the Water Resources Plus (ie resources and treatment) adjustment because that is the scale driver used in all of Ofwat's Water Resources Plus models.

***Capital maintenance levels implied by different adjustment assumptions***

| | **Scottish Water Capital Maintenance**<br>**£m (average 2019-20 to 2023-24)** | **Difference from Outturn** |
|---|---|---|
| Outturn - Wholesale Water | £274m | |
| **Top-down view** | | |
| Based on E&W median per property – Wholesale Water | £173m | £100m |
| **Bottom-up view** | | |
| Based on E&W median per property –<br>Water Resources Plus | £64m | |
| E&W median per length of mains – Treated Water Distribution | £149m | |
| Bottom-up view – Wholesale Water | £213m | £60m |

| **Triangulated view** | | |
|---|---|---|
| Average of top-down and bottom-up view (in line with Ofwat model weightings) | £193m | £80m |

Source: SW analysis based on SW Annual Returns and Ofwat's PR24 wholesale water modelling dataset from: PR24-FD-CA03-Base-costs-water-model-1.xlsx

We note that the bottom-up view results in a significantly higher assumed level of capital maintenance for Scottish Water (£20m per year on average). This arises because of the weight that is put on the length of mains based treated water distribution figure, and the fact that – on average over the past five years – the median spend per length of mains has actually been higher in E&W than it has in Scotland. Thus, while Scottish Water's level of capital maintenance has been increasing in SR21, setting its capital maintenance in line with the E&W median per length of mains over the past five years actually results in assuming that Scottish Water's Treated Water Distribution capital maintenance is higher than the outturn level. In part, this is likely to stem from the more reactive approach (with responses triggered by information on identified problems) that has typically been taken to managing the condition of underground assets in recent years, with this meaning that changes to Scottish Water's asset replacement policy have impacted mains replacement levels more gradually than is the case for a range of other types of asset. This underpins why (as noted above) comparative information on mains renewals rates, while available, does not provide a good reflection of how Scottish Water's asset replacement policy has impacted on its overall levels of capital maintenance activity.

In practice, though, the bottom-up view puts much more weight on length of mains than Ofwat does in its triangulated wholesale water modelled cost figures. That is, costs are effectively treated as driven by the number of connected properties to a much greater extent than would be implied by looking at the bottom-up view alone, because connected properties is the scale variable that Ofwat uses in all 12 of its 'top down' wholesale water models (as well as the 6 Water Resources Plus models). The 'triangulated view' shown in the table calculates the assumed capital maintenance level in a way that can be understood as mirroring the weightings Ofwat used when generating triangulated efficiency scores for wholesale water. That is, Ofwat put 50% weight on its (top-down) wholesale water models, which used the number of connected properties as the scale driver, and 50% weight on the sum of the outputs from its Water Resources Plus models (which also used the number of connected properties as the scale driver) and from its Treated Water Distribution models (which used length of mains as a scale driver).

In line with comments from the peer review process, we also considered whether Ofwat's use of natural logs in its modelling (such that it was modelling log-linear rather than linear relationships) might affect the most appropriate way to seek to capture relevant capital maintenance differences. We found there to be significant reliability concerns over the use of approaches that sought to use natural log values for the purpose of making this capital maintenance adjustment (and note that the approaches we considered would have implied that a much larger downward adjustment to Scottish Water's capital maintenance figures would be appropriate).

Overall, we identified the triangulated view (described above) as the approach that was likely to be best aligned with the cost-scale relationships being captured in Ofwat's models, and we use that approach (where relevant) in all of our assessments below. This was consisted with the feedback we received through the peer review process. The table below shows Scottish Water's efficiency scores under the post-modelling adjustment approach (ie based on Ofwat's PR24 coefficients). Our results under the pre-modelling adjustment approach (which incorporates Scottish Water data and re-runs the Ofwat models) are shown in the next section.

**Implications of applying a triangulated capital maintenance adjustment on efficiency score based on post-modelling adjustment approach**

| | PR24 models triangulated – Ofwat coefficients | Triangulated adjustment with Scottish Water capital maintenance set in line with E&W using | |
|---|---|---|---|
| | | Median £/unit | Lower Quartile £/unit |
| Scottish Water Efficiency Score | 1.31 | 1.09 | 0.98 |
| • Relative to median level | 1.23 | 1.02 | 0.97 |
| • Relative to the UQ level | 1.32 | 1.10 | 1.00 |

Source: SW analysis

As can be seen in the table, applying a median-based adjustment on the triangulated basis implies that Scottish Water's costs are 2% and 10% higher than the median and UQ benchmarks respectively (ahead of the consideration of Highlands and Islands impacts). When a lower quartile-based adjustment is made to capital maintenance, Scottish Water's efficiency score implies upper quartile performance. In line with our comments above – on the relationship between capital maintenance levels and efficiency scores in the England and Wales modelling – we consider that the most reliable view (ahead of the consideration of Highlands and Islands impacts) is likely to be provided by:

- Comparing Scottish Water's efficiency score, after adjusting capital maintenance to align with the lower quartile level in England and Wales (using the triangulated approach), to a UQ benchmark: the results above show Scottish Water's costs to be in line with the UQ benchmark; and,
- Comparing Scottish Water's efficiency score, after adjusting capital maintenance to align with the median level in England and Wales (using the triangulated approach), to a median benchmark: the results above show Scottish Water's costs to be 2% above that base costs benchmark, which implies an average annual difference of around £9m/year. That is equivalent to an opex efficiency 'gap' of around a 5% (note that this is higher than the c2% base costs 'gap' shown in the table because the measure of base costs exceeds relevant opex (it also includes capital maintenance and limited enhancement spend)).

Our focus on these benchmarks as likely to be the most reliable is consistent with the feedback we received in the peer review process.

### *Pre-modelling adjustments to take account of asset replacement policy in Scotland*

The table below shows the results of re-running the PR24 models, with Scottish Water data added to the dataset, but with two alternative pre-modelling adjustments having been made on the same (triangulated) basis as described above:

- Scottish Water's outturn level of capital maintenance each year has been adjusted so as to be in line with the median level of capital maintenance in E&W
- Scottish Water's outturn level of capital maintenance each year has been adjusted so as to be in line with the lower quartile level of capital maintenance in E&W

This pre-modelling adjustment approach allows Scottish Water's cost and explanatory variable data to inform the modelling process, and so may result in modelled outcomes that better reflect Scottish Water's circumstances, relative to the post-modelling adjustment approach described above.

| | Scottish Water outturn capital maintenance adjusted to be in line with E&W levels using a triangulated approach based on: | |
|---|---|---|
| | E&W Median | E&W Lower Quartile |
| Efficiency score | 1.06 | 0.99 |
| • Relative to median | 1.01 | 0.95 |
| • Relative to UQ | 1.07 | 1.00 |

Source: SW analysis.

The results shown in the table are very similar to the equivalent results based on post-modelling adjustments that were shown above, but imply slightly better Scottish Water performance. In line with our comments above, we consider the use of the upper quartile benchmark when capital maintenance is normalised in line with the E&W lower quartile level (when SW's relative efficiency score is 1.00), and the median benchmark when capital maintenance is normalised in line with the E&W median level (when SW's relative efficiency score is 1.01), as likely to provide the most reliable view.

When considered together, the post modelling and pre-modelling adjustment results therefore imply that – ahead of the consideration of Highlands and Islands impacts – Scottish Water's base costs are 0-2% higher than relevant E&W benchmark levels. That is equivalent to a 'gap' of around £0-£9m/year, which – in line with our comments above on the relationship between base costs and opex – is equivalent to an opex efficiency 'gap' of 0-5%.

### *Re-running the models using only Opex*

The table below shows the results of re-running the PR24 models, but using only opex for all companies (as opposed to the 'base cost plus' values that Ofwat used which included opex but also capital maintenance and some limited enhancement spend). In order to undertake this modelling it is necessary to identify which cost lines it is appropriate to include for companies in England and Wales in order to – as far as possible – provide for a like-for-like comparison. This is not immediately straightforward because the separate identification of costs to be included in opex modelling is not something that Ofwat has needed for around 15 years, given its focus on totex (ie total expenditure) and base cost modelling over that period. In its comments on our analysis WICS identified some E&W cost lines that it may be appropriate to include or exclude from the scope of what should be treated as opex. We have engaged with WICS to agree appropriate ways to take account of these points and will reflect these refinements in the analysis we include in our final business plan.

Our opex-only modelling implies a Scottish Water efficiency score in line with the median and around 4% above the UQ level, which equates to a difference from the UQ benchmark of around £7 million/year. We note that this is consistent with our assessments above using base costs (with post and pre-modelling adjustments) rather than (only) opex. That is, the 4% 'gap' from the UQ benchmark identified here falls within the 0-5% range for the opex 'gap' that was identified above as likely to provide the most reliable assessment.

| | Models re-run using opex only |
|---|---|
| Scottish Water Efficiency Score | 1.09 |
| • Relative to median | 1.00 |
| • Relative to UQ | 1.04 |

Source: SW analysis

In its comments on our analysis WICS has noted concerns of over the statistical performance of some of the opex-only models and questioned whether there may be scope for adjustments to be made to the opex modelling to improve that performance. We note that these issues arise in a context where this analysis involves applying models that Ofwat developed for use with the broader category of base costs to the more limited category of opex. We will be engaging with WICS to explore ways in which it may be possible to improve the reliability of out opex-only modelling, and will include the results of that further work in our final business plan.

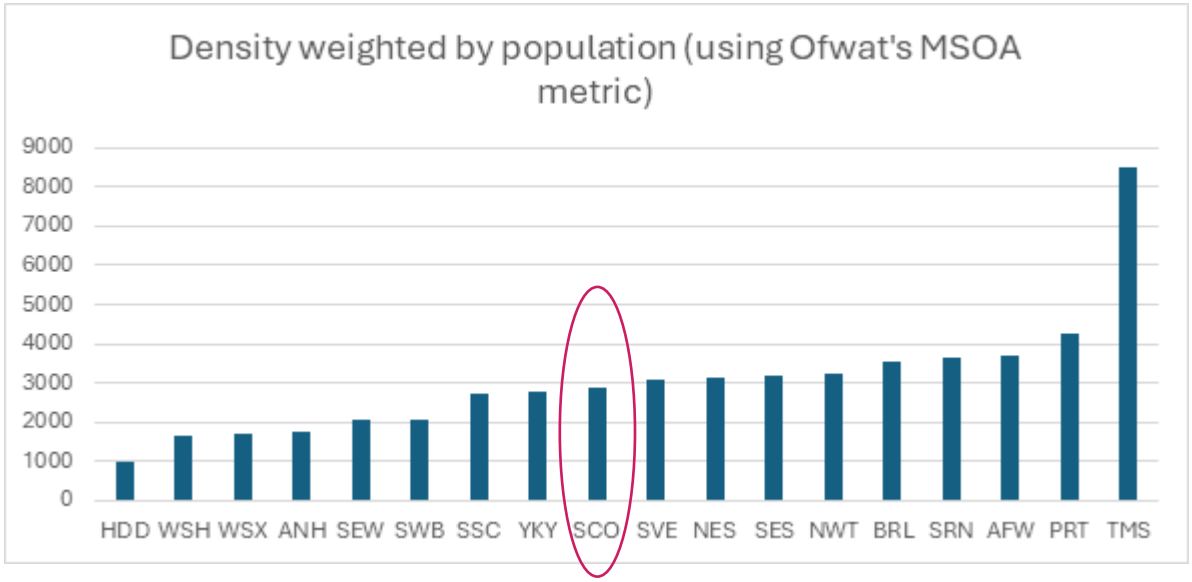
### *Impacts of geographic dispersion*

As was noted above, one of the four key underlying cost drivers that Ofwat's wholesale water modelling seeks to reflect is population density, and all 24 of its PR24 models include density variables. The emphasis that Ofwat put on including, and seeking to develop, density metrics in its modelling stems from the strong underlying engineering and economic rationales that can be identified as to why it would be expected to affect the efficient costs of service provision.

When seeking to identify and select appropriate density variables for modelling the costs of companies in E&W, key considerations will be the extent to which different variables can be expected to capture differences between those companies that relate to density, that are likely to materially affect efficient costs and that are not likely to be adequately captured or off-set in some other way. A challenge when seeking to apply Ofwat's models to Scottish Water is that the form of geographic dispersion that Scottish Water faces – in particular when serving the Highlands and Islands – differs considerably in some respects from that faced by companies in E&W, and this can have a material bearing on the efficient costs of providing relevant services.

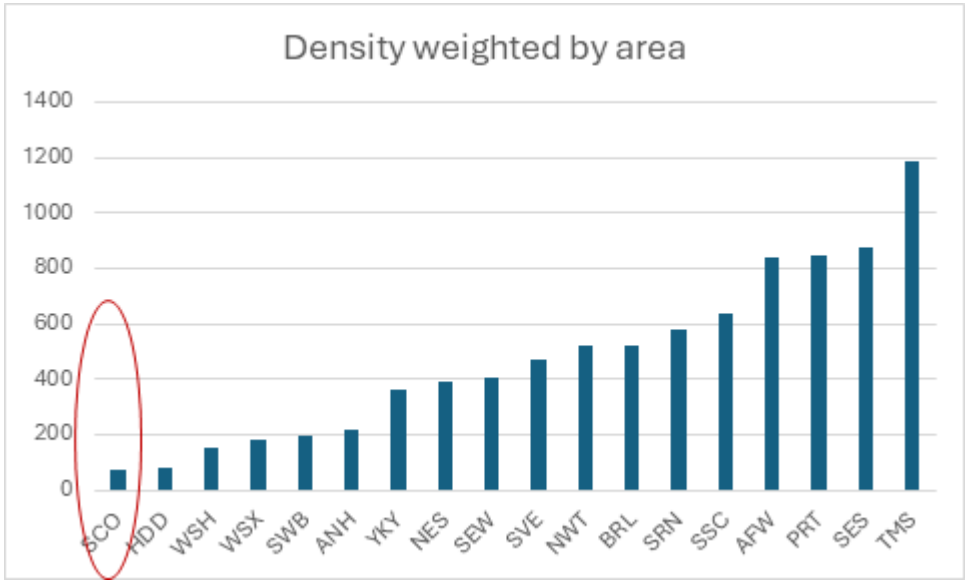
Our assessment is that the density variables that Ofwat included in its PR19 and PR24 models are highly unlikely to provide a sufficient means of reflecting that difference or its implications.

The graphs below highlight the extent to which the choice of density variable can have a major bearing on how Scottish Water's geographic dispersion is being characterised and taken into account within the modelling. The first graph shows how companies compare on one of Ofwat's two 'weighted average density' metrics both of which weight density (within different smaller areas inside company boundaries) by population. It is notable that on this measure Scottish Water could be understood as being 'average' in terms of its density characteristics, sitting as it does in the middle of the distribution.




Source: SW analysis based on MSOA_area_density_derivation_v2.0.xlsx

However, the above characterisation clearly does not capture the extent of geographic dispersion that Scottish Water faces and how much that differs from the position typically faced by companies in England and Wales. This can be seen immediately if one instead compares density measures that are not population-weighted. As can be seen in the graph below, Scottish Water serves the area with the lowest population density and with a density figure that is less than half that of any WASC in England and Wales. From this perspective, then, Scottish Water is clearly not in (or anywhere close to) the middle of the distribution.




Source: SW analysis based on MSOA_area_density_derivation_v2.0.xlsx

Of course, in developing its models, Ofwat would have had no reason to seek to reflect the circumstances of Scottish Water, and it is notable that the way in which other companies are distributed is much more stable across the two measures shown above. While there are some changes in the ordering, the characterisation of relative density/scarcity between companies is broadly similar across the two metrics for companies in E&W where that is demonstrably not the case for Scottish Water.

Ofwat's models perform a little less well if the population weighted average density measure is replaced by an unweighted density measure, although not greatly so. Given that, we have found it relevant consider the impact that using unweighted density measures could have on the model results highlighted above (after the asset replacement policy adjustments have been made), and

note that – on that basis – Scottish Water's efficiency score would be identified as below the UQ level under a range of options that we considered.

In its comments on our analysis, WICS has noted that Ofwat's MSOA-based density metric is only used in 8 of Ofwat's 24 wholesale water models and that Scottish Water has a value that is below the median for the density measures used in the other models. WICS has also noted that a measure of density weighted by area would put a high weight on areas of Scotland where Scottish Water has no assets and as such would be expected to over-estimate predicted costs.

We have sought to recognise the limitations of Ofwat's density measures – and of an area-weighted alternative – by using the analysis of these measures as a means of giving an indication of the likely significance of the impact that geographic dispersion, and how it is taken into account, can have on benchmarking results (before turning to consider the other source of evidence described below). In light of the comments from WICS, we are considering options for taking account of the density and density metric issues referred to above more directly in the modelling process (and therefore in the modelling results), including in terms of the opex-only modelling discussed above. We will include the results of this further work in our final business plan.

While the above gives an indication of the significance of the impact that the account taken of geographic dispersion can have on benchmarking results, we have also sought to examine more directly evidence on potentially relevant drivers of cost associated with geographic dispersion (in addition to density). We have done this by considering three main sources:

- Evidence related to the Scottish Government's classifications of remoteness;
- Data on the number of, and the costs of operating, Scottish Water's very small water treatment works.
- Relative comparisons of opex per property between Scottish Water supply area.

These are considered in turn below.

*Remoteness*

The Scottish Government's Urban-Rural classification includes explicit consideration of the extent to which areas can be regarded as remote.[9] In particular, in addition to using a population-based urban/rural categorisation of areas similar that used by the ONS for England and Wales, the classification includes an assessment of accessibility, and in particular includes the following 3 categories:

- **Accessible**: areas within a 30 minute drive time of a Settlement with a population of 10,000 or more.
- **Remote**: areas that have a drive time between 30 and 60 minutes from a Settlement with a population of 10,000 or more.
- **Very Remote**: areas that are more than a 60 minute drive time from a Settlement with a population of 10,000 or more.

The development and usage of these categories reflects the relevance of having a coherent means of considering remoteness in a Scottish context. In line with, the Scottish Government produces information on the extent to which the populations in different council areas (and a range of other relevant area classifications) are fall into categories that include: remote small towns; very remote small towns; remote rural; and very remote rural. The table below shows the percentage of the population identified as living in a remote (or very remote) area in a number of council areas.

| | % of population classified as remote (based on 2022 data) |
|---|---|
| Argyll and Bute | 72% |
| Highland | 43% |
| Na h-Eileanan Siar | 100% |
| Orkney Islands | 100% |
| Shetland Islands | 100% |

Source:Scottish+Government+Urban+Rural+Classification+2022+-+Census+2022+Population+Estimates+Tables.xlsx

It is recognised that rural communities can face a 'remoteness premium' for some goods and services, and while this raises a range of fairness and consumer protection concerns, it is also understood to be related in part to factors such as transportation costs and lower density (which may then, for example, increase the costs of making some services available).[10]

Remoteness can impact on the efficient costs of providing water services in a range of different ways. One significant issue is that it can limit the scope for benefitting from economies of scale and density, and the consideration of the number and costs of operating small water treatment works is highlighted below. The costs of delivering a secure service can also be increased when there is more limited scope to utilise necessary back-up capacities and capabilities in more flexible ways (given relevant accessibility and travel/response time constraints). Differences in opex per property between Scottish Water's supply areas illustrate the scale of these impacts can have.

**The number and costs of operating very small treatment works**

Relative to companies in E&W, Scottish Water is characterised by having a very large number of the smallest categories of water treatment works, and those works have a significant impact on Scottish Water's wholesale water opex levels. The table below includes relevant Scottish Water data that highlights the scale of this impact.

| Size of works | Number | % of Distribution Input | Water Treatment works opex, £m |
|---|---|---|---|
| <= 1 Ml/d | 127 | 1.2% | £10.4m |
| >1 to <=2.5 Ml/d | 21 | 1.3% | £4.7m |
| Total (all sizes) | 229 | 100% | £90.1m |
| % <= 1 Ml/d | 55% | | 11.5% |
| **% <=2.5 Ml/d** | **65%** | **2.5%** | **16.7%** |

Source: SW analysis based on Scottish Water Annual Return 2024, E4.28 – E4.39

As can be seen, there are 127 water treatment works with a capacity of less than or equal to 1 Ml/d which cost £10.4m to operate in 2023-24. That is, while these works accounted for only 1.2% or Distribution Input, they made up around ten times that share (11.5%) of treatment works opex. It is notable that smallest band of treatment works that Ofwat uses in its data tables is <2 Ml/d, and that:

- Severn Trent Water is the company in E&W with the largest number of works in this category, at 25; and,
- The median number of works in this category in E&W in 2023-24 was 10.

By contrast, Scottish Water has somewhere between 127 and 148 water treatment works with a capacity of <2Ml/d, which cost up to around £15m per year to operate (close to 17% of Scottish Water's total treatment works opex). As was highlighted above, this stems from the provision of services in geographic circumstances which – given the need to supply relatively small groups of customers in a range of remote locations – result in there being material constraints on the scope for achieving economies of scale. These circumstances, therefore, can be understood as putting material upward pressure on the efficient levels of opex per connected property that are note taken into account within Ofwat's modelling framework.

We note that Ofwat did consider proposals to include an explanatory variable which sought to directly reflect economies of scale at water treatment works, but decided this was unnecessary for its assessment.[11] Ofwat said that its efforts to include variables which reflected the proportion of Distribution Input treated in different size bands resulted in a counterintuitive sign and results that were statistically insignificant. Ofwat said that this suggested that the inclusion of population density and water treatment complexity variable already captured the impacts of economies of scale at water treatment works, or that economies of scale in water treatment is not a material cause of cost differences between companies, perhaps because inefficient small WTWs have been decommissioned over time, meaning the remaining small WTWs are not very expensive to operate and maintain.

We note that while this may have been a reasonable conclusion to form when considering differences in the circumstances faced by companies in E&W, Ofwat's comments have limited relevance to the circumstances described above. In particular, we note that:

- The constraints on Scottish Water's ability to benefit from economies of scale at small WTWs do not arise because of the proportion of its Distribution Input that Scottish Water has to treat at sites that would fall into Ofwat's smallest size category: Scottish Water is not an outlier in that respect and some companies in E&W would have a higher value for that metric. As a result, including a variable to reflect the proportion of Distribution Input treated in Ofwat's lowest size band would have been highly unlikely to have captured the circumstances that Scottish Water faces even if its usage could have been justified on other bases.
- As was highlighted above, for Scottish Water, the remaining small WTWs are much greater in number than for any company in E&W, and they are clearly (on a per property or unit of DI basis) very expensive to operate.
- Those high per property/unit operating arise because of the relatively small numbers customers that each of the WTWs serves, and the scope for achieving efficiency gains through decommissioning and rationalising the number of works is limited the dispersed and remote nature of the relevant customer populations.
- As was highlighted above, those geographic characteristics are not well reflected in the population weighted density metrics that Ofwat used in its PR19 and PR24 wholesale water models.

*Opex per property differences between Scottish Water areas*

The extent to which the geographic dispersion of the customers served by Scottish Water affects opex levels can also be examined by comparing costs across different Scottish Water areas. The table below shows the level of functional expenditure (which for 2023-24 accounted for almost 90% of the relevant opex value used for modelling) per connected property in each of Scottish Water's four Areas. [Add map showing the 4 areas?].

***Functional Expenditure per connected property by Area for wholesale water in 2023-24 (£ per property)***

| | Area 1 | Area 2 | Area 3 | Area 4 | Total |
|---|---|---|---|---|---|
| Resources & Treatment | £113 | £34 | £18 | £30 | £32 |
| Water Distribution | £104 | £34 | £21 | £31 | £33 |
| **Total Wholesale Water** | **£217** | **£68** | **£39** | **£61** | **£65** |

Source: SW analysis based on Scottish Water Annual Return 2024: E4.19; E6.2; and E6.11.

The focus above was on highlighting the extent to which the very small water treatment works used to serve dispersed communities impact on opex requirements. In line with this, in the above table it can seen that functional expenditure was £113/property in Area 1 (which includes more remote communities) in 2023-24, which is more than four times the average across the other three areas. While slightly less pronounced, that difference in cost per property is similar for Water Distribution (where the Area 1 cost is 3.7 times larger than the average across the other areas).

These differences underpin the fact that while only 6% of the properties that Scottish Water serves are in Area 1, the provision of wholesale water to that Area accounts for around 20% of Scottish Water's functional expenditure. In order to put this in context in terms of the econometric modelling results that were shown above, the table below shows the total level of Area 1 wholesale water functional expenditure for 2023-24, together with what that level of expenditure would have been if the average level of functional expenditure per property across Areas 2 – 4 had applied. This allows the scale of the annual impact of higher Area 1 costs on overall functional expenditure/opex levels to be highlighted.

***Implied impact of higher Area 1 costs per property – 2023/24***

| | Area 1 |
|---|---|
| Number of connected properties (number) | 165,075 |
| Wholesale water functional expenditure | £36m |
| Functional expenditure if average cost per property in Areas 2 – 4 is assumed to apply | £9m |
| Implied annual impact of higher Area 1 costs/property | £27m |

Source: SW analysis based on Scottish Water Annual Return 2024: E4.19; E6.2; and E6.11.

The above approach effectively assumes that the higher per property level of Area 1 should be wholly treated as not adequately reflected in Ofwat's modelling, and therefore should be wholly neutralised. While this may – to some extent – overstate the level of adjustment that is likely to be appropriate, we nevertheless consider it to provide an indication of the scale of the relevant impact that geographic dispersion and associated remoteness issues have on the efficient costs of service provision for Scottish Water and that should be taken into account when opex efficiency is being assessed relative to companies in E&W.

In commenting on our analysis on remoteness, and the number and costs of operating small treatment works, WICS said that its preference was for these factors to be captured within the modelling. With respect to comparison between the costs of serving different regions, WICS noted that regional differences in cost would also exist for companies in England and Wales. WICS said that it revised modelling was not considered to provide a sufficient means of addressing these matters, then a post-modelling adjustment could be proposed analogous to a 'special factor' adjustment or to Ofwat's cost adjust adjustment claim process (and the criteria associated with it).

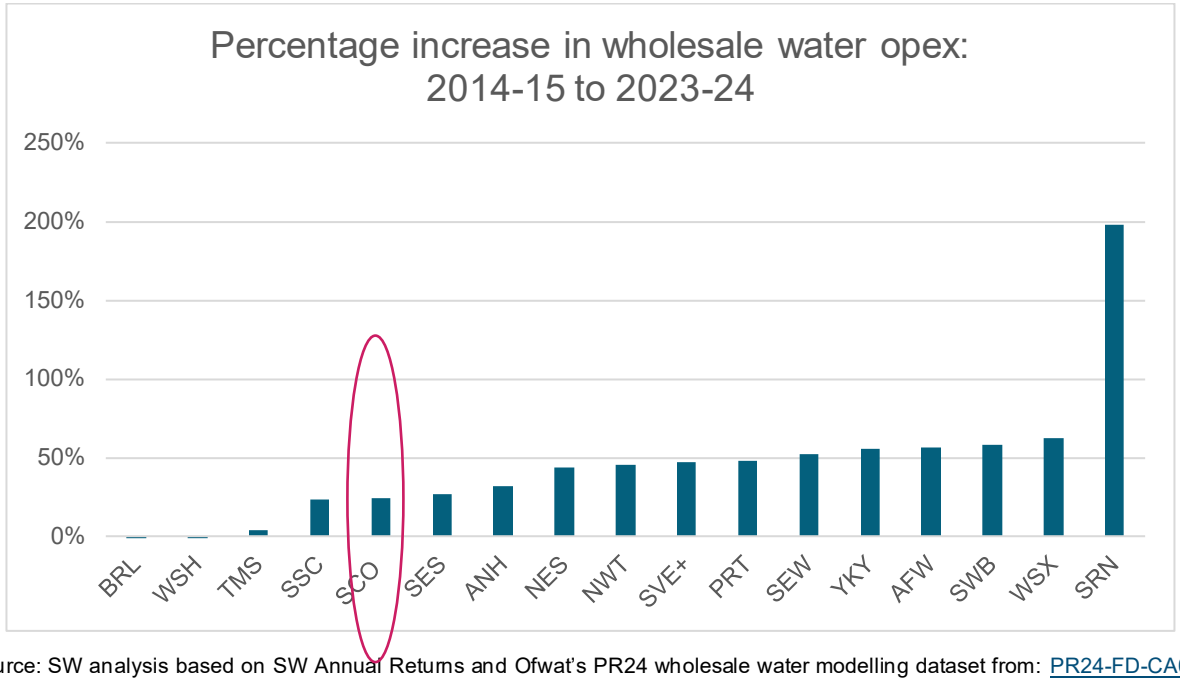
We are continuing to consider ways in which these issues related to geographic dispersion could be taken into account within the modelling process (including, as noted above, through further consideration of how density metrics might be used). Alongside that we are continuing to develop our analysis of supporting evidence in ways that underpin the basis for applying a post-modelling adjustment, where insufficient account has been taken of the relevance of this factor within the modelling framework.

### *Comparing movements in opex over time*

In 2014, its Draft Determination at the SR15 price review, WICS identified Scottish Water's cost performance to be broadly on a par with that of the leading companies in England and Wales, following significant improvements during SR10.[12] The catch-up efficiency challenge that had been set at SR10 was informed by WICS's use of Ofwat's PR04 and PR09 econometric opex benchmarking models. Those models have not been used by Ofwat for around 15 years, and we considered Ofwat's (and the CMA's) more recent modelling was likely to provide a more reliable basis for trying to benchmark Scottish Water's costs against those of companies in E&W. Nevertheless, considering relative movements in opex levels since 2015 provides a way of taking the results of that earlier benchmarking work into account indirectly to some extent, as well as more generally giving a view on how the scale of changes in Scottish Water's opex over the past c10 years compares to that of companies in England and Wales.

The graph below shows the percentage increase in opex by company between 2014-15 and 2023-24 in constant (CPIH) prices. The opex figures on which this is based are largely the same that were used in the econometric modelling described above (such that business rates and some other small cost lines are excluded, in line with Ofwat's approach). However, two specific adjustments have been made to try to improve consistency:

- A single line 'SVE+' has been included as the sum of opex for Severn Trent and – in the relevant years – Dee Valley Water (DVW) and HDD. This avoids the risk of the company boundary changes that were made following Severn Trent's acquisition of DVW (and formation of HDD) distorting the identified levels of opex increase over time.
- Scottish Water changed its cost allocation processes from 2021-22 onwards in a way that resulted in slightly lower opex figures being reported than would have been the case under the previous 'SR15 approach'. The new approach is viewed as providing a more accurate view of opex levels, but could raise consistency issues when changes over time are being considered. To avoid this, we have adjusted the opex figures from 2021-22 to 2023-24 upwards consistent with Scottish Water's ongoing reporting of what its opex level would be under the previous SR15 approach.




Source: SW analysis based on SW Annual Returns and Ofwat's PR24 wholesale water modelling dataset from: PR24-FD-CA03-Base-costs-water-model-1.xlsx

Note: The opex figures used for the graph were in 2022-23 (CPIH) prices.

In line with the graph, and on the basis set out above, the percentage increase in Scottish Water's wholesale water opex since 2014-15 (24%) was a little below the lower quartile increase for E&W (26%), and well below the median increase (46%). A similar result arises if one instead looks at real terms increases in opex per property over the same time period (with the Scottish Water increase of £12/property lower than the lower quartile level of increase across companies in E&W of c£13/property).

In its comments on our analysis, WICS noted that its SR15 assessment (that Scottish Water's cost performance to be broadly on a par with that of the leading companies in England and Wales) was based on an assessment of Scottish Water's operating and maintenance expenditure (what Ofwat refers to as base totex), and therefore was not a direct assessment of Scottish Water's opex efficiency at that time. WICS also suggested considering changes in opex scaled by an appropriate unit of output, and recognising that changes in opex over time can be affected by one-off exceptional costs or savings.

We consider the comparison of movements in opex over time to provide a useful cross-check and informative source of evidence when considering Scottish Water's relative efficiency as compared with companies in England and Wales. We will be further considering how this evidence might be assessed and presented in the light of the comments from WICS and will provide an updated assessment in our final business plan.

### *Our overall assessment in relation to wholesale water opex*

Our overall assessment is that evidence set out above does not support the view that it would be appropriate to apply a catch-up efficiency adjustment when setting Scottish Water's wholesale water opex allowances for SR27. As a result, we have not addressed the second step we described earlier (of calibrating the scale of adjustment that should be applied if an adjustment were to have been identified as appropriate). The key considerations that have underpinned that assessment can be summarised as follows (in the light of the various results and evidence that was set out above):

i. We did not consider it appropriate to put weight on the results from modelling Scottish Water's base plus costs ahead of any adjustments: while we used those modelling results as out starting point above, that modelling takes no account of a known factor – asset replacement policy in Scotland – that has been shown to materially affect the results. Assessing relative efficiency by reference to base plus cost modelling ahead of any adjustments would tend to treat higher levels of capital maintenance – that were the intended response to asset replacement policy – as a source of relative inefficiency. As was noted above, WICS explicitly recognised this issue in its SR27 Methodology, and in line with that we have focused our assessment on results from modelling that seeks to take account of this factor.

ii. We considered a range of different ways of seeking to 'normalise' Scottish Water's level of capital maintenance by reference to evidence from England and Wales, and refined our approach in response to feedback received in the peer review process. We identified the triangulated approach described earlier (which takes account of evidence on capital maintenance per property and per length of main in a way that aligns with Ofwat's triangulation process) to provide a reasonable and practical means of seeking to take account of Scottish Water's asset replacement policy when assessing comparative efficiency. As set out above, or initial analysis of base costs on this basis indicated that Scottish Water's costs were 0-10% higher than a relevant England and Wales benchmark ahead of the consideration of Highlands and Islands impacts.

iii. We found evidence on the broad nature of the relationship between levels of capital maintenance per property and efficiency scores for companies in England and Wales to indicate that there was material risk that applying a upper quartile benchmark to the modelled level of costs could provide an implicit allowance for capital maintenance that would be below the median level. We found this to indicate that the most reliable bases for assessing Scottish Water's base costs were likely to be to:

   - Compare Scottish Water's efficiency score to a UQ benchmark, after normalising Scottish Water's capital maintenance based on the lower quartile level in England and Wales (using the triangulated approach): this showed Scottish Water's costs to be in line with the UQ benchmark under the post- and pre-modelling adjustment approaches.
   - Compare Scottish Water's efficiency score to a median benchmark, after normalising Scottish Water's capital maintenance based on the median level in England and Wales: this showed Scottish Water's base costs to be 1-2% higher than the benchmark level for England and Wales under the post- and pre-modelling adjustment approaches (ahead of consideration of the Highlands and Islands impact). This implies a cost 'gap' of c£3-£9m/year, the upper of which is equivalent SW's opex being up to 5% above an appropriate benchmark level.

iv. Our re-running of the PR24 models on an opex-only basis avoided the need for adjustments to seek to align Scottish Water's capital maintenance with levels observed in E&W. On this basis, we identified Scottish Water's efficiency score – ahead of the consideration of Highlands and Islands impacts – as being around 4% above the upper quartile benchmark (and line with median level). Because of the smaller cost base it relates to (ie opex only rather than base plus costs) this equates to around £7m/year, which falls within the (£3m-£9m, 0-5%) cost 'gap' range identified above based on our 'normalised' base costs analysis.

v. Population density is one the four key underlying cost drivers that Ofwat's wholesale water modelling seeks to reflect (with a density variable included in all 24 of its PR24 models), but we do not consider Ofwat's density metrics – which weight within area density measures by population – to provide an effective means of taking relevant differences between the geographic dispersion of Scottish Water's customers, and that of customers of companies in E&W, into account. We found that if an alternative area-weighted (or

unweighted) density measure was used in the modelling (instead of Ofwat's population-weighted measure), then Scottish Water's efficiency scores would be identified as lower than (ie outperforming) the upper quartile level under a wide range of modelling approaches.

vi. Our assessment of the extent to which Scottish Water's functional expenditure in Area 1 exceeded the average in Areas 2-4 – and of some of the factors that give rise to this (including evidence on remoteness and number of the smallest categories of treatment works relative to E&W, and the cost of operating those works) – provided another way testing the materiality of the likely impact of Scottish Water's different population density characteristics on the efficient level of relevant costs. That assessment highlighted that the higher level of costs per property in Area 1 could be understood as increasing Scottish Water's overall opex levels by around £27m in 2023/4, indicating that the effect of this factor is likely to be significantly greater than the efficiency score 'gaps' identified from modelling referred to above.

vii. We have not identified further factors as likely to have a major (positive or negative) bearing on the comparative assessments described above, and that would appear to justify efforts to make further adjustments to the modelling.

viii. While we have sought to develop a robust dataset, and – through the triangulated use of Ofwat's models – to rely largely on pre-tested modelling specifications and approaches (in a context where CMA used Ofwat's PR19 models in its redeterminations), a range of allocation assumptions were required when generating the necessary input data, and some model reliability questions remain. This suggests that some caution should in any event be applied when identifying and interpreting 'gaps' relative to a UQ benchmark as part of the assessment of the efficiency of Scottish Water's costs.

ix. We identified the percentage increase in Scottish Water's wholesale water opex since 2014-15 to have been a little below the lower quartile level of increase for companies in E&W, and well below the median level of increase. We considered this to provide a useful cross-check on the above findings, including in a context where – in 2014, its Draft Determination at the SR15 price review – WICS had identified Scottish Water's operating and maintenance cost performance as being broadly on a par with that of the leading companies in England and Wales.

Given the above, our assessment is that Scottish Water's current level of wholesale water opex efficiency is likely to be in line with that of the leading companies in England and Wales, and therefore that Scottish Water should not adopt a "catch-up" efficiency challenge for the SR27 period in relation to wholesale water opex. As set out in the above sections, there are a range of areas where we continuing to explore the scope for improvements in our assessments, including in the light of comments we have received from WICS. The assessment we include in our final business plan will take this additional analysis into account where relevant.

## Our Assessment of Waste Water Costs

### *Overview*

After providing an overview of Ofwat's wholesale wastewater models below, we describe how we have used them, the main results we have found, and some supporting analysis we have found helpful when seeking to interpret and cross check those results. We then set out our overall assessment in relation to the appropriateness of applying a catch-up efficiency adjustment when setting Scottish Water's opex allowances for SR27.

### Ofwat's wholesale water base cost models

As with water, we focused our attention on Ofwat's wholesale wastewater base cost models, with this allowing for the benchmarking of a high proportion of relevant wastewater service costs while avoiding significant comparability issues that would be expected to arise in the consideration of retail services (including because of differences in levels of metering).

Ofwat's wholesale wastewater models seek to explain differences in relevant costs between companies by reference to underlying engineering and economic drivers of cost. At PR19, Ofwat used 8 different models to assess wholesale wastewater costs:

- **2 Sewage Collection (SWC) models**: which sought to reflect differences in the costs of operating and maintaining the sewerage network.
- **2 Sewage Treatment (SWT) models**: which focused only on differences in sewage treatment costs.
- **2 Bioresources (BR) models**: which assessed the costs associated with sludge.
- **2 'Bioresources plus' (BRP) models**: which assessed the combined costs associated with sewage treatment and sludge.

The explanatory variables that Ofwat used at PR19 are shown in the table below. After each of the explanatory variables (in the left-hand column, in square brackets), we have included an indication of the underlying cost driver that each variable can be understood as seeking to capture. As with the wholesale waste water models, scale, density, topography and treatment complexity can be understood as key underlying drivers. It is notable, though, that the waste water models also include variables (related to the size of treatment works) which seek to reflect the extent to which companies are likely to benefit from economies of scale. In Ofwat's wholesale water models, the scope for economies of scale was effectively treated as sufficiently reflected through the inclusion of density metrics. The higher costs of transporting waste water tends to mean that the efficient size of waste water networks is smaller than is the case for water networks and that economies of scale can merit closer and more direct attention.[13]

***Explanatory variables included in PR19 base cost models: wholesale waste water***

| **Explanatory variables [indication of underlying cost driver]** | **SWC1** | **SWC2** | **SWT1** | **SWT2** | **BR1** | **BR2** | **BRP1** | **BRP2** |
|---|---|---|---|---|---|---|---|---|
| Ln (Sewer length) [scale] | X | X | | | | | | |
| Ln (Pumping capacity/Sewer length) [topography] | X | X | | | | | | |
| Ln (Properties/Sewer length [density] | X | | | | | | | |
| Ln (Weighted Average Density) | | X | | | X | | | |
| Ln (Load) [Scale] | | | X | X | | | X | X |
| % of load treated in bands 1-3 [Economies of Scale] | | | X | | X | | X | |
| % of load treated in band 6 [Economies of scale] | | | | X | | | | X |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| % of load with an ammonia consent <3mg/l [treatment complexity] | | | X | X | | | X | X |
| Ln (Sludge produced) [Scale] | | | | | X | X | | |
| Ln Number of Sewage treatment works per property) [Density] | | | | | | X | | |

Source: Information from: FM_WWW2_FD.xlsx

The CMA reviewed Ofwat's approach to assessing wholesale waste water base costs and used the same set of models (with an additional year of data that had become available) in its PR19 redeterminations.

For PR24, Ofwat made a range of changes to its approach to modelling wholesale waste water base costs, including the following:

i. Bioresources costs were assessed separately, and the bioresources plus models were not used to provide a form of 'top down' assessment.
ii. Two new 'Waste water Network Plus' (WWNP) models were introduced to provide a 'top-down' assessment jointly of sewage collection and treatment costs.
iii. A new Urban Rainfall metric was introduced that was intended to take account of the impact that rainfall levels can have on sewage collection costs. The measure is based on a calculation of the total amount of rainfall falling across each company's urban MSOAs, with this intended to reflect that a greater the volume of inflows to the drainage and sewerage networks, can mean that larger network and storage assets are needed, and higher pumping and capital maintenance costs may result.
iv. As with wholesale water, Ofwat used more granular underlying density data, categorised by Middle Super Output Areas (MSOAs), to generate weighted average density metrics that were viewed as more accurate than the figures used at PR19.
v. Ofwat developed a new 'Weighted Average Sewage Treatment Works Size' (WATS) metric that it used as an explanatory variable in place of the '% of load treated in band 6' measure that it had used at PR19 (where band 6 is the largest category of works), as it was view as better way of reflecting differences between companies in terms of the size of works.

The explanatory variables that Ofwat used at PR24 for wastewater network plus (ie sewage collection and treatment) are shown in the table below. SWC1 is the same as it was at PR19, other than it also includes Ofwat's new Urban Rainfall metric. SWC2 and SWC3 can be viewed as the same as SWC2 at PR19, other than that they include the new Urban Rainfall metric, and that they each include one of Ofwat's more refined MSOA-based weighted average density measures. The two new network plus models include (some) variables form the sewage collection and treatment models, and differ only in terms of the metrics used to seek to reflect economies of scale.

***Explanatory variables included in PR24 base cost models: wholesale waste water network plus***

| **Explanatory variables [indication of underlying cost driver]** | **SWC1** | **SWC2** | **SWC3** | **SWT2** | **SWT3** | **WWNP1** | **WWNP2** |
|---|---|---|---|---|---|---|---|
| Ln (Sewer length) [scale] | X | X | X | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ln (Pumping capacity/Sewer length) [topography] | X | X | X | | | X | X |
| Ln (Properties/Sewer length [density] | X | | | | | | |
| Ln (Weighted Average Density – LAD from MSOA) | | X | | | | | |
| Ln (Weighted Average Density - MSOA) | | | X | | | | |
| Ln (Urban Rainfall MSOA/Sewer Length) | X | X | X | | | X | X |
| Ln (Load) [Scale] | | | | X | X | X | X |
| % of load treated in bands 1-3 [Economies of Scale] | | | | X | | X | |
| Ln (Weighted Average Treatment Size) [Economies of scale] | | | | | X | | X |
| % of load with an ammonia consent <3mg/l [treatment complexity] | | | | X | X | X | X |

Source: Information from 'Coefficients' tab of: PR24-FD-CA08-Base-costs-wastewater-model-3-Network-Plus.xlsx

For bioresources, Ofwat based its PR24 assessments on 4 unit cost models, the explanatory variables from which are shown in the table below. Bioresources costs include sludge transport, treatment and disposal costs. Because these models sought to estimate unit costs, scale is already taken into account in the assessment. Ofwat identified the key drivers of bioresources unit costs as: economies of scale in sludge treatment; and the location of sewage treatment works relative to sludge treatment centres (which causes differences in efficient sludge transport costs).[14] Ofwat's modelling treated population density and the size of sewage treatment works as largely exogenous variables that can be used to proxy these cost drivers.

***Explanatory variables included in PR24 base cost models: bioresources unit cost models***

| | BR7 | BR8 | BR9 | BR10 |
|---|---|---|---|---|
| % of load treated in bands 1-3 [Economies of Scale] | X | | | |
| Ln (Weighted Average Density – LAD from MSOA) | | X | | |
| Ln (Weighted Average Density - MSOA) | | | X | |
| Ln Number of Sewage treatment works per property) [Density] | | | | X |

Source: Information from 'Coefficients' tab of: PR24-FD-CA93-Base-costs-wastewater-model-3-Bioresources.xlsx

## *Identifying relevant data for Scottish Water*

As with wholesale water, in order to apply Ofwat's models, it was necessary to identify data for Scottish Water in relation to:

- Relevant costs; and,
- Each of the explanatory variables used in Ofwat's models.

We engaged with WICS to develop an agreed set of data in relation to the above that could be used when running the Ofwat models. However, as WICS identified in its methodology, the fact that a range of waste water services are provided under PFI contracts needed to be taken into account in this process. Given the importance of this factor, the following begins by setting out how we have taken account of PFIs when identifying relevant data, and the impact this can have on the interpretation of results. We then identify other key assumptions and considerations – including our approach to septic tank costs – that affected our identification of relevant data.

### *Taking account of PFIs*

The table below provides an indication of the extent to which different waste water activities are provided through PFI contracts rather than being directly provided by Scottish Water. Scottish Water is responsible for almost all sewers in Scotland, and in line with that we have treated PFIs as having no material impact on the explanatory variables included in Ofwat's sewage collection models. By contrast, the vast majority of sludge-related services have been undertaken by PFI providers, and it is notable that 2 PFI plants – Daldowie and Seafield – have accounted for more than half of Scotland's sludge over the past five years. Scottish Water's role in the provision of sludge services increased in 2023-24 following the expiry of PFI contracts relating to facilities in the Aberdeen and Highland regions (and Scottish Water adopted the relevant assets and service provision requirements) and is expected to get much larger when the Daldowie PFI contract ends in 2026. However, as discussed further below, the limited extent to which Scottish Water has been providing sludge services over the historical period assessed by Ofwat raises some immediate question marks over the likely usefulness of Ofwat's bioresources models when seeking to assess Scottish Water's cost efficiency relative to companies in E&W

***Percentage of different waste water activities accounted for PFI providers as indicated by some relevant metrics***

| | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 2023-24 |
|---|---|---|---|---|---|
| Sewage Collection: sewer length | 0.4% | 0.4% | 0.4% | 0.4% | 0.3% |
| Sewage Treatment: estimate of annual average connected population served | 45% | 44% | 45% | 45% | 37% |
| Bioresources: Amount of sewage sludge | 86% | 86% | 89% | 81% | 76% |

Source: SW analysis based on SW Annual Return data

As shown in the table, the provision of sewage treatment services sits between sewage collection and sludge, in that that around 45% of customers had been served by PFI providers until 2023-24 when that dropped to 37% as a result of the Aberdeen and Highland PFI contracts coming to an end and the relevant services being taken on by Scottish Water.

The primary approach we took in relation to PFIs was to seek to exclude the costs and services that related to them from the dataset to be used for modelling (although, as discussed below, we considered PFIs to also have a significant bearing on the extent to which some Ofwat models were likely be informative). In terms of costs, that meant focusing on Scottish Water's relevant base costs, excluding the costs of securing and managing PFI services. This was straightforward to identify from Scottish Water's regulatory accounts, where PFI costs are separately identified.

For most of the explanatory variables used in Ofwat's models, it was also straightforward to identify relevant values, because Scottish Water's Annual Returns provided information on Scottish Water's waste water assets that could be used (for example, on sewer length, and the load treated at different sizes of sewage treatment works). The number of properties served by Scottish Water – as opposed to PFI – operated sewage treatment works is not directly reported in Annual Returns, but information on the estimated populations served by Scottish Water and PFI providers is reported and was used to generate what we would expect to be reasonable estimate of the relevant number of properties. Identifying appropriate population density measures for that portion of Scotland served by Scottish Water raises some more challenging issues (as population density can vary significantly between areas), but we agreed with WICS to use the relevant Scotland-wide variables in our analysis as a starting point.

*Data related to septic tanks*

We agreed with WICS that we should remove septic tanks and associated costs from the benchmarking in a context where there could otherwise be significant comparability issues with E&W when metrics that used the number of Sewage Treatment Works were being used. The impact of excluding septic tanks on the number of sewage treatment works (and on the measure of opex used in the modelling) is shown in the table below.

***Adjustments to remove septic tanks from the benchmarking (2023-24)***

| | Number of Sewage Treatment Works | Relevant Sewage Treatment Opex |
|---|---|---|
| Total including Septic Tanks | 1838 | £172.7m |
| Septic Tanks | 1177 | £4.3m |
| Total excluding Septic Tanks | 661 | £168.5m |

Source: SW analysis based on SW Annual Return data

The removal of septic tanks from the assessment is also highly relevant to taking account of the geographic dispersion of Scottish Water's customers. As was set out above, the need to supply remote communities has a significant impact on wholesale water costs, including because of the resulting extent of small scale works that are needed to provide appropriate treatment for the supply of drinking water, and the need for local distribution assets which supply a relatively small number of customers. However, for waste water treatment, the use of septic tanks is an alternative means of providing waste water services that avoids the localised provision of transportation and treatment assets (with tankers used instead to empty septic tanks periodically and to transport waste for appropriate treatment elsewhere). We comment further on the relevance of remoteness to wholesale waste water costs below.

*Urban rainfall*

As was noted above, Ofwat introduced a new Urban Rainfall metric in its PR24 modelling that was intended to take account of the impact that rainfall levels can have on sewage collection costs. Given the information provided with Ofwat's PR24 Draft Determination, we did not identify a reliable way of generating an equivalent set of figures for Scottish Water that could be used for

this metric. However, WICS identified that some additional information Ofwat published with its Final Determination provided a practical means through which urban rainfall figures could be generated for Scottish Water. We are continuing to engage with WICS on whether further adjustments or refinements to the initial estimates of urban rainfall levels for Scottish Water may be appropriate.

*Ammonia consents*

As was shown above, Ofwat's waste water models include a the percentage of load with an ammonia consent <3mg/l as a treatment complexity variable in a range of waste water models. We could determine the value of this metric for Scottish Water directly from SW's Annual Returns in relation to large sewage treatment works, but Annual Returns include information on the load at treated at smaller treatment works with an Ammonia consent <5mg/l (rather than 3mg/l). In order to address this difference in a proportionate way, we reviewed Scottish Water asset database information to identify what proportionate of small treatment works load was subject to an ammonia consent <3mg/l, and used this to estimate the relevant amount of load (in addition to directly reported load from large treatment works) that should be included for this metric in each year of the modelling period.

**Other relevant data and allocation issues**

The following cost allocation issues that were highlighted above in relation to wholesale water were also relevant to our development of a dataset for wholesale waste water:

- Ahead of 2021-22, Scottish Water's Regulatory Accounts (Table M18) did not report costs in way that showed outturn capital maintenance levels for Wholesale Waste water, Sewage Collection or Sewage Treatment. As with wholesale water data, we agreed some simple allocation assumptions that could be used to generate the cost figures needed for modelling purposes.
- Allocations of capex between capital maintenance and enhancement: as noted above, there is a question over the extent to which Scottish Water's approach to allocating capex between capital maintenance and enhancement is consistent with that applied by companies in E&W.
- A change to Scottish Water's attribution of repair and renewals spend from 2021-22 onwards is taken into account below when changes in wastewater opex over time are considered.

## *Our approach to using the PR19 and PR24 waste water models*

As was noted above, for our wholesale water assessment we focused only on Ofwat's PR24 models, because we considered it reasonable to view that set of models as effectively encompassing Ofwat's PR19 models (with a more refined approach to calculating the relevant weighted average density figures). This was not the case for waste water modelling and given this we have considered the results of the PR19 and the PR24 models in our assessment.

As with wholesale wastewater, our starting point was that we should try to make use of the full set of Ofwat's waste water models where possible, and that we should focus our attention on the overall 'triangulated' results that come from the application of those models. That approach recognises the risk that individual models may tend to result in too much weight being put on some factors and not on others, and that taking a more aggregated view will tend to lessen that risk. That is, combining results across a range of models which adopt different approaches can help generate more balanced outcomes and lessen the risk that identified differences in efficiency scores between companies result from limitations in the modelling process as opposed to differences in underlying efficiency. Also as with wholesale water, we considered that more

aggregated assessments would be likely to be less affected by some of the cost allocation issues referred to above (in particular, given assumptions it had been necessary to make regarding allocations between business areas).

However, we identified the extent of services that have been provided under PFIs as meaning that the following sets of Ofwat models were highly unlikely to provide an informative basis for comparison when assessing Scottish Water's costs:

- The PR24 (and PR19) Bioresources models
- The PR19 Bioresources plus models
- The PR24 Network Plus models

Our concerns with respect to usefulness of these models for assessing Scottish Water's costs are set out below.

**Ofwat's bioresources models**

We have not found Ofwat's PR24 bioresources models to provide a useful way of seeking to assess the efficiency of Scottish Water's sludge costs in a context where:

i. Over the period covered by Ofwat's modelling the vast majority of sludge-related services have been undertaken by PFI providers (as highlighted in the table earlier). Given this, the benchmarking would involve comparing the residual (ie non-PFI) provision of sludge services by Scottish Water with the overall costs faced by companies in E&W across all of the assets used to provide the relevant services. Notably, Scottish Water's costs would not include the costs of Daldowie or Seafield which, as was noted above, have accounted for more than half of Scotland's sludge over the past five years. Given that Ofwat has identified economies of scale as one of two key drivers of bioresources unit costs, comparing Scottish Water's bioresources costs to those of companies in E&W (which will relate to their overall portfolios of relevant assets) looks unlikely to provide a balanced basis for comparison.

ii. Ofwat's modelling treats energy generation income (and implied energy generation income (eg where use is made energy on site)) as a negative cost. Given this, the implied efficiency of a company will be heavily affected by the extent to which its sludge processing plants have been developed to generate energy. With energy price increases over recent years, this has a major impact on the implied net (ie after taking account of energy income) costs of providing bioresources services. While this may align with Ofwat's assessment objectives (in the context of its views on a developing bioresources market), it looks unlikely to provide an effective basis for assessing the comparative efficiency of the set of sludge services in Scotland that are not provided under PFI agreements.

iii. Ofwat's bioresources models are, in any event, highly simplified, as can be seen in the table earlier seeking to explain all differences in efficient unit costs between companies using a single explanatory variable related to density or economies of scale. While that may have been viewed as providing a sufficient basis for capturing relevant differences between companies in E&W, it does not look to provide a sufficient basis to assess the efficiency of Scottish Water's levels of sludge opex (including given the factors highlighted in (i)).

iv. The extent of geographic dispersion of waste water customers in Scotland can be expected to have a significant upward impact on Scottish Water's sludge transportation costs (including in relation to the collection of waste from highly dispersed septic tanks). As was highlighted in relation to wholesale water, the density metrics that Ofwat has used in its modelling do not provide an effective means of reflecting the substantially different

circumstances that Scottish Water faces, relative to companies in E&W, with respect to the provision of services to remote communities.

v. As relevant PFI contracts come to an end, Scottish Water's sludge costs have been and will be subject to large percentage step increases because of the size of PFI assets relative to that of those that Scottish Water had/has been operating. This creates a significant source of 'noise' that can be expected to further complicate comparative analysis (including because of the potential impact of transitional expenditure requirements).

**The PR19 bioresources plus models**

The PR19 bioresources plus models sought to provide a more aggregated basis for modelling a significant portion of wholesale waste water costs (to help generate what Ofwat referred to as a 'mid-level' view) by modelling sewage treatment and bioresources costs together. However, as can be seen in the table presented earlier (which showed the variables included in the PR19 models), Ofwat did this by applying two models that used the same set of explanatory variables it had identified as appropriate for its two sewage treatment models, but with sewage treatment and bioresources costs assessed in aggregate. This approach can be understood as taking account of the scale of bioresources activities that a company undertakes by reference to its scale of sewage treatment activity (through the inclusion of the sewage treatment works 'load' metric in the models).

While this may have provided a convenient way of seeking to take account of levels of bioresources costs when making comparative assessments between companies in E&W, it can be expected to result in a distorted view if used to assess Scottish Water. For Scottish Water, the sewage treatment works 'load' metric would not be expected to provide a good proxy for the scale of the bioresources activities it – as opposed to PFI providers - undertakes. In particular, this would tend to implicitly treat Scottish Water as providing a larger amount of sludge services than it does in practice, because – as was shown earlier – PFIs accounted for around 45% of sewage treatment services in Scotland in four of the past five years, but more than 80% of sludge services in those years.

**The PR24 Network Plus models**

A similar form a scaling problem arises when seeking to apply the PR24 Network Plus models to Scottish Water. As was shown above, those models seek to assess sewage collection and sewage treatment costs together, but do so through the inclusion of sewage treatment works 'load' as a means of taking account of scale. While the amount of load treated by Scottish Water's works provides a reasonable way of reflecting the scale of its sewage treatment activities, it does not sufficiently capture the extent of its sewage collection activities. The extent of this issue is highlighted in the table below which shows how many more properties Scottish Water provides sewage collection services to, as opposed to sewage treatment services. As can be seen, between 2019-20 and 2022-23, the total number of properties that Scottish Water provided sewage collection services to was around 80% higher than the number of properties it provided sewage treatment services to.

***Scale difference between Scottish Water's Sewage Treatment and Sewage Collection activities***

| | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 2023-24 |
|---|---|---|---|---|---|
| Number of properties served by Scottish Water's sewage treatment works | 1.4m | 1.4m | 1.5m | 1.5m | 1.6m |

| | | | | | |
|---|---|---|---|---|---|
| Total number of properties connected to Scottish Water's waste water services | 2.6m | 2.6m | 2.6m | 2.7m | 2.5m |
| Difference | 1.2m | 1.2m | 1.2m | 1.2m | 1.0m |
| As a percentage of the sewage treatment properties total | 81% | 80% | 81% | 80% | 60% |

Source: SW analysis based on SW Annual Return data

Given this, applying the PR24 Network Plus models to Scottish Water would involve implicitly assuming that its sewage collection network was, and the costs associated with were, significantly smaller than they are in practice. We have not identified a practical way of taking this scaling issue into account while applying Ofwat's Network Plus models, and given that have not found these models to provide a reliable basis for assessing the efficiency of Scottish Water's costs.

**We have focused our attention on the sewage collection and sewage treatment models**

Given the above, we have focused our attention on Ofwat's sewage collection and sewage treatment models. In line with the general approach described above, we have focused on aggregated and triangulated efficiency score assessments, and therefore on what – in PR24 – Ofwat described as its 'bottom-up' Wastewater Network Plus assessment, which generates a view of modelled costs by summing the averaged views of the results from the sewage collection and sewage treatment modelling. This approach involves using results from:

- 4 of the 8 PR19 waste water models (not using the 2 bioresources models or the 2 bioresources plus models); and,
- 5 of the 7 PR24 waste water network plus models (not using the 2 'top down' network plus models or the separate bioresources models).

This inevitably means that less of a cross-check is provided for on model results, and so the risk of identified differences between companies reflecting factors other than differences in efficiency is likely to be greater than under Ofwat's broader set of models. We note, though, that while Ofwat's results show some material company specific differences between Ofwat's PR24 bottom up estimate of modelled costs, and the top down view it generated through applying its Wastewater Network Plus models, there is not a material difference on average. Given this, there does not appear to be a reason to have a specific prior expectation that the bottom up approach which we focus on below would imply a higher or a lower efficiency score than would have arisen from a triangulated view of the kind Ofwat used (if that had been possible to generate), although as noted above that may have been the case.

## *Our modelling results ahead of any adjustments: wholesale waste water*

The table below shows the Network Plus efficiency score we identified for Scottish Water, and how it compares to the median and upper quartile (UQ), based on the PR19 and PR24 sewage collection and sewage treatment models. For the PR24 models we show the results based on the coefficients Ofwat identified in its Final Determinations based only on data from E&W, together with the results from re-running Ofwat's models after including Scottish Water data. For PR19, we have re-run the models after including Scottish Water data.[15]

***Summary of modelling results for Wastewater Network Plus ahead of any adjustments***

| | PR19 With Scottish Water data | PR24 Ofwat coefficients | PR24 With Scottish Water data |
|---|---|---|---|
| Scottish Water Efficiency Score | 1.17 | 1.07 | 1.09 |
| • Relative to the median level | 1.15 | 1.05 | 1.06 |
| • Relative to the UQ level | 1.16 | 1.06 | 1.08 |

Source: SW analysis

As can be seen, these initial results show a fairly significant difference between the PR19 and PR24 modelling, with Scottish Water's costs to be between 6% and 16% higher than the upper quartile levels implied by running Ofwat's models, depending on which models and approach is used. We assessed the impact that the policy towards asset replacement that has been applied in Scotland in recent years was likely to be having on these results by using the same broad approach as we did for wholesale water: i.e. considering how the results were affected by different post- and pre-modelling adjustments.

### *Post-modelling adjustments to take account of asset replacement policy in Scotland*

As with wholesale water, while – in principle – physical measures of activity would ideally used to provide a comparison between capital maintenance levels in Scotland and in E&W, in practice, available data does not provide a reliable basis for such a comparison. Given that, we focused our attention on assessing differences in capital maintenance spend.

For wholesale water, our starting point was to use levels of capital maintenance per property as a reasonable basis for comparison. This approach followed from Ofwat's use of the number of connected properties as a scale driver in most (18 out of 24) of its wholesale water models. We then refined this by using a triangulated approach which also took account of Ofwat's use of length of main in its other 6 wholesale water models. That is, we sought to align our approach to the use of scale drivers in Ofwat's models.

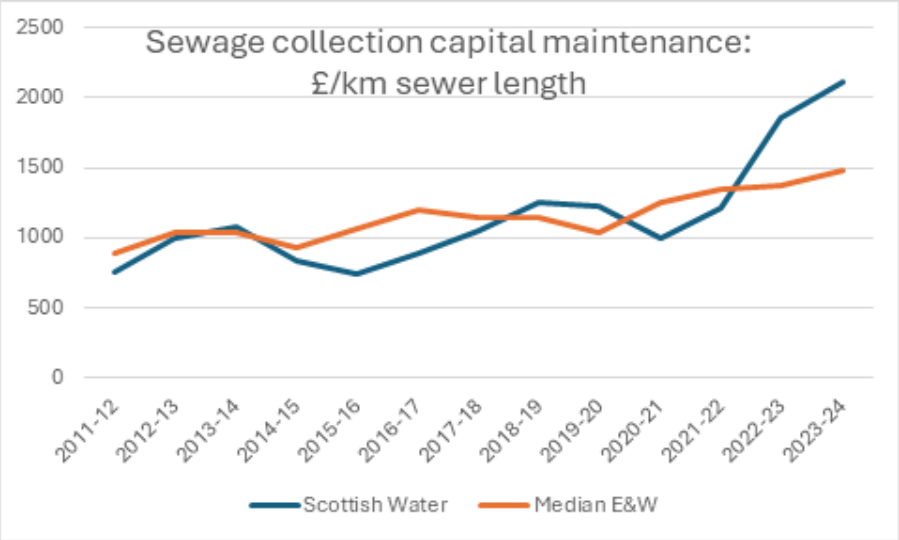
Ofwat has not used the number of connected properties as a scale driver in any of its Wastewater Network Plus models. Instead, in its PR19 and PR24 models, Ofwat used:

- Length of sewer as a scale driver in its sewage collection models; and,
- Load as a scale driver in its sewage treatment models.

Given that, we treated these metrics as providing a reasonable basis for identifying differences in spend levels between Scottish Water and companies in E&W. However, we also consider below the impact of comparing capital maintenance on a per property basis (as an alternative we considered during our assessment process).

The graph below compares Scottish Water's levels of sewage collection capital maintenance per km of sewer since 2011-12, with the median level for water companies in England and Wales. As in the assessment of wholesale water costs, the relationship with the median level is relevant to consider as this would be expected to have impacted on the level of capital maintenance that will have been treated, implicitly, as efficient within Ofwat's calibration of modelled costs. For Sewage

Treatment, an equivalent comparison per unit of load also shows a significant upturn in Scottish Water's capital maintenance per unit since 2020-21.




Source: SW analysis based on SW Annual Return data and PR24-FD-CA06-Base-costs-wastewater-model-1.xlsx

We sought to control for the impact of Scottish Water's asset replacement policy on its implied efficiency score by adjusting Scottish Waters's reported outturn costs such that the capital maintenance part of those costs was equivalent to that which would be implied had it spent in line with the E&W median level (on a per sewer length basis for sewage collection, and on a per load basis for sewage treatment). As with wholesale water, we also considered the effects of making an equivalent adjustment based on the lower quartile level of capital maintenance per unit in E&W, given the potential for this to impact on modelled values and on the upper quartile benchmark.

The table below starts by showing Scottish Water's implied efficiency score based on using Ofwat's PR24 sewage collection and sewage treatment model coefficients to generate a bottom-up Network Plus efficiency score (in line with the figures that were shown in the middle column of the table above). It then shows how the efficiency score changes when Scottish Water's capital maintenance levels are assumed to be consistent with the median and lower quartile levels observed in E&W on the basis described above.[16] As can be seen, on this basis, Scottish Water's Efficiency Score falls to below the upper quartile level (implying upper quartile performance) when the impact of asset replacement is taken into account in the manner described.

***Impact of post-modelling adjustments on Scottish Water's bottom-up Wastewater Network Plus results using Ofwat's PR24 models and coefficients: with sewer length/load-based adjustments***

| | PR24 Ofwat coefficients | With Scottish Water capital maintenance set in line with E&W based on spend per km of sewer/unit of load: | |
|---|---|---|---|
| | | Median | Lower Quartile |
| Scottish Water Efficiency Score | 1.07 | 0.88 | 0.81 |
| • Relative to the median level | 1.05 | 0.86 | 0.79 |

| | | | |
|---|---|---|---|
| • Relative to the UQ level | 1.06 | 0.89 | 0.82 |

Source: SW analysis

The table below shows the equivalent comparison when the adjustment to reflect asset replacement policy is based on spend per number of properties rather than the sewer length and load metrics referred to above. As can be seen, this generates similar results with Scottish Water shown as having upper quartile performance.

***Impact of post-modelling adjustments on Scottish Water's bottom-up Wastewater Network Plus results using Ofwat's PR24 models and coefficients: with per property based adjustments***

| | PR24 Ofwat coefficients | With Scottish Water capital maintenance set in line with E&W based on spend per property: | |
|---|---|---|---|
| | | Median | Lower Quartile |
| Scottish Water Efficiency Score | 1.07 | 0.94 | 0.85 |
| • Relative to the median level | 1.05 | 0.92 | 0.83 |
| • Relative to the UQ level | 1.06 | 0.95 | 0.85 |

Source: SW analysis

Given the models that our assessment is based on, we have used sewer length and sewage treatment works load as appropriate bases for making pre-modelling adjustments (the results from which are set out below).

## *Pre-modelling adjustments to take account of asset replacement policy in Scotland*

The table below shows the results of re-running the PR19 and PR24 sewage collection and sewage treatment models, with Scottish Water data added to the dataset, and with two alternative pre-modelling adjustments having been made consistent with the two post-modelling adjustments considered above: ie setting Scottish Water's capital maintenance levels in line with the E&W median and lower quartile (LQ) levels on the basis described above. As can be see, the results from applying these pre-modelling are similar to those identified above using the post-modelling adjustments. In particular, the results – based on the PR19 and PR24 models – imply upper quartile performance when the impact of asset replacement is taken into account.

***Scottish water bottom-up Wastewater Network Plus efficiency scores after pre-modelling adjustments for asset replacement policy***

| | Scottish Water capital maintenance set in line with E&W median | | Scottish Water capital maintenance set in line with E&W LQ | |
|---|---|---|---|---|
| | PR19 | PR24 | PR19 | PR24 |
| Scottish Water Efficiency Score | 0.98 | 0.91 | 0.91 | 0.84 |
| • Relative to the median level | 0.91 | 0.88 | 0.84 | 0.81 |
| • Relative to the UQ level | 0.98 | 0.90 | 0.91 | 0.82 |

Source: SW analysis

## *Re-running the models using only Opex*

The table below shows the results of re-running the PR19 and PR24 sewage collection and sewage treatment models, but using only opex for all companies (as opposed to the 'base cost plus' values that Ofwat used which included opex but also capital maintenance and some limited enhancement spend). In its comments on our analysis WICS identified some E&W cost lines that it may be appropriate to include in the scope of what should be treated as opex for England and Wales companies. We have engaged with WICS to agree appropriate ways to take account of these points and will reflect these refinements in the analysis we include in our final business plan.

On an opex-only basis, our modelling shows Scottish Water's as an upper quartile performer. This is results are similar under the PR19 and PR24 models, and similar to the that implied by the PR19 base cost models (shown above) when Scottish Water's capital maintenance was adjusted to be in line with the E&W median (the PR24 models showed a lower efficiency score following that adjustment).

***Scottish water bottom-up Wastewater Network Plus efficiency scores when models re-run on an opex only basis***

| | Sewage collection and sewage treatment models re-run using opex only | |
|---|---|---|
| | PR19 | PR24 |
| Scottish Water Efficiency Score | 0.96 | 0.98 |
| • Relative to median | 0.86 | 0.88 |
| • Relative to UQ | 0.97 | 0.99 |

Source: SW analysis

As was noted in relation to wholesale water, WICS has noted concerns of over the statistical performance of some of the opex-only models and questioned whether there may be scope for adjustments to be made to the opex modelling to improve that performance. We will be engaging with WICS to explore ways in which it may possible to improve the reliability of the opex-only modelling, and will include the results of that further work in our final business plan.

## *Impacts of geographic dispersion*

The impact of the geographical dispersion of customers that Scottish Water faces is less pronounced for waste water services than it is for water services, in large part because the scope for using septic tanks in more rural and remote areas. As was noted above, we agreed with WICS that septic tanks should be removed from modelled costs in order to avoid potential distortions (although, as noted above, the dispersion of septic tanks would separately impact on sludge transportation costs). Nevertheless, as can be seen in the table below, there is a material difference in costs per relevant unit between Area 1 (which accounts for 7% of sewer length and 8% of load at sewage treatment works) and Scottish Water's other three operating areas. In particular, functional expenditure for sewage collection per km of sewer length is more than 70% higher for Area 1 than it is on average across Scottish Water's other areas, and functional expenditure for sewage treatment in Area 1 is more than double the level on average across other areas.

***Scottish water functional expenditure per unit by area 2023-24: sewage collection and treatment***

| | **Area 1** | **Area 2** | **Area 3** | **Area 4** | **All Areas** |
|---|---|---|---|---|---|
| **Sewage collection**: functional expenditure per km of sewer | £1,828 | £1,087 | £928 | £1,204 | £1,069 |
| **Sewage treatment**: functional expenditure per unit of load | £741 | £400 | £410 | £251 | £373 |

Source: SW analysis based on SW Annual Return data

We consider this to be expected given the extent of geographic dispersion that Scottish Water faces, and the higher costs that can be associated with serving remote communities. That data above is consistent with the view that while septic tanks lessen the impact those geographic conditions can have on costs, a material impact nevertheless remains The table below gives an indication of the likely scale of this by showing how much lower Scottish Water's functional expenditure (which accounts for around 90% of opex) would have been in 2023-24, if the unit costs of providing sewage collection and sewage treatment in Area 1 had been in line with those on average across the other three areas.

***Implied impact of higher Area 1 costs per unit – 2023/24***

| | **Functional expenditure £m** | | |
|---|---|---|---|
| | Sewage collection | Sewage treatment | Sewage collection and treatment |
| Area 1 outturn 2023-24 | £7.2m | £14.1m | £21.3m |
| Implied expenditure if at unit costs costs/unit with Areas 2-4 | £4.2m | £6.5m | £10.7m |
| Size of adjustment | £.3.0m | £7.6m | £10.6m |

Source: SW analysis based on SW Annual Return data

We note that the sewage treatment cost difference identified above may be overstated to some extent because septic tank costs are not identified separately by area in Annual Returns, so part of the cost difference may reflect their impact. In practice, though, as the total level of functional expenditure associated with septic tanks across in 2023-24 was £4.3m (shown earlier), and not

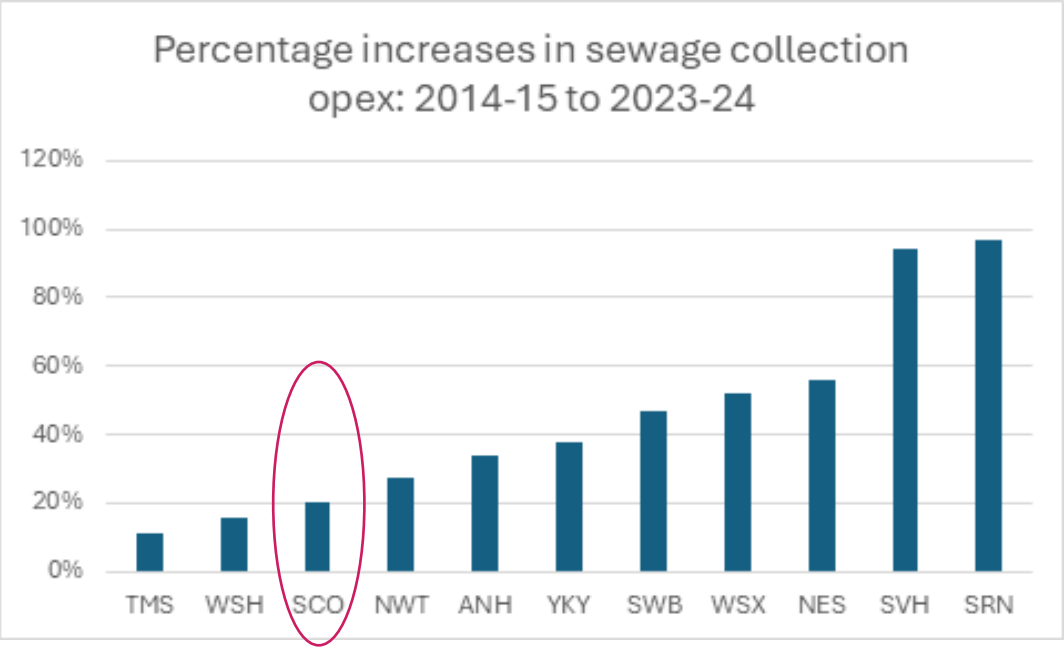
all of Scottish Water's septic tanks are in Area 1, a material difference for sewage treatment, and across sewage collection and treatment would remain.

It is also relevant that – as was noted above – Ofwat's wholesale waste water models seek to take account of economies of scale more directly (through the inclusion of variables related to treatment works size) than is the case for wholesale water, where the effectiveness of the modelling relies on being able to adequately capture economies of scale impacts through the use of density metrics.

### *Comparing movements in wholesale waste water opex over time*

As was noted above, in 2014, its Draft Determination at the SR15 price review, WICS identified Scottish Water's operating and maintenance cost performance to be broadly on a par with that of the leading companies in England and Wales, following significant improvements during SR10.[17] The catch-up efficiency challenge that had been set at SR10 was informed by WICS's use of Ofwat's PR04 and PR09 econometric opex benchmarking models. As with our wholesale water assessment, we have considered relative movements in opex levels since that SR15 assessment as providing a way of taking the results of that earlier benchmarking work into account indirectly to some extent, as well as more generally giving a view on how the scale of changes in Scottish Water's opex over the past c10 years compares to that of companies in England and Wales. In line with this, we have used as providing a form of cross check. As with the wholesale water assessment above, we have adjusted Scottish Water's opex figures upwards for 2021-22 onwards to reflect the change to its cost allocation processes at the time (described earlier) which might others dampen the observed increase to some extent.

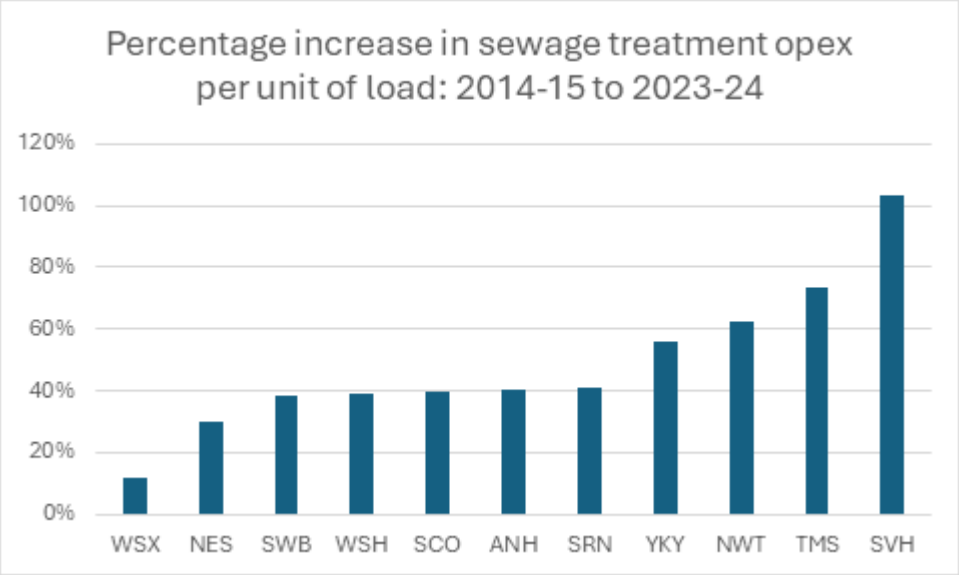
Because of the impact that PFI contracts ending (and activities being taken on by Scottish Water) can have on sewage treatment opex over time, we have considered sewage collection and sewage treatment separately, and – as shown below – considered sewage treatment opex on a cost per load basis. As shown in the graph below, Scottish Water's sewage collection opex has increased by around 20% since 2014-15. That is below the lower quartile increase of 24%, and well below the median increase over that period of 38%.




Source: SW analysis based on SW Annual Return data and PR24-FD-CA06-Base-costs-wastewater-model-1.xlsx

Note: The opex figures used for the graph were in 2022-23 (CPIH) prices

Scottish Water's sewage treatment opex has increased by 52% since 2014-15, which is close to the median increase of 52%, but well above the lower quartile increase of 34%. However, examining opex per unit of sewage treatment load can help avoid the end of PFI contracts distorting the comparison. That is, Scottish Water's sewage treatment opex will have increased in part because the overall proportion of Scotland's sewage treatment that it (rather than a PFI provider) has been responsible for has increased (as some PFI contracts have ended). As can be seen in the graph below, when considered on an opex per load basis, Scottish Water's costs have increased by 39% which is in line the lower quartile level of increase over that period.




Source: SW analysis based on SW Annual Return data and PR24-FD-CA06-Base-costs-wastewater-model-1.xlsx

Note: The opex figures used for the graph were in 2022-23 (CPIH) prices

We consider the comparison of movements in opex over time to provide a useful cross-check and informative source of evidence when considering Scottish Water's relative efficiency as compared with companies in England and Wales. We will be further considering how this evidence might be assessed and presented in the light of the comments from WICS and will provide an updated assessment in our final business plan.

## *Our overall assessment in relation to wholesale waste water opex*

Our overall assessment is that evidence set out above does not support the view that it would be appropriate to apply a catch-up efficiency adjustment when setting Scottish Water's waste water opex allowances for SR27. As a result, we have not addressed the second step we described earlier (of calibrating the scale of adjustment that should be applied if an adjustment were to have been identified as appropriate). The key considerations that have underpinned that assessment can be summarised as follows (in the light of the various results and evidence that was set out above):

i. As was the case with wholesale water, we did not consider it appropriate to put weight on the results from modelling Scottish Water's base plus costs ahead of any adjustments: that modelling takes no account of a known factor – asset replacement policy in Scotland – that has been shown to materially affect the results. We have focused our assessment of modelling results on approaches that seek to take account of this factor.

ii. We considered a comparison of capital maintenance per km of sewer for sewage collection, and per unit of load for sewage treatment, to provide a reasonable and practical means of seeking to take account of Scottish Water's asset replacement policy when assessing comparative efficiency, in a context where those metrics were the scale variables used by Ofwat in the relevant assessment areas. We found that if Scottish Water's level of capital maintenance was assumed to be in line with the median per unit

level observed in E&W on each of those bases, then the PR24 models that we used implied that (on average over the past 5 years) Scottish Water's base plus costs had been around 10% lower than the upper quartile level. Our re-running of PR19 models on that basis also implied better than UQ performance, but Scottish Water's efficiency score was identified as 2% (rather than 10%) below that benchmark.

iii. While we viewed capital maintenance per length of sewer and per volume of load as likely to provide the most appropriate means of comparing capital maintenance levels (for sewage collection and sewage treatment respectively), as a sensitivity we also considered the impact on our PR24 modelling results of adjusting Scottish Water's assumed capital maintenance to be in line with the E&W median level per property. We note that Scottish Water's efficiency score was also identified as below the UQ level on this basis (by around 5%).

iv. Our re-running of PR19 and PR24 models on an opex-only basis avoided the need for adjustments to seek to align Scottish Water's capital maintenance with levels observed in E&W. On this basis, the PR19 models showed Scottish Water's efficiency score to be 3% lower than the UQ level, while the PR24 models showed a score that was 1% lower.

v. The impact on costs of the extent of geographic dispersion that Scottish Water faces is less pronounced than for wholesale water (including because of the use made of septic tanks (which as was explained above, were excluded from the analysis)), and Ofwat's wholesale waste water models include variables which seek to take account of economies more directly than is the case for wholesale water (which rely on such effects being captured through the use of density metrics). We nevertheless note that a material difference in costs per relevant unit can be identified between Area 1 and other Scottish Water areas that affects overall opex levels.

vi. We have not identified further factors as likely to have a major (positive or negative) bearing on the comparative assessments described above, and that would appear to justify efforts to make further adjustments to the modelling.

vii. While we have sought to develop a robust dataset, and to use Ofwat's modelling specifications and approaches where possible, the extent to which sewage treatment and sludge activities in Scotland have been undertaken by PFI operators had a major bearing on the set of Ofwat wholesale waste water models that we considered were likely to be informative. That is, while – for wholesale water – we were able to focus our attention on Scottish Water's 'triangulated' efficiency score across all of Ofwat's wholesale water models, for waste water, we focused our attention on the (PR19 and PR24) sewage collection and treatment models. The extent of PFI activity also had the effect of making some input data dependent on relatively broad brush assumptions (notably that density figures for Scotland overall could be applied to that part in which Scottish Water provided waste water services). Overall, we considered these factors to suggest that a relatively high degree of caution was likely to be merited when seeking to draw conclusions on the basis of waste water model results.

viii. Notwithstanding the point made above in (vii), we note that all of our model results (apart from the unadjusted results addressed in (i) above) showed Scottish Water's efficiency score to be consistent with upper quartile or better performance.

ix. We identified the percentage increase in Scottish Water's sewage collection opex since 2014-15 to have been a little below the lower quartile level of increase for companies in E&W, and well below the median level of increase. For sewage treatment we considered the evolution in levels of opex per unit load in order to take account of the fact that Scottish Water's opex levels will have increased over time to some extent with some PFI contracts ending, such that Scottish Water became responsible for a larger overall amount of activity: on an opex per load basis, Scottish Water's sewage treatment costs have increased in line the lower quartile level of increase since 2014-15. As with wholesale water, we considered

this to provide a useful cross-check which provided some further support for the above findings.

Given the above, our assessment is that Scottish Water's current level of wholesale waste water opex efficiency is likely to be in line with that of the leading companies in England and Wales, and therefore that Scottish Water should not adopt a "catch-up" efficiency challenge for the SR27 period in relation to wholesale water opex. As set out in the above sections, there are a range of areas where we continuing to explore the scope for improvements in our assessments, including in the light of comments we have received from WICS. The assessment we include in our final business plan will take this additional analysis into account where relevant.

## Conclusions

As described in our efficiency technical appendix above, our analysis indicates that Scottish Water's current underlying level of opex efficiency is likely to be in line with that of the leading companies in England and Wales (based on appropriate adjustments to improve comparability and reflect Scottish policy positions). As a result, Scottish Water proposes that the evidence supports no efficiency 'catch-up' requirement in relation to opex costs in SRC27.

# Financial Strength
## Technical Appendix 013

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# 1 Executive Summary

The purpose of this Technical Appendix is to set out:

- A summary of our SR21 performance;
- The steps we have taken to develop and assure our financial model;
- The inputs to our financial modelling for SR27; and
- Our financial projections for SR27.

## 1.1 Key messages

1. **Revenue and cost profiles:** Our revenue and cost profiles in the 2027 to 2033 period reflect indexation using a forecast of Consumer Price Index (CPI) of 2.0% per annum (p.a.).
2. **Revenue assumptions:** Our revenue assumptions for household growth (1% p.a.) and non-household consumption decline (1.5% p.a.) reflect the averages over for the SR21 period. During SR21, we have brought many of the non-household gaps sites into charge and consequently our non-household growth assumption at 0.2% p.a. is lower for SR27.
3. **Expenditure assumptions:** Our expenditure assumptions reflect continued, albeit lower, outperformance of Tier 1 over the remainder of the SR21 period with operating costs over the SR27 period being impacted by:
    a. Our efficiency commitment of 0.8% p.a.;
    b. Leakage reduction;
    c. Demand reduction from smart metering in non-households;
    d. Increasing electricity costs due to our major power purchase agreement ending;
    e. Increasing bad debt and sludge disposal costs; and
    f. A return of Private Finance Initiatives (PFIs). The operating cost increases from PFI returns are more than offset by reduced PFI payments.
4. **Interest rates:** Interest rates are aligned to latest Treasury forecasts and tax is payable over the period.
5. **Cash balance:** Our plan estimates that we will open the new regulatory period with a cash balance of £80 million. We have modelled exiting the SR27 period with a cash balance of £50 million which is set at our minimum risk appetite level.
6. **Cost of delivering our Plan:** In forecast nominal prices, our assessment of the operating, PFI, net interest, Reasonable Cost Contributions (RCC) and tax for 2027 to 2033 period is £5,942 million and that £9,693m is required for repairs and investment. Given available net new government borrowing of £1,020 million, this requires revenue of £14,399 million, and therefore customer charges increasing by CPI inflation + 4.0% p.a.[1]
7. **Areas of uncertainty:** We have identified three areas of uncertainty where we have judged it is more effective and aligned to Ethical Based Regulation (EBR) to have revenue and/or cost allowances updated ex-post – these are wholesale revenue reductions from reduced consumption following the introduction of smart metering, changes in pension contribution rates and real price effects on operating costs.

[1] Total expenditure equal £15,635m. Funded by revenue of £14,399m, plus borrowing of £1,020m, Infrastructure income £147m, Disposal proceeds £9m, Grants & Contributions £30m and utilised cash of £30m

# 2 Background

## 2.1 Developing and assuring our financial model

Scottish Water (SW) and the Water Industry Commission for Scotland (WICS) collaborated to develop a shared financial model. This is a crucial step for Ethical Based Regulation (EBR) as it allows both parties to replicate the calculations of the other – i.e. if identical inputs are used, which are all easily identifiable, both sides will produce the same output. The model has been reviewed by external consultants EY, who verified its logical integrity, functionality, and reliability. Additionally, SW Internal Audit reviewed processes and procedures to assure they are robust.

You can find more detail about our overall assurance process for SR27 in the Risk and Assurance Technical Appendix.

## 2.2 Our performance in SR21

Our financial performance is set out each year both in our regulatory accounts as part of the Annual Return and in our Performance and Prospects annual report. Our financial modelling for the SR27 period reflects the following for the remainder of the SR21 period:

*Quarter 3 forecast for 2024/25*

- **Budget:** Budget for 2025/26, including the agreed charge increase for 2025/26 of 9.9%. Tier 1 costs before items subject to long-term normative charge (responsive repair and refurbishment, reasonable cost contributions and tax) are budgeted to outperform (i.e. come in under) the Final Determination allowance by £3m. This includes the impact of the UK Government's Employer National Insurance increase.
- **Performance against Final Determination Allowance:** A modelled view for 2026/27 including:
    - Nominal charge increase of 8.58%[2] in line with the overall CPI+12.6% Final Determination (FD) settlement for SR21;
    - Infrastructure charge increases in line with those proposed for 24/25, disposal proceeds for the Fairmilehead office in Edinburgh and Tier 1 costs before items subject to long-term normative charge (responsive repair and refurbishment, reasonable cost contributions and tax) allow us to continue to outperform the FD allowance by £3m. Our view is this will be challenging to achieve given the expected increase in non-domestic rates[3], and the rent for the new Waverley Court office; and
    - PFI costs are modelled to reduce with two PFIs returning to Scottish Water operation (Dalmuir Waste Water Treatment Works and Daldowie sludge treatment centre) with operating costs partially offsetting this. We have modelled this on a cautious basis reflecting the uncertainty on the asset condition on return.
- **Cash:** An updated view of cash risk appetite, enabling cash balances for Scottish Water regulated to reduce to £80m.

A summary table of financials for the last two years is provided below:

[2] Forecast CPI for October per latest Bank of England is 3.5%.

[3] Rateable values are reset very three years to reflect inflation and property value increases. Rateable values for 23/24, 24/25 and 25/26 are from values as at 21/22. Rateable values for 26/27 and the subsequent two years will be based on values as at 24/25. Inflation over these three years has been ~20%. If our forecast 24/25 non-domestic rates cost of £71.9m rose by 20% this would be an increased cost of ~£14m.

| Outturn (£m) | 2025/26 | 2026/27 |
|---|---|---|
| Revenue | 1,736 | 1,900 |
| Infrastructure charges | 14 | 20 |
| Disposal proceeds | 2 | 5 |
| **Total** | 1,753 | 1,926 |
| | | |
| **Borrowing (net new)** | 170 | 170 |
| **Grants and contributions** | 7 | 5 |
| | | |
| **Total Financing** | 1,930 | 2,101 |
| | | |
| Operating costs | (552) | (592) |
| PFI costs | (173) | (130) |
| Net Interest cost | (159) | (167) |
| RCC | (38) | (32) |
| Tax | 0 | 0 |
| **Total costs** | (922) | (921) |
| | | |
| **Contribution to repairs & investment** | 1,008 | 1,180 |

## 2.3 Changes from SR21: Revision of Regulatory Accounting Rules

Over 24/25 we have worked extensively with WICS to refresh the Regulatory Accounting Rules (RARs) for the first time in fifteen years. All our projections reflect the revised RARs. As reflected in the RARs refresh, each year in our regulatory accounts we will report on the level of economic depreciation and the surplus or deficit by subtracting replacement investment.

## 2.4 Cost reflectivity of charges

The Principles of Charging require that charges should be broadly cost-reflective, in the sense that charges for given services to particular customer groups recover the cost to Scottish Water of providing that service. We have carried out modelling work to allocate the full cost of each service to different customers groups. While there is not an exact match of charges and costs, we are satisfied that charges broadly reflect the costs of the services charged for over the SRC 27 period. We have also applied the same model to the long term investment profile to show the movements in costs by service over time. Over that period, costs and charges remain broadly in balance, and we do not consider that it would be necessary to adjust the balance of charges over that period.

We have shared our evidence and analysis in this area with WICS and other key stakeholders. We will continue to monitor cost-reflectivity over time and will engage with WICS if we see evidence that charges require adjustments to return to a broad balance versus costs.

# 3 Our financial modelling for SR27

## 3.1 Revenue

- **Household Revenue Growth** is assumed at 1.0% p.a. growth rate. This is a combination of 20,000 properties per year together with a Band D equivalent factor. This level of growth is in line with actuals in the first four years of the SR21 period but is higher than the household formation predicted by National Records of Scotland. We consider that given comparable levels of properties per head across similar European countries, household formation alone is likely to underestimate household revenue growth.
- **Non-household property growth** is assumed at 0.2% p.a. While the average growth rate over the first four years of the SR21 period has been 2.0% p.a. this has been driven by bringing gap sites into charge, a process that is now largely complete. Growth in 2024/25 has been negligible at 0.03% but as a single data point is not a reliable basis to forecast forward.
- **Non-household property consumption** is assumed to decline by 1.5% p.a. which is the average decline over the last five years. The decline over the last two years has been around 2.5% p.a. but as this is a relatively short period the five-year average has been used. While we are assuming a 10% fall in consumption from the full roll out of smart metering (and have reduced our forecast operating costs accordingly) we have not modelled any impact on revenue based on the assumption that wholesale charges will be realigned (i.e. increased) to ensure they continue to be cost reflective.
- **Infrastructure charges** are assumed to increase by CPI each year and are aligned to the household and non-household property growth assumptions set out above.
- **Disposals of land**, property and vehicles are assumed to contribute ~£1.5m p.a. on average.
- **Secondary charges** are assumed to increase in line with inflation.

## 3.2 Operating Costs

Over the SR27 period operating costs are assumed to increase with CPI less the annual efficiency commitment of 0.8%, with the following step changes:

- **Electricity costs in 27/28:** Over the SR21 period around half of Scottish Water's electricity requirement was forward purchased through a long-term power purchase agreement. That agreement expires at the end of 26/27. Based on forward market prices relative to the price set in the power purchase agreement, annual electricity costs are forecast to increase by £13.1m in 27/28.
- **PFIs returning to Scottish Water operation:** During the SR27 period four further PFIs will reach the end of their contracts (Almond Valley/Seafield/Esk and Tay in 2029, Moray in 2031, and Meadowhead/Stevenson/Inverclyde in 2032), with Levenmouth the only remaining PFI at the end of the SR27 period. Analysis of the expected operating cost on return has been carried out on a site-by-site basis. On a risk aware basis reflecting uncertainty of the asset condition on return, once all four have returned to Scottish Water, operating costs will increase by £55m (which is more than offset by the decrease in PFI fees – see below).
- **Land remediation:** Due to capacity issues at outlets near to Dalmuir Waste Water Treatment Works, alternative arrangements for the disposal of sludge cake will be needed. It is expected that the additional costs from alternative disposal will be ~£2m p.a. in the SR27 period. Further work will be undertaken for the Final Business Plan to forecast the impact of this issue across Scotland.

- **New operating costs:** The impact of the investment programme on operating costs is assumed to be in line with the historic trend of £0.7m p.a.
- **Leakage reduction:** Additional investment in the SR27 period to support the leakage reduction target is assumed to reduce annual operating costs by c£2m by the end of period.
- **Bad debt:** Assumed to increase in line with prices (i.e. CPI+4%) which is approximately £1.1m increase p.a.
- **The rollout of Smart metering:** For Non household (NHH) customers is assumed to reduce operating costs by £1.8m by end of the period due to lower consumption.

As set out in the Efficiency Technical Appendix, analysis of Office of National Statistics (ONS) data have shown that historically our operating costs experience a RPE of 0.7% p.a., noting that this can vary considerably year on year. Given there is no robust basis to forecast each RPE component we have not modelled a RPE in the SR27 period and instead propose that operating costs are realigned annually to reflect outturn RPE.

A significant uncertainty on operating costs are employer pension contributions. Scottish Water employees are members of the Strathclyde, Lothian and Aberdeen (Local Authority) pension funds. As of September 2024, all three funds were in surplus. If this position changed then employer contributions would be required to increase; we estimate that if the funds were in a balanced position rather than their current surplus position employer contributions would increase by ~£20m p.a. and if they move to a deficit position this would increase further. Rather than make an assumption on future surpluses and deficits, we propose that operating costs are realigned annually to reflect changes in employer pension contribution rates.

## 3.3 PFI

Due to the return of all but one PFI (Levenmouth) in the SR27, PFI service fees will reduce from £130m in 26/27 to £37m in 2032/33, a reduction of £93m. The Levenmouth contract expires in SR39 (October 2040).

## 3.4 Interest

Interest rates for new debt are assumed at 4.0%, in line with Treasury forecasts. Net new debt is currently assumed at £170m p.a. in line with SR 21.

When we locked down our numbers the forecast National Loans Fund (NLF) rates at the start of the SR27 period were at 4%. The most recent forecasts received indicate an increase of 20 to 30 basis points. We will update our forecasts for the Final Business Plan.

## 3.5 Tax

Corporation tax is estimated to be £80.5m over 27-33 period and is based on the current corporation tax rates and our allocations to capital allowance pools based on historic actuals. Tax legislation can change over the period and if they were to change would have consequential impact on the tax liability of Scottish Water.

## 3.6 Reasonable Cost Contributions (RCC)

Reasonable cost contributions have been assumed to be in line with current average annual run-rate of £31m.

## 3.7 Repairs and Investment

To drive the tax calculation and the P&L[4], the following inputs into the financial model have been made in nominal price base:

- **Repairs:** forecast to be £2,475.4m.
- **Refurbishment:** forecast to be £906.2m
- **Asset Replacement:** forecast to be £3,408.2m.
- **Growth:** forecast to be £453.1m
- **Enhancement**: forecast to be £2,450.2m

Please note that these allocations will be updated to match the data table 8 split in the final business plan. It is not expected that the value for repairs will change materially and therefore will have minimal impact on the tax calculation.

[4] Profit & Loss

# 4 A summary of our financial projections for SR27

The high-level output is that the charge path of CPI +4% p.a. finances £8,305m of repairs and investments (23/24 prices).

The final guidance requests that Scottish Water should set out the circumstances in which it might propose deviating from the charge profile of the Final Determination. Such a proposal would only be in circumstances which are materially different with respect to the financial projections, where we judge it would be of benefit to our customers, both present and future. Such circumstances would include inflation falling to such a level that a 2% or flat nominal increase would be a higher real terms increase than that set out in the Final Determination or another cost-of-living crisis.

A high-level summary of the financial flows for the alternative charge path scenarios (annual increases of CPI +3% and CPI +5% respectively) are shown in the Annex.

### 17/18 prices

| 17/18 Prices (£m) | 2027/28 | 2028/29 | 2029/30 | 2030/31 | 2031/32 | 2032/33 | Total |
|---|---|---|---|---|---|---|---|
| Revenue | 1,416.9 | 1,482.2 | 1,550.7 | 1,622.3 | 1,697.4 | 1,776.0 | 9,545.6 |
| Infrastructure charges | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 16.3 | 97.8 |
| Disposal proceeds | 1.2 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 5.9 |
| **Total** | 1,434.4 | 1,499.5 | 1,567.9 | 1,639.6 | 1,714.6 | 1,793.2 | 9,649.2 |
| | | | | | | | |
| **Borrowing (net new)** | 118.8 | 116.5 | 114.2 | 111.9 | 109.7 | 107.6 | 678.7 |
| **Grants and contributions** | 3.5 | 3.4 | 3.4 | 3.3 | 3.2 | 3.2 | 20.0 |
| | | | | | | | |
| **Total Financing** | 1,556.7 | 1,619.4 | 1,685.4 | 1,754.8 | 1,827.6 | 1,904.0 | 10,347.9 |
| | | | | | | | |
| Operating costs | (433.2) | (431.3) | (448.0) | (452.0) | (453.6) | (457.2) | (2,675.2) |
| PFI costs | (89.5) | (90.4) | (57.1) | (39.0) | (31.3) | (22.9) | (330.3) |
| Net Interest cost | (121.6) | (124.0) | (125.1) | (126.0) | (128.0) | (128.8) | (753.5) |
| RCC | (23.2) | (23.2) | (23.2) | (23.2) | (23.2) | (23.2) | (139.3) |
| Tax | 0.0 | (0.8) | (6.2) | (11.0) | (15.2) | (19.4) | (52.6) |
| **Total costs** | (667.5) | (669.8) | (659.7) | (651.2) | (651.3) | (651.4) | (3,951.0) |
| | | | | | | | |
| **Cash utilised** | 21.0 | 0.0 | (0.0) | 0.0 | (0.0) | 0.0 | 21.0 |
| **Change in working capital** | (0.0) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | | | | | | |
| **Contribution to repairs & investment** | 910.1 | 949.6 | 1,025.7 | 1,103.6 | 1,176.3 | 1,252.5 | 6,417.8 |

## 23/24 prices

| 23/24 Prices (£m) | 2027/28 | 2028/29 | 2029/30 | 2030/31 | 2031/32 | 2032/33 | Total |
|---|---|---|---|---|---|---|---|
| Revenue | 1,833.5 | 1,918.1 | 2,006.7 | 2,099.4 | 2,196.5 | 2,298.2 | 12,352.5 |
| Infrastructure charges | 21.1 | 21.1 | 21.1 | 21.1 | 21.1 | 21.1 | 126.5 |
| Disposal proceeds | 1.6 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 7.6 |
| **Total** | 1,856.2 | 1,940.4 | 2,029.0 | 2,121.7 | 2,218.8 | 2,320.5 | 12,486.7 |
| **Borrowing (net new)** | 153.7 | 150.7 | 147.8 | 144.9 | 142.0 | 139.2 | 878.3 |
| **Grants and contributions** | 4.5 | 4.4 | 4.3 | 4.3 | 4.2 | 4.1 | 25.8 |
| **Total Financing** | 2,014.5 | 2,095.5 | 2,181.1 | 2,270.8 | 2,365.0 | 2,463.9 | 13,390.8 |
| Operating costs | (560.6) | (558.1) | (579.7) | (584.9) | (587.0) | (591.6) | (3,461.9) |
| PFI costs | (115.9) | (117.0) | (73.9) | (50.5) | (40.5) | (29.6) | (427.5) |
| Net Interest cost | (157.3) | (160.5) | (161.9) | (163.0) | (165.6) | (166.6) | (975.0) |
| RCC | (30.0) | (30.0) | (30.0) | (30.0) | (30.0) | (30.0) | (180.3) |
| Tax | 0.0 | (1.0) | (8.1) | (14.3) | (19.7) | (25.1) | (68.1) |
| **Total costs** | (863.8) | (866.7) | (853.7) | (842.8) | (842.9) | (843.0) | (5,112.8) |
| **Cash utilised** | 27.1 | 0.0 | (0.0) | 0.0 | (0.0) | 0.0 | 27.1 |
| **Change in working capital** | (0.0) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Contribution to repairs & investment** | 1,177.8 | 1,228.8 | 1,327.4 | 1,428.1 | 1,522.2 | 1,620.9 | 8,305.1 |

## Nominal Prices

| Outturn (£m) | 2027/28 | 2028/29 | 2029/30 | 2030/31 | 2031/32 | 2032/33 | Total |
|---|---|---|---|---|---|---|---|
| Revenue | 2,028 | 2,164 | 2,309 | 2,464 | 2,629 | 2,806 | 14,399.8 |
| Infrastructure charges | 23 | 24 | 24 | 25 | 25 | 26 | 147.1 |
| Disposal proceeds | 2 | 1 | 1 | 1 | 1 | 1 | 8.8 |
| **Total** | 2,052.8 | 2,188.8 | 2,334.5 | 2,490.0 | 2,656.1 | 2,833.4 | 14,555.7 |
| **Borrowing (net new)** | 170.0 | 170.0 | 170.0 | 170.0 | 170.0 | 170.0 | 1,020.0 |
| **Grants and contributions** | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 30.0 |
| **Total Financing** | 2,227.8 | 2,363.8 | 2,509.5 | 2,665.0 | 2,831.1 | 3,008.4 | 15,605.7 |
| Operating costs | (619.9) | (629.6) | (667.1) | (686.4) | (702.6) | (722.4) | (4,028.0) |
| PFI costs | (128.1) | (132.0) | (85.0) | (59.3) | (48.5) | (36.2) | (489.2) |
| Net Interest cost | (174.0) | (181.0) | (186.3) | (191.3) | (198.3) | (203.4) | (1,134.4) |
| RCC | (33.2) | (33.9) | (34.6) | (35.3) | (36.0) | (36.7) | (209.6) |
| Tax | 0.0 | (1.2) | (9.3) | (16.8) | (23.5) | (30.6) | (81.4) |
| **Total costs** | (955.3) | (977.7) | (982.3) | (989.1) | (1,009.0) | (1,029.3) | (5,942.6) |
| **Cash utilised** | 30.0 | 0.0 | (0.0) | 0.0 | (0.0) | 0.0 | 30.0 |
| **Change in working capital** | (0.0) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Contribution to repairs & investment** | 1,302.5 | 1,386.2 | 1,527.2 | 1,676.0 | 1,822.1 | 1,979.1 | 9,693.1 |

## Financial ratios

Our forecast financial ratios are set out in Table 1 below.

| Financial Ratios | 2027/28 | 2028/29 | 2029/30 | 2030/31 | 2031/32 | 2032/33 |
|---|---|---|---|---|---|---|
| Cash Interest Cover | 7.43 | 7.83 | 8.44 | 9.06 | 9.55 | 10.14 |
| Funds from Operations to net debt | 21.2% | 22.6% | 24.4% | 26.3% | 28.0% | 29.8% |

*Table 1: Financial Ratios*

Both ratios above improve over the period as our revenue base increases at a higher rate than our costs, to fulfil the increased investment demand.

Our view is that it would be appropriate to create a shadow regulatory capital value, and we would welcome working with WICS on this so it can be included in our Final Business Plan.

# 5 Financial Statements

## Profit & Loss

| | 2027/28 | 2028/29 | 2029/30 | 2030/31 | 2031/32 | 2032/33 |
|---|---|---|---|---|---|---|
| | *Forecast* | *Forecast* | *Forecast* | *Forecast* | *Forecast* | *Forecast* |
| **Regulated income** | | | | | | |
| Household | 1,499.0 | 1,604.8 | 1,718.1 | 1,839.4 | 1,969.3 | 2,108.3 |
| Wholesale Income | 511.9 | 541.0 | 571.8 | 604.4 | 638.9 | 675.4 |
| Other income | 16.8 | 17.9 | 18.9 | 20.1 | 21.3 | 22.5 |
| **Total revenue** | **2,027.7** | **2,163.7** | **2,308.9** | **2,463.9** | **2,629.4** | **2,806.2** |
| **Regulated expenditure** | | | | | | |
| Total regulated operating costs | (619.9) | (629.6) | (667.1) | (686.4) | (702.6) | (722.4) |
| | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PFI | (128.1) | (132.0) | (85.0) | (59.3) | (48.5) | (36.2) |
| Repairs and Non-asset | (392.4) | (400.3) | (408.3) | (416.4) | (424.8) | (433.3) |
| Depreciation and amortisation | (439.4) | (459.2) | (481.1) | (507.5) | (540.0) | (576.5) |
| Amortisation of PFI | (3.6) | (3.6) | (1.8) | 0.0 | 0.0 | 0.0 |
| (Gain)/loss on sale of assets | 0.5 | 1.4 | 1.4 | 1.4 | 1.4 | 1.5 |
| **Total expenditure** | **(1,583.0)** | **(1,623.3)** | **(1,641.9)** | **(1,668.2)** | **(1,714.5)** | **(1,766.8)** |
| **Regulated PBIT** | **445** | **540** | **667** | **796** | **915** | **1,039** |
| Interest | (174.0) | (181.0) | (186.3) | (191.3) | (198.3) | (203.4) |
| **Regulated profit before tax** | **270.7** | **359.4** | **480.7** | **604.3** | **716.7** | **835.9** |
| Current tax payable | 0.0 | (1.2) | (9.3) | (16.8) | (23.5) | (30.6) |
| Deferred Tax | (67.7) | (88.7) | (110.9) | (134.3) | (155.6) | (178.4) |
| **SW Profit after Tax** | **203.0** | **269.6** | **360.5** | **453.2** | **537.5** | **626.9** |

## Balance Sheet

| | 2027/28 *Forecast* | 2028/29 *Forecast* | 2029/30 *Forecast* | 2030/31 *Forecast* | 2031/32 *Forecast* | 2032/33 *Forecast* |
|---|---|---|---|---|---|---|
| Fixed Assets | 8,858.1 | 9,390.0 | 10,033.2 | 10,790.7 | 11,653.8 | 12,629.1 |
| Investments | 37.6 | 37.6 | 37.6 | 37.6 | 37.6 | 37.6 |
| PFI 'assets' | 5.4 | 1.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| Trade and other debtors | 140.0 | 140.0 | 140.0 | 140.0 | 140.0 | 140.0 |
| Stock | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 |
| Cash | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 |
| Total debtors | 199.8 | 196.2 | 194.4 | 194.4 | 194.4 | 194.4 |
| Trade and other creditors | 282.1 | 282.1 | 282.1 | 282.1 | 282.1 | 282.1 |
| Accruals and provisions | 172.0 | 172.0 | 172.0 | 172.0 | 172.0 | 172.0 |
| Infrastructure Income | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 |
| Unearned income | 104.5 | 104.5 | 104.5 | 104.5 | 104.5 | 104.5 |
| Deferred Tax | 812.1 | 900.8 | 1,011.7 | 1,146.0 | 1,301.7 | 1,480.0 |
| **Net assets** | **7,714.0** | **8,153.6** | **8,684.1** | **9,307.3** | **10,014.8** | **10,811.7** |
| Loans | 5,384.4 | 5,554.4 | 5,724.4 | 5,894.4 | 6,064.4 | 6,234.4 |
| Capital reserves | 133.4 | 133.4 | 133.4 | 133.4 | 133.4 | 133.4 |
| Trading reserves | 2,196.0 | 2,465.6 | 2,826.1 | 3,279.3 | 3,816.8 | 4,443.7 |
| **Total capital & reserves** | **7,713.9** | **8,153.4** | **8,683.9** | **9,307.1** | **10,014.6** | **10,811.6** |

Please note that for the purposes of SR27 financial modelling it is assumed that trade debtors, trade creditors, accruals and prepayments are purposely kept flat so cash impacts are not impacted by working capital.

## Net new borrowing

| £m, forecast out-turn | 2027-28 | 2028-29 | 2029-30 | 2030-31 | 2031-32 | 2032-33 |
|---|---|---|---|---|---|---|
| Opening debt | 5,214 | 5,384 | 5,554 | 5,724 | 5,894 | 6,064 |
| Closing Debt | 5,384 | 5,554 | 5,724 | 5,894 | 6,064 | 6,234 |
| **Net New Borrowing** | **170** | **170** | **170** | **170** | **170** | **170** |

## Cash Flow

| | 2027/28 *Forecast* | 2028/29 *Forecast* | 2029/30 *Forecast* | 2030/31 *Forecast* | 2031/32 *Forecast* | 2032/33 *Forecast* |
|---|---|---|---|---|---|---|
| **PBIT (excl gain on sale of assets)** | **444.2** | **539.1** | **665.6** | **794.2** | **913.5** | **1,037.9** |
| Depreciation/amortisation | 443.0 | 462.8 | 482.9 | 507.5 | 540.0 | 576.5 |
| *Depreciation of tangible fixed assets* | 439.4 | 459.2 | 481.1 | 507.5 | 540.0 | 576.5 |
| *Amortisation of grants and PFI assets* | 3.6 | 3.6 | 1.8 | 0.0 | 0.0 | 0.0 |
| Change in working capital | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Operating cash flow | 887.3 | 1,001.8 | 1,148.5 | 1,301.8 | 1,453.5 | 1,614.4 |
| Net interest | -174.0 | -181.0 | -186.3 | -191.3 | -198.3 | -203.4 |
| Tax payments | 0.0 | -1.2 | -9.3 | -16.8 | -23.5 | -30.6 |
| Capital payments | -938.3 | -1,014.8 | -1,148.6 | -1,289.8 | -1,428.4 | -1,577.5 |
| PFI investment | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Intercompany Loans | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Infrastructure income receipts | 23.3 | 23.8 | 24.3 | 24.8 | 25.2 | 25.8 |
| Sale of fixed assets | 1.8 | 1.4 | 1.4 | 1.4 | 1.4 | 1.5 |
| **Net cash inflow/(outflow)** | **-200.0** | **-170.0** | **-170.0** | **-170.0** | **-170.0** | **-170.0** |
| Financing | | | | | | |
| New loans - Scottish Government | 266.5 | 280.1 | 298.3 | 285.6 | 295.4 | 295.5 |
| Loan repayments | -96.5 | -110.1 | -128.3 | -115.6 | -125.4 | -125.5 |
| Net new borrowing | 170.0 | 170.0 | 170.0 | 170.0 | 170.0 | 170.0 |
| Cash utilised | 30.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Net cash outflow/(inflow)** | **200.0** | **170.0** | **170.0** | **170.0** | **170.0** | **170.0** |

As can be seen above operating cash flows are being utilised to fund capital payments.

# Annex A – High level summary of alternative charge paths

## 23/24 prices

### CPI+3%

| 23/24 Prices (£m) | 2027/28 | 2028/29 | 2029/30 | 2030/31 | 2031/32 | 2032/33 | Total |
|---|---|---|---|---|---|---|---|
| Revenue | 1,816.2 | 1,882.1 | 1,950.4 | 2,021.3 | 2,094.9 | 2,171.2 | 11,936.1 |
| Infrastructure charges | 21.1 | 21.1 | 21.1 | 21.1 | 21.1 | 21.1 | 126.5 |
| Disposal proceeds | 1.6 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 7.6 |
| **Total** | 1,838.9 | 1,904.4 | 1,972.7 | 2,043.6 | 2,117.1 | 2,193.5 | 12,070.2 |
| | | | | | | | |
| **Borrowing (net new)** | 153.7 | 150.7 | 147.8 | 144.9 | 142.0 | 139.2 | 878.3 |
| **Grants and contributions** | 4.5 | 4.4 | 4.3 | 4.3 | 4.2 | 4.1 | 25.8 |
| | | | | | | | |
| **Total Financing** | 1,997.2 | 2,059.5 | 2,124.8 | 2,192.7 | 2,263.3 | 2,336.8 | 12,974.3 |
| | | | | | | | |
| Operating costs | (560.6) | (558.1) | (579.7) | (584.9) | (587.0) | (591.6) | (3,461.9) |
| PFI costs | (115.9) | (117.0) | (73.9) | (50.5) | (40.5) | (29.6) | (427.5) |
| Net Interest cost | (157.3) | (160.5) | (161.9) | (163.0) | (165.6) | (166.6) | (975.0) |
| RCC | (30.0) | (30.0) | (30.0) | (30.0) | (30.0) | (30.0) | (180.3) |
| Tax | 0.0 | 0.0 | (5.2) | (10.4) | (14.8) | (19.1) | (49.4) |
| **Total costs** | (863.8) | (865.7) | (850.8) | (838.9) | (837.9) | (837.0) | (5,094.2) |
| | | | | | | | |
| **Cash utilised** | 27.1 | 0.0 | 0.0 | (0.0) | 0.0 | (0.0) | 27.1 |
| **Change in working capital** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | (0.0) | 0.0 |
| | | | | | | | |
| **Contribution to repairs & investment** | 1,160.5 | 1,193.9 | 1,274.0 | 1,353.8 | 1,425.4 | 1,499.8 | 7,907.3 |

### CPI+5%

| 23/24 Prices (£m) | 2027/28 | 2028/29 | 2029/30 | 2030/31 | 2031/32 | 2032/33 | Total |
|---|---|---|---|---|---|---|---|
| Revenue | 1,850.8 | 1,954.5 | 2,064.0 | 2,179.8 | 2,302.1 | 2,431.4 | 12,782.7 |
| Infrastructure charges | 21.1 | 21.1 | 21.1 | 21.1 | 21.1 | 21.1 | 126.5 |
| Disposal proceeds | 1.6 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 7.6 |
| **Total** | 1,873.5 | 1,976.8 | 2,086.3 | 2,202.1 | 2,324.4 | 2,453.7 | 12,916.8 |
| | | | | | | | |
| **Borrowing (net new)** | 153.7 | 150.7 | 147.8 | 144.9 | 142.0 | 139.2 | 878.3 |
| **Grants and contributions** | 4.5 | 4.4 | 4.3 | 4.3 | 4.2 | 4.1 | 25.8 |
| | | | | | | | |
| **Total Financing** | 2,031.8 | 2,131.9 | 2,238.4 | 2,351.2 | 2,470.6 | 2,597.1 | 13,820.9 |
| | | | | | | | |
| Operating costs | (560.6) | (558.1) | (579.7) | (584.9) | (587.0) | (591.6) | (3,461.9) |
| PFI costs | (115.9) | (117.0) | (73.9) | (50.5) | (40.5) | (29.6) | (427.5) |
| Net Interest cost | (157.3) | (160.5) | (161.9) | (163.0) | (165.6) | (166.6) | (975.0) |
| RCC | (30.0) | (30.0) | (30.0) | (30.0) | (30.0) | (30.0) | (180.3) |
| Tax | 0.0 | (3.0) | (11.0) | (18.3) | (24.8) | (31.4) | (88.4) |
| **Total costs** | (863.8) | (868.6) | (856.6) | (846.7) | (848.0) | (849.3) | (5,133.1) |
| | | | | | | | |
| **Cash utilised** | 27.1 | 0.0 | 0.0 | (0.0) | 0.0 | (0.0) | 27.1 |
| **Change in working capital** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | (0.0) | 0.0 |
| | | | | | | | |
| **Contribution to repairs & investment** | 1,195.1 | 1,263.3 | 1,381.8 | 1,504.4 | 1,622.6 | 1,747.7 | 8,714.9 |

# Performance Monitoring

## Technical Appendix 014

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# 1 Executive Summary

Our performance monitoring appendix explains our approach to forecasting the ambitious outcomes we expect to achieve over SR27, how we have aligned with WICS Guidance[1] and how we expect to develop a monitoring and performance framework for Scottish Water that is aligned to these outcomes.

## 1.1 Our alignment with Guidance

For this Draft Business Plan (DBP), we have followed the WICS Guidance in developing our outcome projections, ensuring that our performance monitoring framework for SR27 is robust and comprehensive. For Scenario A we provide SR27 outcome projections, and projections for each investment period to 2051, enabling effective long-term planning. For Scenarios B and C, we provide outcome projections for the end of SR27.

Our approach to translating our contribution towards high-level outcomes from the Water Sector Vision (WSV) into tangible measures and milestones is outlined in Section 1. We show how we plan to meet the Draft Ministerial Objectives (MOs) for the 2027-33 regulatory period, marking a significant step towards achieving the long-term sector vision.

## 1.2 Our Outcome Proposals

**Customer Experience Measures (CEMs):**

- Customer satisfaction is central to all that we do and that benchmarking our performance with other companies helps drive the business to customer excellence. Our benchmark UKCSI score will be above the average score of all the UK companies in the national survey and our CEMs are expected to see a 6% reduction in points lost, ensuring that SW continues to lead in service delivery and customer satisfaction.

**Water Quality and Compliance:**

- The provision of wholesome drinking water quality is an essential service for Scotland, and customers continue to expect us to meet the highest standards. We forecast a 30% reduction in points lost from sample failures for total drinking water compliance, a 16% reduction in DWQR reported incidents, a 19% reduction in the water risk assessment planning (WRAP) measure and a 39% reduction in the number of lead pipes in our water mains and distribution network.

**Water Continuity:**

- Our management of water demand improves efficiency and effectiveness in our investments. We forecast that leakage across the water system will reduce by 10%, repeat interruptions to supply will reduce by 17% and the low-pressure register will reduce by 13%.

**Environmental Impact:**

- Our customers, communities and environments in which we live can be affected by severe weather events and asset failures which cause spills, sewer flooding and pollution incidents. Our ambitious environmental targets include a forecasted 38% reduction in serious environmental pollution incidents and a 14% reduction in unsatisfactory intermittent discharges.

**Carbon emissions:**

[1] WICS - Strategic Review of Charges 2027-2033: Guidance and Definitions to the Business Plan Tables

- Though we use gravity to move water and waste water where we can within out systems, we also pump water and waste water. This contributes to operational carbon footprint alongside embodied carbon emissions from our capital investment programme. We will continue our progressive journey towards the 2040 net zero target outcome.

## 1.3 Our next steps

As part of our ongoing engagement and discussions with WICS, we propose additional outcomes that we think will add value to assessment of our performance. In this document we also highlight, some outcomes that are in development for submission in the Final Business Plan (FBP), and some measures for future consideration. These steps are crucial for ensuring that our outcome projections not only meet current guidance but also anticipate future needs and challenges.

We outline the suitability of our proposed outcomes to be target outcomes, which will form a performance monitoring framework for SR27. This framework will guide the future development of our incentives, ensuring that our performance remains aligned with sector expectations and regulatory requirements.

In conclusion, this technical appendix explains our approach to monitoring performance across SR27 and our response to the WICS Guidance. We are committed to achieving the high-level outcomes set out here, listening to what our customers have told us, to translate these into tangible measures and milestones that will drive performance improvements and sector advancements in the long term, while balancing ambition and cost.

# 2 Background

## 2.1 Scope of Technical Appendix

This technical appendix explains our approach to monitoring our performance across SR27 and our response to the WICS Guidance. We set out how we will

- Monitor performance against our Strategic Ambitions and Long-Term Outcomes,
- Manage risk and opportunities across the SR27 plan,
- Intervene to address areas of underperformance or where risk reaches unsatisfactory levels,
- Share the outputs of our Monitoring work with WICS, SEPA, DWQR and our other stakeholders,
- Benefit from our new Assurance processes to enhance and continuously improve our Monitoring process.

The requests of us from the WICS Guidance for Table 1 outcomes and performance monitoring are summarised in *Table 21* in the Annex, together with an indication of where each has been prepared within this Technical Appendix.

Specifically, we will detail how we have responded to WICS Guidance, including our consideration of WICS' initial set of 44 outcomes measures and our proposal of two additional outcomes for SR27.

Table 1 below provides a summary of the outcomes proposed by WICS and by Scottish Water, and their status, the details of which we present in this technical appendix.

*Table 1: Summary of proposed SR27 outcomes*

| Measure of level of service | Technical Appendix section | Reference | Our response |
|---|---|---|---|
| **Customer Experience Measure** | Customer Excellence | 1.01 | Forecast provided |
| | | 1.02 | |
| | | 1.03 | |
| | | 1.04 | |
| | | 1.05 | |
| | | 1.06 | Forecast not supplied* |
| **Leakage** | Water Continuity | 1.07 | Forecast provided |
| | | 1.08 | |
| **Business demand** | | 1.09 | |
| **Per capita consumption (PCC)** | | 1.10 | |
| **Customers receiving low pressure** | | 1.11 | |
| **Unplanned interruptions** | | 1.12 | |
| **Planned and unplanned interruptions** | | 1.13 | |
| **Unplanned interruptions** | | 1.14 | |
| **Water availability** | | 1.15 | |
| | | 1.16 | |
| **Drinking water aesthetics** | Water Quality | 1.17 | |
| | | 1.18 | |
| **Drinking water quality** | | 1.19 | |
| | | 1.20 | |

| Measure of level of service | Technical Appendix section | Reference | Our response |
|---|---|---|---|
| | | 1.21 | |
| | | 1.22 | |
| | | 1.23 | |
| **Internal sewer flooding** | Waste water Flows | 1.24 | |
| | | 1.25 | |
| **External sewer flooding** | | 1.26 | |
| | | 1.27 | |
| **Discharge Permit Compliance** | Water Environment | 1.28 | |
| **Serious pollution incidents (EPI Cat 1/2)** | | 1.29 | |
| **Total pollution incidents (all categories)** | | 1.30 | |
| **Sludge compliance** | | 1.31 | |
| **Sewerage infrastructure discharges** | | 1.32 | |
| **River water quality** | | 1.33 | Forecast not supplied* |
| **Net Zero Emissions** | Carbon Emissions Mitigation | 1.34 | Forecast provided |
| **Operational emissions** | | 1.35 | |
| | | 1.36 | |
| | | 1.37 | |
| | | 1.38 | |
| **Climate change mitigation** | | 1.39 | |
| | | 1.40 | |
| | | 1.41 | |
| | | 1.42 | Forecasts under development |
| **Resource recovery** | | 1.43 | |
| **Asset health** | Asset health | 1.44 | Forecasts under development |
| **Strategic Delivery** | Additional measures | n/a | Proposed and in development |
| **Customer Awareness** | | | |

* As discussed below and communicated separately to WICS, we do not consider it to be additive and/or appropriate for Scottish Water to provide forecasts for Community CEM or River Water Quality measures.

## 2.2 Context and drivers

As Scotland's regulated main provider of water and waste water services, we hold ourselves to account in terms of the quality of services that we deliver to our customers, communities and the environment. This is reflected in stretching and ambitious forecast outcomes, many of which will become target outcomes in a basket used to measure and manage the performance of Scottish Water.

Our proposal for SR27 builds on the previous Strategic Reviews, forms forecast outcomes to 2033 and expands our coverage of the measures into our Performance Monitoring for SR27 and is set within the context of our Long-Term Strategy (LTS)[2].

The long-term outcomes that we plan to deliver for a flourishing Scotland are aligned to our Ministerial Objectives (MOs), the Water Sector Vision (WSV) and our strategic ambitions of Service Excellence, Beyond Net Zero Emissions and Great Value and Financial Sustainability.

[2] Draft Long-Term Strategy - Our Sustainable Future Together

### 2.2.1 *Ministerial Objectives*

We set out the outcomes for SR27 in Data Table 1 related to the following MOs:

The MOs for SR27 are in the following highlighted objectives:

1. WSV – Scottish Water should take the lead in working with partners to begin to pursue action towards the realisation of the co-created vision.
2. Standards of service – Scottish Water should maintain or improve current levels of service over the long term.
3. Asset Maintenance – Scottish Water should develop an evidence-based strategy that will inform the long-term capital maintenance needs of the industry.
4. Supporting Sustainable Economic Growth – Scottish Water should continue to invest in water, sewerage and drainage infrastructure to **provide capacity to enable development**.
5. Drinking Water - **Scottish Water should comply with drinking water quality duties** and develop investment plans to remove contact of potable water with lead pipes in its network.
6. Environment - **Scottish Water should build upon compliance levels with its current environmental licences** and develop investment plans that address risks of impacts on the environment from its assets.
7. Flooding/Surface Water Management – Scottish Water should pursue further partnerships with Local Authorities and other stakeholders to develop delivery and monitoring arrangements that will secure **improvement for storm water management**.
8. Security & Resilience – Scottish Water should develop, and act upon, strategies and plans, which will maintain and improve the resilience and security of Scottish Water's services and protect its network and information systems from malicious attack.
9. Climate Change, Adaptation and Mitigation - Scottish Water should understand the impacts of climate change on its assets and implement its plans for adaptation measures necessary to protect services. In response to the climate change emergency, it should also develop and implement a strategy that will see it take a leadership role in **utilising its land and assets, and working with others, to achieve its climate change commitments**.
10. Private Finance Initiative (PFI) funded contracts - Scottish Water should develop plans to manage its PFI contracts to secure the best value for money for the future operation of these facilities.

### 2.2.2 *Water Sector Vision*

The alignment of outcomes to the WSV is highlighted below is exemplified by the mapping of outcomes to the Scotland National Performance Framework (NPF) outcomes of health and active, protecting and enhancing the environment, inclusive and vibrant communities and a strong and competitive economy.:

1. Scotland's water sector will be admired for excellence, secure a sustainable future and promote a responsible Hydro Nation.
2. Together we will support the **health and wellbeing of the nation**. We will ensure that all of Scotland gets excellent quality drinking water that people can responsibly enjoy. We will **involve and inspire Scotland's people to love their water and only use what they need**.

3. Scotland's waste water will be collected, treated and recycled in ways that generate value and protect people and the environment. We will promote access to the natural environment and encourage communities to enjoy and protect it.
4. We will enable the **economy to prosper**.
5. We will transform how we work to live within our planet's resources, work with the natural environment and **maximise our contribution to Scotland achieving net zero emissions and adapting to climate change**.
6. We will be agile and collaborate within the sector and work in partnership with others to be resilient to the challenges that face us.
7. We will keep services affordable by innovating and delivering the greatest possible value from our resources, helping those who need it most. We will serve all customers and communities in a way that is fair and equitable to present and future generations.
8. We are a vital part of a flourishing Scotland.

These outcomes have been informed by customers across Scotland and set out in our LTS. These outcomes can be converted into measures and metrics which enable us to track our progress. Our Draft Business Plan (DBP) explains how we will deliver these outcomes during SR27, as a step on the long-term journey.

We set out the expected outcomes for a range of measure and metrics in this Technical Appendix. These are made for the central funding level of Scenario A to 2032/33 and projected out to 2051 over three further regulatory periods. They are also made for two other Scenarios (B and C), to express how those outcomes are expected to change with different funding levels in SR27. In addition, we have applied confidence grades to these metrics which reflect the reliability and accuracy of the forecast outcomes.

### 2.2.3 *WICS Guidance*

Our projected outcomes are aligned with the WICS Guidance[3]. WICS has set out 44 outcome measures and metrics for SR27, following discussions with us and other stakeholders. The list of measures and metrics covers outcomes across our customer excellence, water and waste water services, carbon emissions and asset health. The list included several measures and metrics that form part of our existing performance monitoring and several that have been developed within Scottish Water and other stakeholders.

In addition, the WICS guidance invited us to add further measures and metrics. The guidance also invited Scottish Water to express how these outcomes would contribute toward the Scottish Governments' NPF and enable benchmarking of performance with comparator companies in England & Wales.

As set out in our DBP, we are seeking a price settlement of CPI+4% to fund investment of £8.31bn[4] over the SR27 period. This is an increase in real prices over the period for our customers, as well as a "step up" compared with the long-term price trajectory of CPI+2% set out by WICS in SR21. This increase aligns with our LTS and is supported by our improved knowledge of our assets. This investment is necessary for us to effectively respond to the three main challenges of climate change, population shift and ageing assets; and when combined with the progress we expect to make on innovation, collaboration, transformation and efficiency,

[3] WICS - Strategic Review of Charges 2027-2033: Guidance and Definitions to the Business Plan Tables
[4] Post-efficiency value, 2023/2024 price base

it will allow us to meet the needs of customers, communities, the environment and the economy. Specifically we will:

- maintain and replace existing assets to ensure that they can be adapted to meet the challenges of more frequent extreme weather events and continue to deliver services sustainably and affordably now and for generations to come,
- protect people and the environment by ensuring compliance with all drinking water quality and environmental regulations,
- improve further areas of service that are of most importance to our customers and to enable sustainable housing and economic growth, supporting the connection of new homes and business premises.

In this context, it is particularly important that the outcome measures and targets we put forward demonstrate the full value to our customers from this funding.

Our forecast outcomes are stretching and ambitious. We recognise that we perform at our best when we have clear and relevant targets that provide motivation and focus to staff and partners to deliver. The rest of this Section will convey this in more detail with additional detail provided in the in the Table 1 Commentary. We welcome stakeholder engagement to date and in the future and feedback on these draft proposals to inform our Final Business Plan (FBP) submission.

## 2.3 Methodology and approach

Performance Monitoring and outcomes have been instrumental in driving us to improve our service and adding value to our customers, communities and environment in ways that are aligned to the MOs, WSV and LTS. This initiative aligns with both the immediate objectives of SR27 and the overarching long-term vision for 2051.

The incorporation of WICS metrics and measures is a welcome development. It not only enhances our monitoring capabilities but also ensures that we remain accountable for the quality of services provided to customers, communities, and the environment. By following WICS Guidance, outcome projections have been developed for various scenarios up to 2051, ensuring a robust framework for future development.

The methodology employed in this development involves high-level engagement with WICS and other stakeholders[5]. This collaborative approach is essential in ensuring that the proposed outcomes are both ambitious and achievable, setting a clear path towards Service Excellence, Beyond Net Zero Emissions, and Great Value and Financial Sustainability.

High-level methodologies and approaches have been detailed, explaining how these outcomes interact with investment areas of the business plan. This comprehensive approach ensures that each outcome is backed by rigorous data and analysis, providing a clear rationale for their inclusion in the performance monitoring framework.

While most outcomes have been identified and forecast, some areas require further development. For instance, asset health and long-term forecasts require ongoing refinement to ensure they remain aligned with the LTS. This iterative approach ensures that the performance monitoring framework stays dynamic and responsive to emerging challenges.

[5] For further details see Annex C – Summary of joint discussions on the proposed Outcome measures.

The adaptation of data and construction of new definitions for certain lines is addressed in the report. This process ensures that the metrics employed are both relevant and accurate, providing a solid foundation for performance monitoring.

Areas not covered, such as a community Customer Experience Measure (CEM), and river water quality, have been identified, and the reasons for their exclusion have been clearly outlined. This transparency ensures that all stakeholders are aware of the scope and limitations of the current performance monitoring framework.

## 2.4 SR21 Outcomes

In any regulatory period, we are subject to a set of MOs which provide guidance to investment, intervention and outcomes. Our performance monitoring in the current regulatory period has been focussed on:

- Customer Service through the Overall Performance Assessment (OPA);
- Customer Excellence through the CEMs; and,
- Carbon Emissions through Net Zero Emissions.

This is alongside Value for Money and our people. This has involved a flexible year-ahead internal target setting within a regulatory framework that enabled investment to be reallocated to best meet the needs of our customers during the period.

Our OPA score was expected to be within the range 395 to 410 and has improved from 402 to 416 points over this regulatory period – with the figure of 416 reached from an exceptionally mild weather year and performance improvement. The basket of key performance metrics includes.

- Total drinking water compliance at the water treatment work, service reservoirs, and customer taps as reported to DWQR
- The level for water leakage across our water system
- The number of households affected by unplanned water supply interruptions above 6 hours
- Waste water treatment compliance in final effluent
- Internal sewer flooding incidents per annum caused by overloaded sewers and other causes.
- Serious environmental pollution incidents (Cat 1 & 2) in waste water and water services.
- Other environmental pollution incidents (Cat 3) in waste water and water services.
- Disposal of sludge compliance

Our CEMs have shown gradual improvement through SR27. Our CEMs reflect the number of incidents through contacts and the service they experience through customer satisfaction surveys for developers, licence providers and businesses and householders.

Our overall carbon emissions are predicted to have reduced by 25% in the last 3 years. Our carbon emission target is to be net zero by 2040. This includes carbon emissions form our operations net of sequestration and from our embodied carbon from capital expenditure.

The existing measures and metrics provide useful indicators of performance to-date over past years and regulatory periods. Their continuity also provides assurance that we will keep a good focus on getting the basics right. We also believe that we need to set ourselves ambitious goals

to stretch and improve out service for our customers, communities and the environment of Scotland.

## 2.5 Developing the SR27 Outcomes

For SR27 the WICS guidance has set out two main changes to the performance monitoring for SR27. Firstly, there is a provisional list of metrics and measures with:

i. Some revisions to definitions, primarily to enable comparison with England & Wales and,
ii. Some additions to enhance the monitoring of outcomes aligned to the LTS.

The revisions to definitions are for some of the metrics within the current OPA. While the changes are relatively minor, we note that proposed changes will:

- Include annual internal overloaded sewers associated with severe weather incidents (which are currently excluded). This is likely to increase the year-on-year variation in this metric with changing weather patterns.
- Remove the proportion of households affected by unplanned interruptions to supply of above 6-hours, so that the metric is simply the total number of households affected. This introduces an upward trend over time to the number of households in each area that might be affected by an incident.
- Remove Environmental Pollution Incidents (Category 3) in our water system. These are relatively few but currently included in the OPA.

The additional set of outcomes in Table 1 include:

- **Leakage reduction** in water supply zones that are expected to experience demand exceeding supply (i.e. a deficit). Improvement in this outcome will save money by delaying the need for capital investment in those zones;
- **DWQR reported incidents** provides a focus on the events that happen in the water system and the incidents that have highest impact on our service. Improvement in this outcome will show that we are learning how to reduce the events that can affect our customers;
- **Water risk assessment planning (WRAP) measure** enables the greatest risk to water supply to be shown. Improvement in this outcome will show that we have targeted our investment towards those most at risk of water supply incidents and sample failures;
- The number of **lead pipes in our network** focuses on the exposure of lead in water from our communication supply pipes to the property boundary. Improvement in this outcome will show the progress in replacing the lead pipes and reducing the risk of levels of lead exceeding complaint level;
- The number of postcodes with **repeat interruptions to supply** in a three-year period, Improvement in this outcome will reduce the loss of water supply to the areas most affected by interruptions;
- The number of **pollution incidents that are category 1 & 2**. Improvement in this outcome will reduce the number of most serous pollution incidents that affect our environment from our water and waste water systems;
- The number of combined sewer overflows confirmed to have an environmental impact by SEPA (known as **unsatisfactory intermittent discharges** or UIDs). Improvement in this outcome will reduce the combined sewer overflow discharges with the most environmental impact in Scotland.

The full list of outcomes is included in the Table 1 submission and the outcomes to 2032/33 are discussed in Section 2. The outcomes to 2051 and for Scenarios B & C are discussed in Section 3. Further details are available in Table 1 Commentary.

## 2.6 Additional outcomes

Data Table 1 includes several additional areas of interest for the development of new metrics and measures, and an invitation for us to add to the provisional list.

Of the WICS list of 44 outcomes we have currently not formed projected outcomes for the following:

- ***Biodiversity (line 42):*** The biodiversity outcome-based is being developed with Nature Scotland. It will continue to be explored and then be trialled.
- ***Resource recovery (43).*** A resource recovery metric in E&W involves phosphorous extraction, but this is not a part of our LTS, or SEPA expectations, in Scotland. A metric for resource recovery can only be considered once there is an Advanced Anaerobic Digestion (AAD) site fully operating, as this would be necessary for us to assess what is recoverable.
- ***Communities measure (6):*** The current CEMs are based on different communities across Scotland. In addition to the main CEMs, a stakeholder CEM tracked interest from stakeholders like contacts, escalations experience and perceptions from Scottish Members of the Scottish Parliament. This measure has proved to be an unsuitable performance measure due to its inherent volatility. We continue to monitor information across our communities, and have focussed our attention on a new measure aligned to our LTS ambitions (see below).
- ***River quality (33):*** Overall, river water quality is measured by SEPA. A metric will be considered, with SEPA, alongside the forthcoming River Basin Management Programme (RBMP4) to find a suitable measure for River Water Quality specific to Scottish Water.
- ***Asset health (44*)**: We include submissions in Tables 3 and 4 from the early development work of the equipment health index (EHI), We have explored several options that consider how to form a single summary statistic for asset health that could monitor and drive better performance, though this is not ready for the DBP and further details are set out in Section 3.7 below. We would welcome the opportunity to work jointly with WICS to reach the best outcome for the FBP.

The guidance invited us to consider whether there should be additional metrics from consideration of the mapping of outcomes to Scotland's National Performance Framework (NPF) categories. Our review found that the proposed list of outcomes published by WICS for SR27 reflected our core outcomes and contribution into four main NPF Outcome categories:

- Health: Healthy and Active,
- Economy: A strong, competitive economy,
- Communities: Inclusive empowered resilient and safe communities,
- Environment: Protecting and enhancing the environment.

There were a further two NPFs with some connection;

- International: Make a positive contribution internationally
- Poverty: Tackle poverty

There are five residual NPF categories with no representation from the WICS list;

- Children: Realising children and young people's potential,
- Culture: Vibrant and diverse cultures,

- Education: Excellence in teaching, research and innovation,
- Fair work: Fair Work and Business,
- Human rights: Respect, protect and fulfil human rights.

Through the development of our Long-Term Investment Strategy (LTIS) and our application of Strategic Cost Benefit Analysis, we identified several indirect and tertiary contributions to the residual NPF categories from our long-term investment programme. For example, we found some areas where we contribute materially to a flourishing Scotland, such as through the number of additional jobs created, the number of apprentices trained, and the number of major drainage schemes undertaken.

However, we have not formally added these to the list of Table 1 metrics as they might be inputs to Scottish Water. There were also other metrics (that are less material, less measurable, or still emerging) that we considered such as:

- Methane gas which can then be used as a power source, which can be used in place of existing external power inputs (electricity) to Scottish Water.
- Recycled clothing - We can recycle used clothing and PPE, reducing the amount send to landfill as a waste stream, thereby reducing our carbon footprint, and reducing the procurement of new clothing.
- Chemical free treatment achieved through changing the processes at a treatment works and reducing or removing the need for the purchase of chemicals. This avoids the purchase of as many chemicals as would have been the case in the past

While we will continue to watch and report the more substantive activities in these areas, we do not propose at this stage any additional outcome metrics or measures from this review period.

However, while developing our DBP and the projected outcomes for Table 1, we recommend the future addition of two measures:

- An outcome measure (currently referred to as the **strategic tracker**) to track the progress of the outcomes in our LTIS to 2051
- An outcome measure (currently referred to as the **awareness measure**) to monitor change in customer knowledge, perceptions, behaviours and outcomes related to per capital consumption and sewer blockages form wet wipes and fats & oils.

These two measures are in development within Scottish Water with further information on these measures provided in Section 4. While we have not yet formed an outcome proposal for these measures for the DBP, we propose to do so form the FBP and would welcome engagement with WICS and other stakeholders as these are progressed.

## 2.7 Our customers' perspectives

Our LTS sets out how we will work to deliver our long-term outcomes through three key approaches;

- Collaborate and lead partnerships with public, private and third sector organisations and with customers and communities, undertaking activities such as contributing to a natural environment that is resilient to climate change and supports water resources, quality and helps us drain catchments sustainably,
- Transform and drive efficiency, reducing costs in the way we work though research, innovation and technology,
- Reduce demand on our services and assets by addressing leakage, helping customers use less water and managing rainwater on the surface.

### 2.7.1 *LTS Customer Research*

In the earliest stages of customer research for the LTS, we asked customers to feedback on the outcomes set out in the SR21 Strategic Plan. We found that customers were particularly positive towards objectives that had clear, measurable actions, including figures where possible, as they felt Scottish Water could then be held most accountable for the work done in these areas. This view was most prevalent amongst non-household customers, who regularly reported wanting to see more details given on those objectives where fewer specific actions had been provided. The objectives that provided the clearest action points were the ones that resonated most with customers.

In the final stages of the of the customer research for the LTS, an exercise was undertaken to look at the customer preferences across three scenarios (whether to deteriorate, maintain or improve services) across six categories (drinking water quality, drinking water supply, water taste, smell and appearance, sewage treatment, spills in the network, and flooding from the sewers). This was based on an allocation of coins for three levels of funding. The results were;

- Customers trust Scottish Water implicitly to make the right decision, and to have the best interest of customers at heart when it comes to investing in improvement.
- All want to see standards across each service maintained, at the very least. They would not trade-off deterioration in any service area to achieve greater improvement in another.
- Household customers are most likely to want to see investment going towards the improvement to prevent spills from the sewer network. The impact on the environment, and negative media attention UK-wide, means this is at the forefront of customers' minds, and considered an immediate priority.
- Flooding from sewers, for similar reasons, is also a priority – but as this affects a small minority, it is less likely to be considered an immediate priority compared to other service areas.
- Business and future customers have similar priorities to household customers, but are more likely to seek investment in improvements in drinking water service areas. Large businesses especially want to see improvement in drinking water service areas.

### 2.7.2 *DBP Customer Research*

For the DBP, our customer research started by sharing three investment scenarios, each of which showed outcomes that might be offered at three different levels of charging (CPI+2%, CPI+4%, and CPI+6.5%)[6]. Customers were also presented with personalised SR27 bill impacts of each scenario, taking into account their Council Tax Band and discount level to inform their feedback.

Customers' understanding and acceptance of the long-term challenges presented by Scottish Water and their generally positive sentiment towards Scottish Water, led to customers wanting to protect both the company and its infrastructure, In addition, they were generally accepting of the need, due to challenges and future-proofing efforts, to pay more in their bills. However, customers were seeking improved outcomes in exchange for any price rises, and none of the early presented scenarios offered enough value for money to get wholehearted endorsement from customers.

Following consideration of stakeholder engagement, customer research and internal review, the CPI+4% was developed further, and again summarised for customers' further review. Outcomes were revised and improved to include;

[6] These were our early draft investment scenarios, reflecting our thinking at this early stage of business plan development, and used extensively across the development of our investment planning.

- Balancing supply and demand of drinking water - keeping on top of leakage and reduce it a further 10% over SR27, and deliver water supply resilience schemes where needed (East Central Scotland and West Coast Islands),
- Internal sewer flooding - to remove properties through SR27 to keep the number of properties at risk of internal sewer flooding at similar levels,
- Managing rainwater - maintain the existing three strategic drainage partnerships (Glasgow, Dundee and Edinburgh, and add two strategic drainage partnerships (potentially in Ayrshire and Fife). This will reduce the about of rainwater entering sewers and creates more green spaces,
- Repairing and replacing our assets - maintain and operate our assets in ways which protect service levels and risks, and make sure that further generations inherit assets that have been well looked after and are future proof,
- Carbon emissions - upgrading technology to use less electricity and minimise carbon from process emissions. Creating new woodlands on our land, restoring peatlands, and use more low-carbon generation.

When invited to consider re-prioritising expenditure across investment areas, participants generally maintained the allocations presented in the rebalanced scenario. Where changes were suggested, they typically involved diverting funds to those choice areas perceived to benefit a greater number of customers and deliver broader impact. In the post-group feedback, most participants agreed that we had listened to their feedback from the original research when designing the rebalanced investment scenario.

These feature directly in the outcome proposals for the DBP and will be subject to further customer research ahead of the FBP.

# 3 SR27 Outcomes

In this Section we outline the projected outcomes to 2032/33 for Scenario A, our reference scenario, for each line of the list published in the WICS guidance covering:

- Customer excellence
- Water continuity and water quality
- Waste water flows and water environment
- Net carbon emissions and related outcomes
- Asset Health.

## 3.1 Customer Excellence

This Section includes all the measures related to customer excellence including CEMs, the new Awareness measure and UKCSI.

Our projected outcomes to 2032/33 are set out in Table 2, and summarised as follows:

- 6% reduction in points lost for dCEM, nhCEM and hCEM which reflects a continuation of recent upwards trending,
- Upper quartile position for R-MeX, which will retain our position as a leading wholesale service provider in the UK,
- Above average Scottish Water UKCSI benchmark score when compared to the UKSCI all company score, which is 6 points above the ambition of the water and waste water companies in England & Wales.

The annual projections to 2032/33 included in the main Table 1 submission are shown below and are out of 100 for the CEMs with a base of 2026/27 to show the expected change in lost points over the period. We expect these to continue to be a targeted outcome in SR27. R-MEX and UKCSI are new measures to Scottish Water. The figures for R-Mex and UKCSI reflect the latest score out of 10 and 100, respectively. The same figures have been entered into Table 1 as we have no projection of the absolute. These measures are comparator measures that focus on the relative rather than absolute scores. We expect the relative positions bulleted above to become a targeted outcome in SR27.

We have not provided a projection for a new communities measure, instead we favour of the development of an Awareness measure, as discussed in Section 1 (See section 7 for more details).

*Table 2: Extract of the Customer Excellence projected outcomes from Table 1 submission (base is 2026/27)*

| WICS ref | Short title | Base | Change of Base to End of SR27 | Year 1 2027-28 | Year 2 2028-29 | Year 3 2029-30 | Year 4 2030-31 | Year 5 2031-32 | Year 6 2032/33 |
|---|---|---|---|---|---|---|---|---|---|
| 1.01 | dCEM | 81.99 | 6% | 82.17 | 82.34 | 82.52 | 82.70 | 82.87 | 83.04 |
| 1.02 | nhCEM | 88.78 | 6% | 88.89 | 89.00 | 89.11 | 89.22 | 89.33 | 89.43 |
| 1.03 | R-MeX | 9.0 | n/a | 9 | 9 | 9 | 9 | 9 | 9 |
| 1.04 | hCEM | 87.78 | 6% | 87.90 | 88.02 | 88.14 | 88.26 | 88.38 | 88.49 |
| 1.05 | UKCSI | 77.9 | n/a | 77.90% | 77.90% | 77.90% | 77.90% | 77.90% | 77.90% |
| 1.06 | Communities | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## 3.2 Water Continuity

Our projected outcomes to 2032/33 are set out in Table 3, and summarised as follows:

- 17% reduction in the number of **repeat interruptions to supply,** to reduce the impacts on customers in those postcodes worst affected interruptions in a 1 and 3 year period.
- 10% reductions in **overall zone leakage** metrics when compared with the 2024/25 base year.
- 13% reductions in **deficit zone leakage** metrics when compared with the 2024/25 base year.

Our focus is on reducing the number of repeat interruptions to supply where households are currently worst affected. Other metrics for interruptions to supply, including above 6 hours and Minutes lost, are forecast to remain stable.

Business demand is forecast to reduce, driven by the existing trend of decreasing business consumption rates, and the introduction of smart metering; the figures presented here are a combination of both.

There is limited change in per capita consumption, as there is no investment targeted in this area, and we forecast a gradual return to working in offices in Scotland.

There is reduction in low pressure register, which is already a low figure in the current OPA.

The figures for worst drought and peak demand indicate an improvement in resilience for customers at risk of loss of supply in exceptional circumstances. These are very provisional with low confidence grades, highlighting further development needed for the FBP, including the addressing of high volatility.

### *3.2.1 Target outcomes*

The outcomes in the current OPA are expected to continue to be target outcomes, while the new metrics of Repeat interruptions and Zonal leakage have the potential to become target outcomes. The other metrics are more suitable for reporting than target outcomes (see Section 6).

*Table 3:Extract of the Water Continuity projected outcomes from Table 1 submission (base is 2026/27)*

| WICS ref | Short title | Base | Change of Base to End of SR27 | Year 1 2027-28 | Year 2 2028-29 | Year 3 2029-30 | Year 4 2030-31 | Year 5 2031-32 | Year 6 2032/33 |
|---|---|---|---|---|---|---|---|---|---|
| 1.07 | Total leakage | 456 | 10% | 2.0% | 2.9% | 4.2% | 5.8% | 7.7% | 9.9% |
| 1.08 | Zonal leakage | 233 | 13% | 2.2% | 3.3% | 5.1% | 7.2% | 9.8% | 12.9% |
| 1.09 | Business demand | 372 | 16% | 3.0% | 4.2% | 6.5% | 9.5% | 12.9% | 16.2% |
| 1.10 | Per capita consumption (PCC) | 177 | 2% | 177 | 176 | 176 | 175 | 175 | 174 |
| 1.11 | Low pressure | 30 | 13% | 36 | 39 | 31 | 28 | 27 | 26 |
| 1.12 | Unplanned interruptions | 6,750 | 0% | 6,750 | 6,750 | 6,750 | 6,750 | 6,750 | 6,750 |
| 1.13 | Minutes lost | 15 | 0% | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| 1.14 | Repeat ITS | 240 | 17% | 270 | 300 | 275 | 250 | 225 | 200 |
| 1.15 | Worst historic drought (m) | 2.941 | 21% | 2.990 | 2.999 | 3.008 | 3.016 | 3.024 | 2.328 |
| 1.16 | Peak demand (m) | 0.655 | 47% | 0.657 | 0.693 | 0.662 | 0.663 | 0.667 | 0.346 |

Note: For 1.07 to 1.09 the values indicate cumulative reductions relative to the base. Therefore, a reduction is recorded as a positive value, indicating improved performance.

## 3.3 Water Quality

Our projected outcomes to 2032/33 are set out in 4 and summarised as follows:

- ~40% reduction in the number of lead pipes in the SW network from our mains and distribution replacement programme to remove an average of 3,000 pipes per year;
- ~30% reduction in the points lost in total drinking water compliance through the investments in our water system from source to treatment works to customer tap.[7]
- ~20% reduction in the number of hazard nodes[8] at an unsatisfactory level of risk to the supply of customers in the water system within the WRAP measure from focussed investment
- ~15\% reduction in the number of events that, under a DWQR criteria, become unsatisfactory incidents.

In addition, there is a relatively stable forecast outcome for **taste & odour** and **discolouration** contacts. Taste & odour is forecast to marginally decline, with climate change contributing to higher levels of algae and earthy or musty tasting water. Discolouration contacts are forecast to marginally improve through operational activity such as flushing. These two metrics are included in the household customer experience measure (hCEM).

[7] See Water Quality Technical Appendix for further details of the SR27 investments

[8] There are a set of different types of hazards or risks that can occur at a location and a set of locations or nodes on the water system that are included in the assessment.

### 3.3.1 Target outcomes

The DWQR compliance measure already forms part of the OPA and target outcomes and is expected to continue for SR27. The **Lead in SW network**, **DWQR incidents,** and **WRAP** are new metrics and have the potential to be target outcomes, subject to further development through to the FBP (see Section 5 for more details).

Lead customer pipes are forecast to reduce as customers increase their awareness of the programme of investment to reduce lead in our network and customers act to remove lead pipes within their properties. As these are not directly driven by Scottish Water actions, their progress will be reported.

*Table 4:Extract of the Water Quality projected outcomes from Table 1 submission (base is 2026/27)*

| WICS ref | Short title | Base | Change of Base to End of SR27 | Year 1 2027-28 | Year 2 2028-29 | Year 3 2029-30 | Year 4 2030-31 | Year 5 2031-32 | Year 6 2032/33 |
|---|---|---|---|---|---|---|---|---|---|
| 1.17 | Taste & odour | 0.51 | -4% | 0.51 | 0.52 | 0.53 | 0.52 | 0.53 | 0.53 |
| 1.18 | Discolouration | 2.11 | 2% | 2.11 | 2.11 | 2.11 | 2.09 | 2.09 | 2.08 |
| 1.19 | Lead SW networks | 45,550 | 39% | 42550 | 39550 | 36550 | 33550 | 30550 | 27550 |
| 1.20 | Lead customer pipes | 98.01 | 7% | 98.04 | 98.06 | 98.08 | 98.11 | 98.13 | 98.15 |
| 1.21 | Drinking water compliance | 99.93% | 29% | 99.937% | 99.941% | 99.943% | 99.946% | 99.946% | 99.950% |
| 1.22 | WRAP | 7,975 | 19% | 7254 | 7267 | 7180 | 6994 | 6807 | 6465 |
| 1.23 | DWQR reported incidents | 30 | 16% | 30 | 29 | 28 | 27 | 26 | 25 |

## 3.4 Waste water Flows

Our projected outcomes to 2032/33 are set out in Table 5, and summarised as follows:

- 6% reduction in the annual number properties with internal sewer flooding from overloaded sewers and other causes, including severe weather incidents.
- Maintain the current number of properties on the internal sewer register for overloaded sewers at risk of 1 in 10 repeats
- Around 5-7% worsening of the position for the number of external areas affected by sewer flooding.

The annual number of properties with **internal sewer flooding** from overloaded sewers (excluding severe weather) is in the current OPA.

But with the inclusion of properties affected by severe weather, the year-on year variation in the metric is expected to increase, in line with varying weather patterns. Indeed, all four metrics have a high level of variation from weather patterns.

The **external sewer flooding** metrics are subject to further variation from planned monitoring, and investigations that might show an increase in the number of the areas affected and at risk. This is reflected in their confidence grade of C5 (relatively low reliability and accuracy).[9]

*The high volatility of these metrics means that they are less suitable for target outcomes (see also Section 5.4).*

*Table 5: Extract of the Waste water Flows projected outcomes from Table1 submission (Base is 2026/27)*

| WICS ref | Short title | Base | Change of Base to End of SR27 | Year 1 2027-28 | Year 2 2028-29 | Year 3 2029-30 | Year 4 2030-31 | Year 5 2031-32 | Year 6 2032/33 |
|---|---|---|---|---|---|---|---|---|---|
| 1.24 | Annual internal sewer flooding | 1.57 | 6% | 1.53 | 1.52 | 1.51 | 1.50 | 1.49 | 1.48 |
| 1.25 | Internal sewer flooding register | 1.51 | 0% | 1.65 | 1.69 | 1.61 | 1.61 | 1.59 | 1.51 |
| 1.26 | Annual external sewer flooding | 10.50 | -7% | 10.62 | 10.75 | 10.87 | 10.99 | 11.11 | 11.24 |
| 1.27 | External sewer flooding register | 11.35 | -5% | 11.44 | 11.52 | 11.61 | 11.70 | 11.79 | 11.88 |

## 3.5 Water Environment

Our projected outcomes to 2032/33 are set out in Table 6, and summarised as follows:

- 38% reduction in the number of serious (Category 1 & 2) environmental pollution incidents in our water and waste water systems
- 14% reduction in the number of unsatisfactory intermittent discharges (UIDs) currently registered with SEPA.
- Maintain WwTW compliance for final effluent, sludge compliance and total pollution incidents in our waste water system.

Details of the investments underpinning these performance levels is set out in the Water Environment Technical Appendix.

All these metrics. Except for the UIDs, are in the current OPA. The UIDs measure is a new metric and could be included in the target outcomes for SR27.

The list of outcomes from the WICS Guidance includes a reference to river quarter quality but as discussed in Section 1, this metric will be considered as part of the forthcoming RBMP4 with SEPA.

[9] Further information on Confidence Grades can be found in Section 5.

*Table 6: Extract of the Water Environment projected outcomes from Table 1 submission (base is 2026/27 unless stated)*

| WIC S ref | Short title | Base | Change of Base to End of SR27 | Year 1 2027-28 | Year 2 2028-29 | Year 3 2029-30 | Year 4 2030-31 | Year 5 2031-32 | End of SR27 |
|---|---|---|---|---|---|---|---|---|---|
| 1.28 | WwTW discharge permit compliance | 96.37 % | 0% | 96.37 % | 96.37 % | 96.37 % | 96.37 % | 96.37 % | 96.37 % |
| 1.29 | Serious pollution (EPI Cat 1/2) | 8 | 38% | 8 | 7 | 7 | 6 | 6 | 5 |
| 1.30 | Total pollution (all categories) | 34.8 | 0% | 34.8 | 34.8 | 34.8 | 34.8 | 34.8 | 34.8 |
| 1.31 | Sludge compliance | 0 | 0% | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.322 | Unsatisfactory intermittent discharges (UIDs) | 873 | 14% | 850 | 811 | 809 | 806 | 799 | 748 |
| 1.33 | River water quality | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## 3.6 Carbon emissions mitigation

This subsection summarises the outcomes for 2032/33 (shown in Table 7 and Table 8) in the areas related directly and indirectly to the 2040 net zero emission target.

### 3.6.1 *Net carbon emissions*

Our key projected outcomes to 2032/33 are summarised as follows:

- 67% reduction in the net zero carbon emissions, including operational emissions net of sequestration and embodied (capital) emissions

*These projections are very dependent on the progress made to net zero form the greening of the grid and low and no carbon supply options coming to fruition. Further information of the investments in this area are provided in the Climate Change Adaption Technical Appendix and Climate Change Mitigation Technical Appendix.*

Table 7: Extract of the Carbon Emissions projected outcomes from Table 1 submission (base is 2026/27)

| WICS ref | Short title | Base | Change of Base to End of SR27 | Year 1 2027-28 | Year 2 2028-29 | Year 3 2029-30 | Year 4 2030-31 | Year 5 2031-32 | Year 6 2032-33 |
|---|---|---|---|---|---|---|---|---|---|
| 1.34 | Net Zero Emissions | 259,257 | 67% | 243,869 | 190,714 | 172,114 | 155,889 | 103,900 | 84,994 |
| 1.35 | Operational emissions (W) | 62,882 | 96% | 56,366 | 36,425 | 31,714 | 27,520 | 8,260 | 2,314 |
| 1.36 | Operational emissions (WW) | 102,219 | 65% | 95,172 | 74,811 | 69,680 | 65,360 | 41,789 | 35,717 |
| 1.37 | Baseline emissions | 35.74% | 77% | 32.80% | 24.08% | 21.95% | 20.10% | 10.83% | 8.23% |
| 1.38 | Operational emissions (net) | 156,908 | 91% | 141,841 | 96,542 | 84,449 | 75,160 | 30,763 | 14,461 |
| 1.39 | Embodied carbon | 102,349 | 31% | 102,028 | 94,172 | 87,665 | 80,729 | 73,137 | 70,533 |
| 1.40 | Carbon capture/ sequestration | -8,193 | -188% | -9,697 | -14,693 | -16,944 | -17,720 | -19,285 | -23,569 |

### 3.6.2 *Biodiversity and resource recovery*

We have a duty to report biodiversity every three years, and there are two metrics proposed in list published in the WICS Guidance:

**Input based-metric (line 41):** This is a metric that acknowledges a change in land use that supports improved biodiversity and may include biodiversity improving measures (e.g. improved site management) or nature-based options to support service (e.g. catchment management, carbon capture, flooding) to meet this requirement. This is an input-based approach to reporting - i.e. the work undertaken each year in land use change/biodiversity improvement. For this, we undertake 3-yearly assessments of our land inventory for biodiversity and natural capital. This forms the principal basis for reporting, published under the Nature Conservation Act. This is reflected in the WICS Outcome Table 1 line 41.

We are currently working with NatureScot to pilot a further means to assess the status of biodiversity management. The Scottish Biodiversity Strategy sets an aspiration that 30% of Scotland's land (excluding statutory protected sites) is managed for biodiversity by 2030 (and 40 by 2040). These sites are termed "Other Ecological Conservation Measure" sites and we are testing NatureScot's method on its sites. Through this we expect to develop a view of the proportion of our land managed positively for nature. We would expect to report this in our 2026 Biodiversity Report.

**Outcome based-metric (line 42):** A metric that takes account of the relative benefit, or "gain" (not the same as statutory biodiversity gain) of biodiversity when changing the land use is outcome-based approach to assessing biodiversity. This is more complex to undertake and presently there is no formal biodiversity metric in use in Scotland (this is in development between NatureScot, Scottish Government and stakeholders (including Scottish Water). It involves

- the need for criteria to define the attributes of biodiversity (e.g. condition, habitat type, connectivity) to be assessed:
- the need for guidelines to assess whether those levels have been met
- an assessor – someone who can verify that the change has occurred to the biodiversity status to-be-reported.

A further complication is that there is delay between an intervention and the biodiversity outcome being realised. For example, it is standard to wait years from the delivery of a woodland creation project before Scottish Forestry will sign off that the land use has changed from, say, grassland to woodland. Similarly, it may take several years post intervention for a biodiversity habitat creation scheme to realise its outcomes as the habitat needs to mature. This delay may make it difficult for an assessor to ratify the before-to-after change.

The outcome-based approach is our longer-term aim. However, it is not yet available in Scottish Water, or anywhere else in Scotland. In the absence of a metric, within the 2023 biodiversity report, we presented an initial status baseline for biodiversity using a metric agreed with NatureScot. In the last 2 years we have been working with NatureScot, testing how this can support decision making and benefit reporting and found areas to be improved, notably in bringing site condition into the metric. Work to review this has started, and we will align with the continuing development of a Scottish metric. Once available, we will explore how we might use this within 3-yearly reporting. Meanwhile we can report on an input-based metric. As such we have provided

the outcome for line 41 only. We have not provided an outcome projection for biodiversity outcomes or resource recovery (see Section 1.1).

*Table 8:Extract of the Biodiversity and Resource Recovery projected outcomes from Table 1 submission (base is 2023/24)*

| WICS ref | Short title | Base | Change of Base to End of SR27 | Year 1 2027-28 | Year 2 2028-29 | Year 3 2029-30 | Year 4 2030-31 | Year 5 2031-32 | Year 2031-32 |
|---|---|---|---|---|---|---|---|---|---|
| 1.41 | Biodiversity land-use | 0 | n/a | 750 | 1,500 | 2,250 | 3,000 | 3,750 | 4,500 |
| 1.42 | Biodiversity outcomes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.43 | Resource recovery | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## 3.7 Asset Health

In the WICS guidance we were invited to develop an Asset Health measure to enter as a summary statistic in line 44 for the Table 1 submission. The Asset Health line in the Table 1 has a nil return for the DBP.

An equipment health index of all our assets is being developed but is not expected to be ready for all assets by 2027 and is also expected to show relatively small movement within a single regulatory period. Consequently, we have identified the opportunity to form a measure comprised of several metrics that might be expected to move from greater expenditure to improve asset health in areas of AC mains replacement, mains bursts and sewer collapses.

We aim to be able to show progress and value to customers from additional expenditure in Asset Repair, Refurbishment and Replacement (AR3). The challenge is how to show the gain or value from AR3 over a 6-year period. Mechanical Electrical and Instrumentation Control Assets (MEICA) might show greater progress over a six-year period, when compared to civils due to the latter's longer lifespan. We do not want any measure to dampen the incentive to extend asset lives.

With two thirds of our SR27 capital expenditure programme allocated to AR3, we are keen to find ways of expressing its positive impact on services and service risk to customers.

We have considered several potential ways of addressing this challenge. Each potential approach is likely to have differing strengths and weakness. Below, we discuss some example approaches to highlight potential paths that could be taken for the FBP.

- **Option A:** The formation of an Equipment health index across all categories using only age.
- **Option B:** The formation of an Equipment health index for 10 Management Approach Categories using age and condition.
- **Option C:** The formation of an index of a set of metrics that closely relate to asset performance and failure but do not necessarily lead to service impacts.

We review these in turn:

**Option A:** Step 1 of this process would be to create a representative age-based measure of asset health. Step 2 would be to incorporate an asset condition element to the measure. Step 2 would be significantly harder to achieve and comprehensive information on asset condition is not expected to be ready for the start of the control period in April 2027.

**Option B:** This would be a development of Step 2 of Option A – developing a sub-set of data relating to the most important (by value) Management Approaches. The 10 highest value Management Approaches can be grouped to MEICA, Civils and Pipes. This level of data has the potential to identify movements in asset health over a price control period. However, while these metrics might be trialled and reported in SR27, they are not expected to be comprehensively available by the FB.

*Table 9: List of ten management approaches for potential prioritisation in development*

| | | |
|---|---|---|
| MEICA | MA012 | Waste water Pumping Mains |
| | MA057 | Waste water Treatment Works - Ancillaries |
| | MA094 | Water Treatment Works - Process Stages Mechanical and Electrical |
| | MA023 | Waste water Pumping Stations |
| | MA114 | Water Chemical Storage and Dosing |
| Civils | MA043 | Waste water Treatment Works - Secondary & Tertiary Treatment |
| | MA017 | Waste water Treatment Works - Inlet Works |
| | MA037 | Treated Water Storage |
| | MA116 | Water Strategic Infrastructure (Raw Water Mains, Sub Seas, & Trunk Mains) |
| Pipes | MA111 | Water Distribution Mains (including recuring ITS) |

**Option C:** We could focus on a sub-set of metrics that relate to asset performance and failure but do not necessarily lead to service impacts. Using available metrics there is the potential to develop a basket of metrics for the FBP.

*Table 10: List of six metrics for potential development for asset health measure*

| | | |
|---|---|---|
| Pipes | Mains bursts or repairs | It is an indication of deterioration and ultimately a driver for its replacement within our models |
| | AC mains replacement rates | It is a priority for replacement of pipes |
| Sewers | Sewer collapses | It is an indication of the rate at which sewers need to be replaced due to aging and condition |
| MEICA | MEICA average time to fail | It is a driver for proactive maintenance and reflect life extension. |
| | Water Treatment work outages | It is an indicator of risk to water supply from asset failure |
| Civils | Civil works condition | It is an indicator of high priority activity to preserve our major civil assets such as dams and aqueducts |

We continue to assess the best approach to a single asset health measure that gives an accurate representation of the development of the health of Scottish Water's assets whilst complementing the detailed asset health data available in Table 3b. In doing so, we will take account of data quality and availability. Our approach may ultimately draw on aspects of the different approaches described above.

We are also aware of the significant attention that Ofwat and companies in England and Wales are giving to the development of asset health measures and we are keen to ensure that we align with any developing best practice before 'locking in' a measure in this area.

Given the challenges associated with representing asset health in a meaningful 'one line' measure, we will continue to engage with WICS as our work progresses to help ensure that we achieve a joint understanding of the most effective measure to be used in SR27.

# 4 Outcomes for Scenarios B & C, and Long-term

In this Section we outline the projected outcomes to 2032/33 for Scenario B & C and long term to 2051, for each line of the list published in the WICS guidance by:

- Customer excellence
- Water continuity and water quality
- Waste water flows and water environment
- Net carbon emissions and related outcomes

**Scenario A** is our reference scenario with overall investment in SR27 of CPI+4%, £8.31bn[10]. Our two alternative scenarios are **Scenario B** with investment of CPI+5%, £8.72bn[5], and **Scenario C** with investment of CPI+3%, £7.91bn[5].

The higher investment in Scenario B leads to increased outcomes in some specific lines of the list published by WICS. Conversely, the lower investment in Scenario C leads to some reduced outcomes in specific areas.

The **long-term** projected outcomes result from the investment over the three regulatory periods to 2051, SR33, SR39, and SR45.

## 4.1 Customer Excellence

*There is no change to the outcomes between Scenarios A, B and C. There is gradual improvement in the CEM scores with improved service outcomes.*

*Table 11: Extract of the Customer Excellence projected outcomes to SR45*

| WICS ref | Short title | Scenario A 2032/33 | End of SR33 | End of SR39 | End of SR45 | Scenario B Year 6 2032-33 | Scenario C Year 6 2032-33 |
|---|---|---|---|---|---|---|---|
| 1.01 | dCEM | 83.04 | 84.06 | 85.01 | 85.91 | 83.04 | 83.04 |
| 1.02 | nhCEM | 89.43 | 90.07 | 90.66 | 91.22 | 89.43 | 89.43 |
| 1.03 | R-MeX | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 |
| 1.04 | hCEM | 88.49 | 89.18 | 89.83 | 90.44 | 88.49 | 88.49 |
| 1.05 | UKCSI | 77.9 | 77.9 | 77.9 | 77.9 | 77.9 | 77.9 |
| 1.06 | Communities | 0 | 0 | 0 | 0 | 0 | 0 |

## 4.2 Water Continuity

The forecast outcomes for the Scenario B are the same as those for Scenario A, our reference scenario as the investment is the same in both Scenarios for Water Continuity.

However, when comparing Scenario C to Scenario A, there is a 10% increase in the level of interruptions for both unplanned interruptions greater than 6 hours and minutes lost. This is the forecast impact of the £100m reduction in distribution mains renewal (down to 250km per annum) for Scenario C when compared to Scenario A.

In the long term for Scenario A, our reference scenario:

- The Total leakage in the long term towards and ELL[11] of 380 Ml/d.

[10] Post-efficiency value, 2023/2024 price base

[11] Economic level of leakage

- The impact of smart metering increases through SR33 and is then maintained
- Per capita consumption reduces to the LTS level of 140 Ml/d.
- Repeat interruptions reduces to about 30% of the 2032/33 level with the continued focus on improving service to those postcodes worst affected by supply interruptions
- Low pressure, unplanned interruptions to supply greater than 6 hours and minutes lost show some improvement
- Worst historic drought and peak demand outcomes improve the resilience of the water supply.

*Table 12: Extract of the Water Continuity projected outcomes from Table 1 submission to SR45*

| WICS ref | Short title | Scenario A 2032/33 | End of SR33 | End of SR39 | End of SR45 | Scenario B Year 6 2032-33 | Scenario C Year 6 2032-33 |
|---|---|---|---|---|---|---|---|
| 1.07 | Total leakage | 9.9% | 11.90% | 13.90% | 15.90% | 9.90% | 9.80% |
| 1.08 | Zonal leakage | 12.9% | 14.90% | 16.90% | 18.90% | 12.90% | 12.80% |
| 1.09 | Business demand | 16.2% | 21.90% | 21.90% | 21.90% | 16.20% | 16.20% |
| 1.10 | Per capita consumption (PCC) | 174 | 165 | 150 | 140 | 174 | 174 |
| 1.11 | Low pressure | 26 | 23 | 20 | 15 | 26 | 26 |
| 1.12 | Unplanned interruptions | 6,750 | 6,500 | 6,000 | 5,000 | 6,750 | 7,425 |
| 1.13 | Minutes lost | 15.0 | 14.5 | 14.0 | 13.0 | 15.0 | 16.5 |
| 1.14 | Repeat ITS | 200 | 160 | 120 | 60 | 200 | 240 |
| 1.15 | Worst historic drought (m) | 2.328 | 1.500 | 0.750 | 0.200 | 2.328 | 2.328 |
| 1.16 | Peak demand (m) | 0.346 | 0.250 | 0.150 | 0.050 | 0.346 | 0.346 |

Note: For 1.07 to 1.09 the values indicate cumulative reductions relative to the base.

## 4.3 Water Quality

The forecast outcomes for the Scenario C are the same as those for Scenario A, our reference scenario, as the investment is the same in both Scenarios for Water Quality.

However, £225m increase in water supply security for Scenario B when compared to Scenario A, leads to improved outcomes in Scenario B. For example, there is a minor reduction in the number of hazard-nodes in the WRAP measures, and there is a reduction of four additional DWQR reported incidents for Scenario B compared to Scenario A.

In the long term,

- Discoloration and taste & odour contacts improve relative to the offset of climate change risk and impacts[12]
- The current list of SW lead pipes is fully removed by the end of SR39 and lead in customer pipes continues to improve.
- Total drinking water compliance improves to 99.98%.
- The hazard-nodes in the WRAP measure reduce to about 30% of the levels at the end of SR27.
- DWQR reported incidents reduce to about 40% of the levels at the end of SR27.

## 4.4 Waste water Flows

The annual internal and external sewer flooding outcomes (1.24 and 1.26 in Table 13 below) are the same in Scenarios A, B and C.

However, for the **internal sewer flooding register** (1.25) there is, when compared to Scenario A, an improved outcome in Scenario B, and a reduced outcome in Scenario C. This is the impact of an additional £80m investment in Scenario B, and £130m less investment in Scenario C, when compared to our Reference Scenario, A.

For the **external sewer flooding register**, there is prioritised investment in Scenario C, resulting in no reduced outcomes when compared with Scenario A. But additional investment in scenario A, is forecast to deliver improved outcomes.

In the long-term, the greater funding and ability to prioritise investments to remove properties from the risk register, enables removals to exceed additions, even with additions increasing through climate change impacts, resulting in a substantial forecast reduction in the **internal sewer register.** In contrast the **annual internal and external sewer flooding registers** are projected to worsen with climate change, as they are forecast to be increasingly affected by weather patterns.

*Table 13: Extract of the Waste water Flows projected outcomes to SR45 from Table1 submission*

| WICS ref | Short title | Scenario A 2032/33 | End of SR33 | End of SR39 | End of SR45 | Scenario B Year 6 2032-33 | Scenario C Year 6 2032-33 |
|---|---|---|---|---|---|---|---|
| 1.24 | Annual internal sewer flooding | 1.48 | 1.63 | 1.79 | 1.94 | 1.48 | 1.48 |
| 1.25 | Internal sewer flooding register | 1.51 | 1.84 | 1.29 | 0.17 | 1.31 | 2.07 |
| 1.26 | Annual external sewer flooding | 11.24 | 11.97 | 13.44 | 12.83 | 11.24 | 11.24 |
| 1.27 | External sewer flooding register | 11.88 | 12.64 | 11.26 | 5.41 | 11.80 | 11.88 |

[12] Refer to the Climate Change Mitigation, and Climate Change Adaptation Technical Appendices for further details

## 4.5 Water environment

All forecast outcomes, except for **Unsatisfactory intermittent discharges (UIDs)**, are the same across Scenarios A, B and C for SR27.

For **Unsatisfactory intermittent discharges (UIDs)**, we forecast that the elevated (when compared to Scenario A) investment in Scenario B will lead to a reduced list of UIDs registered with SEPA. Conversely, the reduced investment in Scenario C will lead to increases in the list of UIDs.

In the long-term, the greater funding for enhancement enables the forecast outcomes for;

- The current list of UIDs currently registered with SEPA to be fully removed,
- WwTW compliance to improve to nine non-compliant treatment works out of 580,
- The serious environmental pollution incidents Category 1&2) in the water and waste water systems to reduce to 2 per year,
- Total environmental pollution incidents (Category 1,2 and 3 in the waste water system to gradually with improved monitoring.

*Table 14: Extract of the Water Environment projected outcomes to SR45 from Table 1 submission*

| WICS ref | Short title | Scenario A 2032/33 | End of SR33 | End of SR39 | End of SR45 | Scenario B Year 6 2032-33 | Scenario C Year 6 2032-33 |
|---|---|---|---|---|---|---|---|
| 1.28 | WwTW compliance | 96.37% | 96.89% | 97.58% | 98.44% | 96.37% | 96.37% |
| 1.29 | Serious pollution (EPI Cat 1/2) | 5 | 4 | 3 | 2 | 5 | 5 |
| 1.30 | Total pollution (all categories) | 34.8 | 32.0 | 30.0 | 28.0 | 34.8 | 34.8 |
| 1.31 | Sludge compliance | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.32 | Unsatisfactory intermittent discharges (UIDs) | 748 | 550 | 300 | 0 | 708 | 748 |
| 1.33 | River water quality | 0 | 0 | 0 | 0 | 0 | 0 |

## 4.6 Carbon emissions mitigation

This subsection summarises the outcomes for Scenarios B and C and the long term to 2051 in the areas related directly and indirectly to the 2040 net zero emission target.

### 4.6.1 *Net carbon emissions*

Scenario B includes higher capital investment, and Scenario C lower capital investment, relative to our reference scenario, Scenario A. Greater capital investment generally increases construction activities, in the use of materials, and energy consumption. Therefore, all other things being equal, higher capital investment will increase **Net Zero emissions** and **embodied carbon.** We see this in the higher values for these two measures in Scenario B, and lower in Scenario, when compared to Scenario A.

In all other categories there is no difference between Scenarios A, B and C.

For the long term, in the Technical Appendix for Climate Change Mitigation there are three profiles for carbon emissions. The central forecast (the black line in Figure 15 of that Appendix) is used for the purpose of this submission. This forecast is based on substantive and challenging levels of change and innovation through all aspects of supply to meet lower emission levels. The elements within the WICS Table 9 set out separately and form the net zero carbon emissions projection of WICS line 34.

As a point of note, this projection shows a net zero emissions level of 30295t CO2e in 2040 and so the target of zero emissions by 2040 would require further future innovation to be delivered beyond that assumed in this profile. Net Zero emissions is an ambitious goal with extensive external dependencies such as the greening of the grid and Scotland's decarbonisation pathway. Whilst challenging, we expect that, in line with its net zero emissions route map, innovation in waste water process emissions, carbon capture, and capital investment within SR27 will offer further opportunities to meet the ambition, as will working across wider water catchments to further increase land carbon benefits.

The information also includes the percentage reduction in operational emissions compared to the 2006-07 baseline of WICS line 27.

*Table 15: Extract of the Carbon Emissions projected outcomes to SR45 from Table 1 submission*

| WICS ref | Short title | Scenario A 2032/33 | End of SR33 | End of SR39 | End of SR45 | Scenario B Year 6 2032-33 | Scenario C Year 6 2032-33 |
|---|---|---|---|---|---|---|---|
| 1.34 | Net Zero Emissions | 84,994 | 36,589 | -5,684 | -24,936 | 88,461 | 74,361 |
| 1.35 | Operational emissions (W) | 2,314 | 757 | 527 | 527 | 2,314 | 2,314 |
| 1.36 | Operational emissions (WW) | 35,717 | 33,353 | 32,955 | 32,955 | 35,717 | 35,717 |
| 1.37 | Baseline emissions | 8.23% | 7.38% | 7.25% | 7.25% | 8.23% | 8.23% |
| 1.38 | Operational emissions (net) | 14,461 | -20,574 | -48,033 | -53,354 | 14,461 | 14,461 |
| 1.39 | Embodied carbon | 70,533 | 57,163 | 42,349 | 28,418 | 74,000 | 59,900 |
| 1.40 | Carbon capture/sequestration | -23,569 | -54,684 | -81,514 | -86,835 | -23,569 | -23,569 |

### 4.6.2 *Biodiversity and resource recovery*

For the Biodiversity land-use measure, we are forecasting the same outcomes for Scenarios A, B and C, and for the long-term.

*Table 16: Extract of the Biodiversity projected outcomes to SR45 from Table 1 submission*

| WICS ref | Short title | Scenario A 2032/33 | End of SR33 | End of SR39 | End of SR45 | Scenario B Year 6 2032-33 | Scenario C Year 6 2032-33 |
|---|---|---|---|---|---|---|---|
| 1.41 | Biodiversity land-use | 4,500 | 4,500 | 4,500 | 4,500 | 4,500 | 4,500 |
| 1.42 | Biodiversity outcomes | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.43 | Resource recovery | 0 | 0 | 0 | 0 | 0 | 0 |

# 5 Proposed additional measures

WICS Guidance invites Scottish Water to consider additional measures and metrics. As outlined in Section 1, while developing our DBP and specifically the projected outcomes for Table 1, we identified two potential additional measures to the WICS list.

- An outcome measure (currently referred to as the **strategic tracker**) to track the progress of the outcomes in our LTIS to 2051
- An outcome measure (currently referred to as the **awareness measure**) to monitor change in customer knowledge, perceptions, behaviours and outcomes related to per capita consumption and sewer blockages form wet wipes and fats & oils.

While we have not yet formed an outcome proposal for these measures for the DBP, we propose to do so for the FBP and would welcome engagement with WICS and other stakeholders as these are progressed.

## 5.1 Strategic tracker

The strategic tracker is in development as a summary statistic or measure to monitor the overall progress towards the outcomes of the LTIS. The measure and its accompanying information could then be used to inform a consistent means of reporting in our Prospects & Performance reports.

Table 1 includes projections for a set of current measures and metrics through to the end of SR27, and the later regulatory periods out to 2051. As such it sets a provisional baseline for these “metric” outcomes and their trajectory through time.

We recommend forming an overall baseline trajectory for the long-term outcomes, by converting them into metrics that all increase with better performance and then applying weighting to form a single summary statistic over time. The same weighting would also then be applied to the outturn ‘metric’ outcomes.

### 5.1.1 *Development options*

The basic approach above includes two areas to develop further:

- Enhanced alignment to the ‘long-term’ outcomes of the LTS.
- Enhanced alignment to societal benefits to bring customer, community and environmental weighting into the statistic.

We outline each in the section below.

**Enhanced alignment to the ‘long-term’ outcomes of the LTS**

There are additional ‘metric’ outcomes that might be added to Table 1 in future regulatory periods. For example, some metrics are not yet available. The LTIS included some of these outcomes in a much looser form than a ‘metric’ outcome for reporting performance. Though not suitable for performance monitoring or reporting on their own, their inclusion into a strategic tracker would provide a more comprehensive and complementary statistic of the progress towards LTS outcomes.

In essence, this is the consideration of whether some additional ‘long-term’ outcomes might be added into the simple strategic tracker of ‘metrics’ outcomes. Long-term outcomes are those used to inform the LTIS. “Metric outcomes” are those used for performance monitoring in SR27. The main differences are that the long term ‘metric’ outcomes are sufficiently well defined and SMART that their actual outturn values can be audited, while the Long-term outcomes are more loosely defined to inform the scale of long-term needs and strategic direction.

Examples of 'long term' outcomes that might be supplementary to Table 1 for inclusion in a strategic tracker include drainage, abstraction and impoundment and resource recovery. In a simple step, we would recommend adding these in through expenditure or output, rather than outcome, to support greater simplicity and transparency in reporting.

**Enhanced alignment to societal benefits for customers, communities and the environmental**

This would translate the baseline and reporting into societal benefits, rather than weighting the outcomes from Table 1 by expenditures in the basic strategic tracker. This would directly reflect the relative value of performance improvements by customers, communities and the environmental into the summary statistic and reporting.

This could be achieved through the existing link of 'long term' outcomes to societal benefits within the LTIS. It would involve the translation of the progress (or movement) of "metric" outcomes into "long term outcomes of the basic strategic tracker and a translation from expenditures to long term outcomes from any supplementary areas from (a) above.

The translations would involve a transparent set of rules. For example,

- There are 'metric' outcomes for Total drinking water quality compliance, DWQR reported incidents and WRAP measure related to a range of long-term outcomes including Microbiology, while the LTIS considers the investment and outcomes for Microbiology as a subset of water quality. There would be a weighting of the multiple metric outcomes to Microbiology.
- The 'metric' outcome within Total drinking water quality compliance reflects the number and proportion of sample fails, while the 'long term' outcome for Microbiology reflects the number of customers affected or at risk from intervention or investment. There would be consideration of whether a rule was needed in translation from the 'metric' to 'long term' outcome.

While this option is more involved, it would join the metric and long-term outcomes together for reporting performance into a summary statistic and consolidate the LTIS and FBP performance reporting.

In conclusion, our focus for SR27 will be the performance of Table 1 target outcomes. However, there is an opportunity to develop an additional complementary strategic tracker for the FBP. It would be beneficial to link the 'metric' outcomes in Table 1 and the 'long term' outcomes. We recommend this tracker as it can provide good foundations for further improvements through SR27, as it joins the long term and nearer term applications and reporting.

We would welcome further engagement and discussion with WICS and other stakeholders on the development of the strategic tracker for the FBP.

## 5.2 Customer awareness

The LTIS includes our intention to deliver more demand side solutions. The LTS states a target reduction in per capita consumption (PCC, included in the WICS list) from 180 to 140 litres per person per day by 2050. There is also an ambition in the Business Plan to reduce sewer blockages.

Following our review of the WICS list of metrics alongside out LTS, we recommend introducing a new 'Awareness' measure for SR27. Through customer research, we know that:

- Customers are often surprised to learn how much water they use and flush,
- Customers always want to learn more, and think that we should be doing more to inform them.

The Awareness measure would be a further development and addition that takes these elements forward. It would monitor and encourage positive change in customer behaviour or demand side management relating to per capita consumption (line 10 on the WICS list) and sewerage blockages.

We recommend the Awareness measure as it would look to encourage and show progression in demand side management. Like the CEMs, the measure would combine qualitative survey on trust and awareness with quantitative assessments of outputs like proactive communications and outcomes like PCC and blockages. This would enable progress to be tracked in the period to 2032/33.

At this stage in the process this measure is in development. We set out the current development of it in this subsection.

### 5.2.1 *Approach*

The concept we are applying is that: trust enables awareness - awareness has the potential to change customer behaviour - customer behaviour has the potential to change and lead to better outcomes – which leads to reduced excess water use and blockages.

The **COM-B** model is a behaviour change framework that more formally proposes that there three necessary components for any behaviour (**B**) to occur: Capability (**C**), Opportunity (**O**), and Motivation (**M**).

- **Capability:** This involves enhancing the physical and psychological ability of individuals to perform the desired behaviours. For example, increasing awareness and knowledge about water conservation techniques and the impact of blockages can empower customers to make informed decisions. Training sessions and educational campaigns can be implemented to boost the capability of customers to reduce water usage and avoid actions that lead to blockages
- **Opportunity:** This refers to creating an environment that supports the desired behaviours. For instance, providing access to water-saving devices and technologies, such as low-flow showerheads and faucets, can make it easier for customers to reduce their water consumption. Additionally, ensuring that customers have access to information about the consequences of blockages and the benefits of proper waste disposal can create opportunities for behaviour change
- **Motivation:** This involves increasing the internal drive to perform the desired behaviours. Motivational strategies can include highlighting the environmental and financial benefits of reducing water consumption and preventing blockages. For example, campaigns that emphasize the cost savings and positive environmental impact of water conservation can enhance motivation. Additionally, social norms and peer influence can be used to encourage customers to adopt water-saving behaviours and proper waste disposal practices

By addressing these three components, the COM-B model provides an effective framework for promoting behaviour change in the water sector. We can link the quantitative and qualitative metrics to these components as a validation of alignment and coverage to support reduced per capita consumption and minimized blockages, leading to improved water management and sustainability.

The application of this framework to form an Awareness measure requires the collation of existing survey and reporting data in the following types of areas:

- Customer knowledge of Scottish Water's role in the water cycle and who their service provider, whether they consider tap use and their accuracy in estimating water consumption (which is generally under-estimated), whether they have the opportunity from their recognition of campaigns and advertising to reduce water demand.
- Customer knowledge of Scottish Water roles in waste water and who is their service provider, whether they consider avoiding flushing fat, oils and wipes, whether they can understand from their recognition of campaigns and advertising to reduce wet wipes.
- Customer motivation to change behaviours which might be influenced by campaigns and adverting and their perceptions of the Scottish Water in the public sector and trust.
- The outcomes of per capita consumption and blockages.

In conclusion, the measure would not simply be looking at the per capita consumption line in Table 1 but would look to show progress and movement in customer knowledge and understanding and perceptions which are first steps towards positive behaviour change. The degree of movement through 2032/33 could inform the extent to which the demand side might be influenced and the further steps needed to reduce per capita consumption and blockages in later regulatory periods.

We would welcome the opportunity for further engagement and discussion with WICS and other stakeholders to develop this measure.

# 6 Beyond our current outcomes; new metrics and measures

In this Section we provide information on some of the lines within the WICS Table 1 that are beyond the current set of measures and metrics and new to Scottish Water's performance monitoring. We also address areas where the WICS Guidance asked Scottish Water to clarify or confirm definitions.

In addition, **Annex B** includes a set of definitional clarifications.

- Definitions developed by Scottish Water
- Outcomes that require further development prior to forecasting
- Outcomes that Scottish Water does not consider it currently appropriate to submit.

## 6.1 Customer Excellence

**Retail market and R-MeX[13] (Table 1 line 3):** The retail market in Scotland has been running for several years with performance monitoring by Scottish Water wholesale. Scottish Water values the insight and trends that it receives from the Non-Household Customer Experience Measure (nhCEM) and will continue to track the established metrics to understand how SW is delivering improvements in services for the business and Licence Provider community.

In England, some alternative and new measures have been introduced for the non-household customers and the retail market, for example;

- BMeX[14] is a satisfaction survey of non-household customers who have had an interaction with the wholesaler. BMeX is like the Business End User (BEU) survey which is already a part of nhCEM. Therefore, we propose keeping the BEU survey in its current form as it provides a valuable direct comparison against household service levels (an equivalent household survey forms part of hCEM). We therefore propose not adopting BMeX, which would add no further advantages.
- RMeX is a six-monthly survey of retailer satisfaction, and Scottish Water has already started mirroring RMeX for benchmarking purposes. We have now established this in full alignment with the Ofwat programme and publication of performance to allow benchmarking of wholesale services.

We propose a target outcome for R-MeX to be in the upper quartile of all UK Water Wholesalers through SR27.

**Household satisfaction scores and UKCSI (Table 1 line 5):** The UK Customer Satisfaction Index (UKCSI) is a benchmark of customer satisfaction across different organisations. Through an online questionnaire, it tracks the state of customer satisfaction in the UK by asking over 10,000 customers to rate their experiences of dealing with over 200 organisations across 13 sectors. All survey results are published twice a year - in January and July each year. However, each set of results is based on fieldwork from the previous March and previous October to reduce impact of any seasonal variations (e.g. January 2025 results include customer feedback from March 2024 and October 2024).

The national survey is published by the Institute based on these 10000 responses. It is generally a self-selecting survey - respondents select which organisations to rate. A minimum of 48 responses is needed for an organisation to appear in the national survey. This minimum base size has changed in the past; until January 2023 it was 35, rising to 45 in July 2023. It has

[13] R-MeX = Retailer Measure of Experience
[14] BMeX = Business End User Measure of Experience

been 48 since January 2024, and the institute has confirmed it will stay at this base 'for the foreseeable'. This low and volatile national minimum base size means that in the past Scottish Water has not appeared in the national result. This also means that if selected, Scottish Water might not be compared with the same set organisations in each reporting wave.

The Institute also conducts a benchmarking survey on Scottish Water's behalf, using the same questionnaire and approach as the national survey. This guarantees Scottish Water 1000 responses - providing more robust results to analyse. The benchmarking results are the ones predominately used for internal reporting due to the more robust base size. it is the national results that are shared by the Institute in any press releases.

OFWAT has recently cited aspirations to utilise the UKCSI as a complementary measure to the C-Mex. After considering a variety of options, OFWAT has decided on an initial target of water companies achieving 5 points below overall UKCSI (all sector) average score. The Institute is now boosting the sample of water company customer responses in the national survey to ensure this measure is as robust as possible. This is being done by respondents seeing a randomised list of water companies to select from as a prompt when completing the survey. This change has increased Scottish Water's national base size from ~50 to ~200 – an overview of national base sizes for Scottish Water is below for reference -

Our proposal for targeting is to –

- Use Scottish Waters business benchmark survey results; these provide a more robust and consistent base size. (However, if this is for reporting at WICS, Scottish Water's national score may be more appropriate – as it aligns fully to the methodology used in England and Wales and externally published data).
- Approach targeting in comparable manner to OFWAT (no more than 5 points below UKCSI Overall average) but recognising Scottish Water's sustained positive performance when setting the target itself. We therefore propose a target of Scottish Waters Business Benchmarking score is either above or >1 points above the UKCSI Overall average score.

## 6.2 Water Continuity

**Zonal Leakage (Table 1 line 8):** The Zonal Leakage for inclusion in the new OPA is that it will encourage a focus on the reduction of leakage in zones with a supply demand deficit and thereby not only reduce Total Leakage but also improve the supply demand balance and contribute to a more reliable service and delayed capital investment. The retention of Total Leakage within the OPA will encourage maintaining leakage levels in areas where there is no supply demand issue, as well as continue the tracking of Total Leakage and OPA scores over time.

The metric is formed from a subset of the data for Total Leakage. The subset relates to the set of zones that report above ELL (recalculated Q3 2025) and have a supply demand deficit in 2024/25. This list will remain constant through SR27 to mitigate for changes in geographic structure and to ensure we can clearly show the benefits achieved.

The metric tracks the percentage reduction of the 3-year rolling average leakage level associated to the list of zones taken in 2025. The reduction is taken from a baseline 3-year rolling average at the completion of 2024/25 reporting year.

We have identified a number of risks associated with achieving progress against this metric including external factors such as tough market competition for skilled leakage resource across the UK and climate change increasing the natural rate of rise year on year, and internal factors such as complex delivery of our mains replacement and rehabilitation programmes we will mitigate these risks through:

- Ensuring we develop a robust active leakage management framework that allows us to flex resources as and when we need them and where we need them.
- Increasing the internal skill base to take greater control of active leakage management activities and relying less on contractor resource.
- Upskilling resources to support leakage activity when impacted by climate effects both in winter and summer.
- Employ improved processes and technology to reduce the awareness, locate and repair times for all leakage activity both reported and unreported.
- Apply resources accordingly to the proportion of leakage at Trunk Main, Service Reservoir, Distribution system and Customer side.

**ITS repeats (Table 1 line 14):** The issue of ITS repeats has been identified from CEM analysis. Although service is restored shortly after a failure occurs, some customers can experience repeat events resulting in recurring interruptions to supply when there are multiple failures on the same water main over a period. In many cases these situations can lead to customer escalation either within Scottish Water or via Community Councils and MSPs. The identification of frequent supply failures in the same area that could indicate systemic issues. Their resolution could improve customer satisfaction and reduce customer escalations.

| RCI | | | |
|---|---|---|---|
| Postcode Threshold | | | |
| 1-year contacts | | 3-year contacts | |
| Threshold | Max no. of contacts (per property) in postcode | Threshold | Max no. of contacts (per property) in postcode |
| 1 | ≥12 | 1 | ≥20 |
| 2 | ≥10 | 2 | ≥17 |
| 3 | ≥8 | 3 | ≥13 |
| 4 | ≥6 | 4 | ≥10 |
| 5 | ≥4 | 5 | ≥7 |
| 6 | ≥3 | 6 | ≥5 |
| 7 | ≥1 | 7 | ≥1 |
| 8 | = 0 | 8 | =0 |

*Figure 1: Rule set for recording of repeat ITS*

To ensure recurring customer interruptions (RCI) are addressed in a planned and consistent, policy driven manner, a management approach has been developed which considers the frequency of interruption for trunk mains and distribution network. It aims to address the problem within 12 months when these thresholds are exceeded in normal operation conditions. The number and type of customers affected and other impacts from the interruption are used to aid prioritisation within the 12-month period.

A repeat ITS is recorded if either of two conditions are satisfied within a postcode:

- ≥ 6 property contacts within 1 year
- ≥ 10 property contacts within 3 years.

This equates to a given postcode reaching **at least** threshold **level 4**. The Master RCI Monthly Report follows this rule set as shown in Figure 1.

## 6.3 Water Quality

**WRAP (Table 1 line 22):** Scottish Water has developed a WRAP score, and it is included in the WICS list of metrics for projected outcomes. It provides an assessment of the share of hazards and customer nodes (over 23k in number) that have an unsatisfactory level of risk. This is currently close to 8,000. These assessments inform the risk in the accompanying management approaches that relate to actions to improve outcomes. As such they are an input to yield more cost-effective outcomes. There is some further development work to secure this proposition.

The current version of Scottish Water's WRAP provides a means to report a single summary statistic of the share of the population with an unsatisfactory level of risk at the tap. It evaluates risk at every customer tap by assessing 19 hazards across 1,216 Water Supply Zones (WSZ). Of the 19 hazards, 16 relate to the quality of water, and 3 relate to the quantity. This risk assessment is based on the pre-defined logic of potential failures involving:

- **Risk Assessment**: The risk assessment involves calculating the likelihood and consequence scores for each potential failure. These scores are based on various data sources, but where data availability is lacking, a SME (subject matter expert) will score it.
- **Node Aggregation**: Individual likelihood scores from potential failures are aggregated at various network nodes, such as catchment, raw water storage, treatment, distribution, and customer nodes. This process ensures that risk assessments are both data-driven and reflective of the entire water supply chain.

The WRAP assessment calculates a risk score for each hazard in every WSZ by multiplying its likelihood and consequence values. A score of 50 or greater is classified as "unsatisfactory." This measure reports the number of unsatisfactory risks per month and can also be expressed as the annual percentage of the population exposed to unsatisfactory risk.

**DWQR reported incidents (Table 1 line 23):** Scottish Water reports "events" to DWQR and DWQR assesses which of those events are "incidents. This provides an operational and asset perspective that is addition to that provided by sampling and the total water quality compliance measure.

The method determines the number of DWQR reported incidents, and involves three main steps:

- Using preset criteria, DWQR scores the 'severity' of the event, and identifies the category of severity that the score sits within.
- Using preset criteria and given the severity category for the event, DWQR scores each event and applies the likelihood of a negative impact on public confidence.
- Events with a combined score that is significant, serious or major DWQR declare the event as an incident.

The severity score for an event takes account of: its duration; the population affected which might typically be the whole catchment for an event at a treatment works that affects all customers downstream, or a more localised set of households the event is within the distribution system or at a property; the acceptability based on consumer complaint information; and the cause of it in terms of whether or not it was exacerbated by Scottish Water. The likelihood of negative impact on public confidence is undertaken by a DWQR committee drawing on the evidence submitted by Scottish Water.

## 6.4 Waste water Flows

There is a potential impact of climate change leading to increased uncertainty and risk of service deterioration in some metrics. Metrics include the internal sewer flooding register, the external sewer flooding register and the external sewer flooding (within the curtilage of the property). There is a risk that the investment is insufficient to maintain current levels in some services.

*Consequently, we have separately identified these into new measures, so that the higher risk associated within them might be managed. Where there is a higher level of deterioration risk, there is the potential to monitor performance differently to how we currently do. For example, by using a broader range or lower baseline, to form a floor, below which service will not deteriorate further, and an outperformance opportunity. These are subsequently referred to as baselined in Figure 3: Mapping of the list from WICS to the provisional performance framework*

below.

## 6.5 Water Environment

**Unsatisfactory Intermittent Discharge (UID) (Table 1 line 32):** A UID is a Combined Sewer Overflow (CSO) that is not operating as expected. UIDs are a subset of CSOs that are prioritised by SEPA for intervention by Scottish Water because of their environmental impact.

While there is an interest in All Combined Sewer Discharges in the regulatory framework in E&W, Scotland has adopted an approach which focusses on those that cause the most material environmental impact. We consider improvement in UIDs to be the most appropriate performance measure of 'sewerage network environmental impact. this puts environmental risk / harm as the focus.

There is a register of currently reported UIDs into the Annual Return. The 2023/24 reported UIDs is 907. This comprised of approximately 24 UIDs with water quality impact, with the remaining UIDs having aesthetic impact.

The register of UIDs is under review, most significantly being assessment of ~330 historic UIDs which will be either confirmed or removed from the UID register. There is also a reference document of Improving Urban Waters (IUW) Programme Ruleset which sets out the process (SEPA liaison) and mechanics for additions and reductions.

As the IUW programme has progressed, some UIDs have been found to be satisfactory and are recommended for removal from the list, subject to the agreement of SEPA. In December 2024 we introduced a near real time overflow map covering more than 1000 intermittent discharges. This was the first step in increasing the visibility of UID performance and creates the potential for additional UIDs to be identified into the future.

# 7 Building towards a new monitoring framework

## 7.1 Context

The performance monitoring framework used by Scottish Water has evolved over regulatory periods and has provided excellent value to our customers and Scotland. We have used the OPA and CEM scores, and more recently the 2040 carbon emissions target, to incentivise our staff to deliver change and performance improvements.

Within the Table 1 Commentary, we have identified the outcomes we consider to be most suitable for potential target outcomes and inclusion in an OPA-type measure for SR27. The OPA measure converts a basket of performance outcomes into a single score to reflect the overall balance of performance of individual outcomes in any single year. We expect that a balance of measures such as this will show an upward trend by the end of SR27 relative to the end position of SR21. Other measures might stand as separate measures, akin to the net zero emissions metric, and complement the OPA-type measure.

*A potential design for the development of the performance monitoring framework for SR27 are shown in Figure 2: Overall hierarchy of a potential SR27 performance monitoring framework*

. This potential high-level approach would:

- enable the performance metrics and measures to be aggregated into a single score SW Incentive scheme, from scores across the three Strategic Ambitions of Delivering Service Excellence, Great Value and Financial sustainability and Beyond Net Zero.
- enable the performance scores of the Strategic Ambitions to be aligned to and formed from aggregated performance scores within the Categories of: Customer excellence, Service Excellence, Strategic Delivery, Value for Money and Carbon.

This approach uses categories that comprise several Measures. For example, Customer Excellence comprises the measures of the CEMs, Awareness and UKCSI. The Measures are identified as a current, new or for trial in 2027/33. They are also colour coded, those in:

- Blue: maintaining the continuity of current performance monitoring.
- Orange: potential additional baskets of service measure.

The new measures (relative to the current framework) incorporate the new WICS outcomes which align with our LTS. Under this approach, other metrics on the WICS list and LTS will be reported separately and not enter the main framework for SW Incentives Scheme.

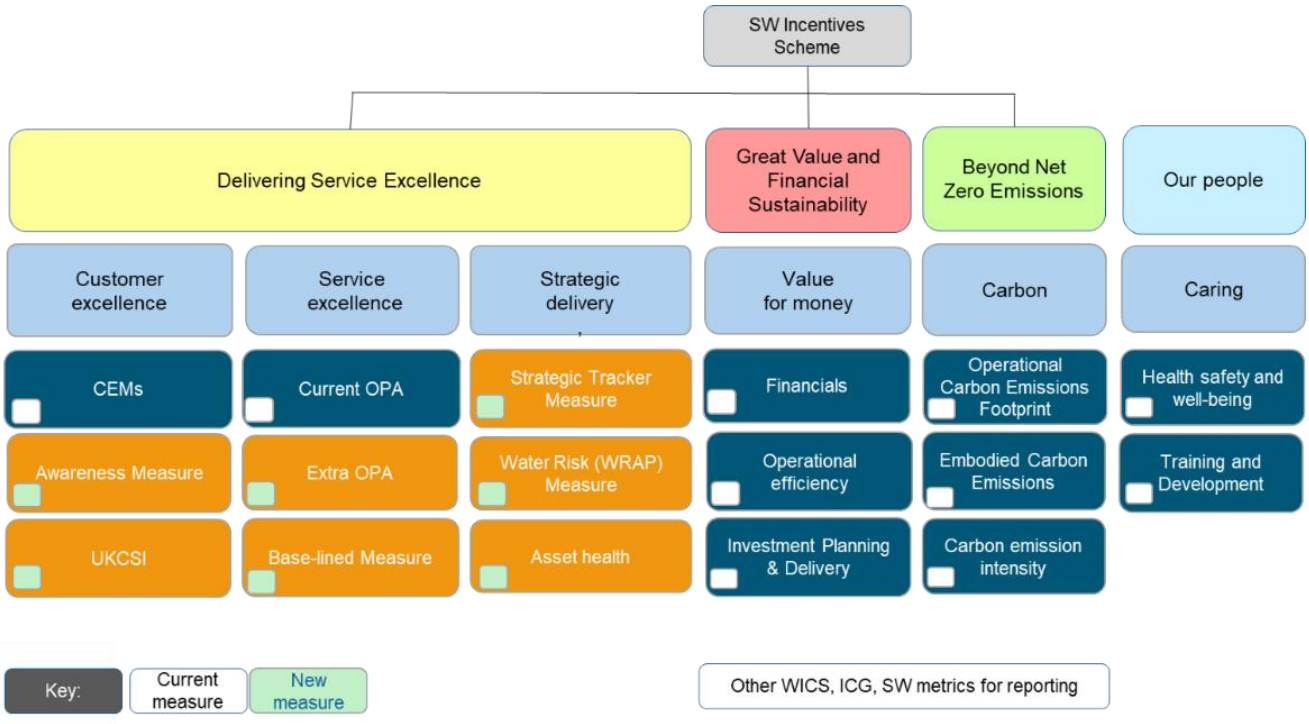


*Figure 2: Overall hierarchy of a potential SR27 performance monitoring framework*

We have mapped how the 44 outcomes published by WICS align with this high level overall performance framework in Figure 3. This shows:

- *Customer Excellence*: with the three current CEMs, the new additions to Scottish Water of the R-Mex and UKCSI comparator measures and the in-development Awareness measure that is associated with per capita consumption within the list from WICS.
- *Service* Excellence: having three separate bundles of measures and metrics:
    - Current OPA: includes the 8 current metrics in OPA that have the same of similar definition in the list from WICS.
    - OPA 'Extra': includes three new metrics in the list form WICS with more limited history than those in the current OPA
    - Baselined: includes three new metrics in the list from WICS that are particularly vulnerable to weather pattern impacts
- *Strategic Delivery*: includes the very new metric of WRAP and in-development strategic tracker and Asset health.
- *Carbon*: includes the set of metrics related to monitoring progress towards the 2040 net emissions target
- *Reporting*: includes the set of metrics that, at this stage, seem least suitable (discussed below) to be target outcomes for 2032/33 and the set of metrics in the list form WICS that we do not believe we will have for the start of SR27.

The identification of those outcomes suitable for either targeting or reporting (see Table 20 below) involved two main steps.

- Firstly, we applied the SMART criteria (see Section 7.2 below) to assess the suitability of a metric to be a target outcome, and found those listed under the *Reporting* column in Figure 3 (below) to have limitations.
- Secondly, we applied the confidence grade criteria (a set out in the Guidance for application in other areas of the DBP, see Section 7.3 below) to the outcomes and found some correlation with the columns in Figure 2.

| Customer Excellence | | | Service Excellence | | | | | | | | | | Strategic Delivery | | Carbon | | | Reporting | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **dCEM** | | 1 | **Current OPA** | Total Leakage | 7 | **OPA Extra** | Zonal leakage | 8 | **Base-lined** | Internal register | 25 | **Strategic Tracker** | SR27 | **NZE** | Total | 34 | **Reporting** | nhh demand | 9 |
| **nhCEM** | | 2 | | Pressure | 11 | | Repeat ITS | 14 | | External flooding | 26 | | SR33 | | Op W | 35 | | ITS average mins lost | 13 |
| **R-MeX** E&W | | 3 | | ITS>6 hrs | 12 | | T&O contacts | 17 | | External register | 27 | | SR39 | | Op WW | 36 | | Drought | 15 |
| **hCEM** | | 4 | | Total WQ | 21 | | Discolour-ed contacts | 18 | | | | | SR45 | | Carbon 2006 baseline | 37 | | Peak demand | 16 |
| **Awareness** | PCC | 10 | | Internal flooding | 24 | | Lead SW | 19 | | | | **WRAP** | 22 | | Op Total | 38 | | Lead customer | 20 |
| **UKCSI** | | 5 | | WWtW | 28 | | DWQR incidents | 23 | | | | **Asset health** | 44 | | Embodied | 39 | | Biodiversity Land use | 41 |
| | | | | Pollution Cat 1&2 W&WW | 29 | | UIDS | 32 | | | | | | | Sequest-ration | 40 | **Not available** | Communities | 6 |
| | | | | Pollution Cat 1-3 WW | 30 | | | | | | | | | | | | | River quality | 33 |
| | | | | Sludge | 31 | | | | | | | | | | | | | Biodiversity outcomes | 42 |
| | | | | | | | | | | | | | | | | | | Resource recovery | 43 |

*Figure 3: Mapping of the list from WICS to the provisional performance framework*

## 7.2 Review of 'suitability to target' with SMART criteria

We assessed each metric using the SMART criteria (Specific, Measurable, Achievable, Relevant and Time-bound) and before consideration of any data values.

Our assessment of those measures more suitable for reporting rather than targeting is outlined as follows:

- **Specific (strategy):** Some metrics, such as average minutes lost and lead in customer supply will benefit from a period of reporting to build a more comprehensive history before specific targets can be well calibrated.

Meanwhile, for SR27 we propose the specific metrics in the current OPA and those identified in the 'OPA Extra' category as the most suitable to be target outcomes. They best align to customer priorities, and to the LTS.

- **Measurable (application):** Some metrics, for example business demand, are affected by many factors, including the economy, temperature, retail contracts, business entrants and exits to the market, as well as the activities of Scottish Water, such as our wholesale activities.

The main purpose of the metric is to enable us to show changes in the performance of Scottish Water resulting from the roll-out of smart metering. For this to be a reliable measure of performance, there would need to be significant analysis to eliminate and correct for the non-smart-metering factors listed above. Therefore, the metric is less suitable for target outcomes and more suitable for reporting.

- **Relevant (use)**: Some of the metrics are an output of a model that is dependent on the setting of multiple parameter values (e.g. worst drought and peak demand). The model estimates, for each Water Resource Zone (WRZ), the "Dry Year Headroom" less "Target Headroom", to form a deficit and then sums the populations served in the deficit zones.

The model uses many inputs to form estimates for these two variables and inform the planning response in each WRZ. The model is better viewed as a tool to inform planning under different scenarios analysing the nuances of each WRZ, and less a measure of performance.

As such it is more suitable for reporting.

- **Timebound (periodicity)**: Some metrics are limited by their reporting window. A biodiversity land-use output metric would require the planted trees and plants to take 5-years to mature before they could be signed off as being realised. Therefore, an input-focus metric is proposed to report progress in SR27.
- **Achievable (readiness):** Some metrics are limited by their availability. For the longer-term we are working with NatureScot to develop a biodiversity outcome metric. However, this is not yet formed and not expected to be available ahead of the FBP or the start of the next regulatory period.

In Table 20 below, we categorise each metric and its suitability as a target during SR27.

## 7.3 Review with confidence grades

To provide further colour on our forecasts of outcomes over SR27, we have incorporated WICS guidance on confidence grades that has been used in other parts of the Business Plan Data Tables submissions for SR27 and applied it to the outcomes in Data Table 1. This looks at reliability, and particularly the source of information. It also considers accuracy and the margin of error for the central estimate. We have used this information to assign the WICS outcomes into distinct groups which reflect their maturity and readiness for application of target outcomes. This is further enabled by adding an additional column regarding the reliability and accuracy definitions which expresses their readiness for target outcomes currently.

*Table 17: Overview of reliability bands*

| Reliability Band | WICS Description | SW level of reliability and state of readiness for use in target outcomes |
|---|---|---|
| **A** | Sound textual records, procedures, investigations or analysis properly documented and recognised as the best method of assessment. | Excluded as we have none that are robustly forecast from an audit process viewpoint. |
| **B** | As A, but with minor shortcomings. Examples include old assessment, some missing documentation, some reliance on unconfirmed reports, some use of extrapolation. | Those subject to outturn audit processes within current performance, have been subject to in-period forecasting and are sufficiently reliable for target outcomes |
| **C** | Extrapolation from limited sample for which Grade A or B data is available. | Those that are not yet within current performance monitoring, have received development attention and could developed further to become sufficiently reliable for target outcomes. |
| **D** | Unconfirmed verbal reports, cursory inspections or analysis. | Those that are not considered to be sufficiently reliable or suitable for target outcomes. |

We assessed this in terms of the range around the overall percentage change. For example, if the projected lost points in a CEM metric is expected to reduce by 6% by 2033 and be within a range of 0 to 15 percentage points the margin of error is 9% and we state it as a "3". This is the state of variation or margin of error around the central estimate at the time of the DBP. The final column in the table expressed this as a level of uncertainty about the forecast number.

*Table 18: Overview of accuracy and uncertainty bands*

| Accuracy Band | Accuracy Range | Uncertainty in the forecast values |
|---|---|---|
| **1** | Less than +/- 1% | Very low |
| **2** | +/- 5% to +/- 1% | Low |
| **3** | +/- 10% to +/- 5% | Medium |
| **4** | +/- 25% to +/- 10% | High |

| Accuracy Band | Accuracy Range | Uncertainty in the forecast values |
|---|---|---|
| **5** | +/- 50% to +/- 25% | Very high |
| **6** | Greater than +/- 50% | Extremely high |
| **X** | Accuracy outside +/- 100 %, zero or small numbers or otherwise incompatible | |

The following confidence grades were then applied.

*Table 19: Overview of confidence grades*

| Accuracy Bands | Reliability Band | | | |
|---|---|---|---|---|
| | **A** | **B** | **C** | **D** |
| **1** | A1 | | | |
| **2** | A2 | B2 | C2 | |
| **3** | A3 | B3 | C3 | D3 |
| **4** | A4 | B4 | C4 | D4 |
| **5** | | | C5 | D5 |
| **6** | | | | D6 |

We show the confidence grade for the outcomes for SR27 in Figure 4 below. In general (but not in every instance) higher reliability and accuracy to the left and lower reliability an accuracy to the right. Further details of this are provided below.

For reliability, there are more cells with a reliability of ‘B’ to the left and more cells with a reliability of ‘D’ to the right.

For accuracy, there are more blue cells with an accuracy of ‘3’ to the left and more cells with an accuracy of ‘5’ to the right.

| Customer Excellence | | | Service Excellence | | | | | | | | | | Strategic Delivery | | Carbon | | | Reporting | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **dCEM** | | B3 | **Current OPA** | Total Leakage | B3 | **OPA Extra** | Zonal leakage | C3 | **Base-lined** | Internal register | C4 | | SR27 | | NZE | Total | C3 | **Reporting** | nhh demand | D3 |
| **nhCEM** | | B3 | | Pressure | B3 | | Repeat ITS | C4 | | External flooding | C5 | **Strategic Tracker** | SR33 | | | Op W | B3 | | ITS average mins lost | D3 |
| **R-MeX** E&W | | C3 | | ITS>6 hrs | B3 | | T&O contacts | C3 | | External register | C5 | | SR39 | | | Op WW | B3 | | Drought | D4 |
| **hCEM** | | B3 | | Total WQ | B3 | | Discolour-ed contacts | C3 | | | | | SR45 | | | Carbon 2006 baseline | B3 | | Peak demand | D5 |
| **Awareness** | PCC | C4 | | Internal flooding | B3 | | Lead SW | C3 | | | | **WRAP** | | C4 | | Op Total | B3 | | Lead customer | D4 |
| **UKCSI** | | C3 | | WWtW | B3 | | DWQR incidents | C4 | | | | **Asset health** | | B4-D5 | | Embodied | C3 | | Biodiversity Land use | DX |
| | | | | Pollution Cat 1&2 W&WW | B3 | | UIDS | C4 | | | | | | | | Sequest-ration | C0 | **Not available** | Communities | - |
| | | | | Pollution Cat 1-3 WW | B3 | | | | | | | | | | | | | | River quality | - |
| | | | | Sludge | B2 | | | | | | | | | | | | | | Biodiversity outcomes | - |
| | | | | | | | | | | | | | | | | | | | Resource recovery | - |

*Figure 4: Mapping of the list from WICS to the provisional performance framework including confidence grade*

The confidence grades in Table 1 also highlight the further work that will be needed for the FBP to improve the confidence grades, by securing more rigorous processes to progress and monitor the measures and metrics and consideration of ways to reduce year-on-year volatility in the numbers.

## 7.4 Assessment of outcomes that could be targeted in SR27

We present in the table below with our initial response to the question in WICS' guidance of which outcomes could be targeted in SR27. Our current assessment is that there is a metrics used for performance monitoring in SR21 that are expected to continue to be target outcomes in SR27. There are a set that have the potential to become a target outcomes subject for further development, testing and/or revision. Other lines are expected to be reported but not targeted because they are not available or are not suitable to be a target outcome.

*Table 20: Suitability for target outcomes or reporting*

| WICS ref | Short title | Key | WICS ref | Short title | Key |
|---|---|---|---|---|---|
| 1.01 | dCEM | 1 | 1.23 | DWQR reported incidents | 2 |
| 1.02 | nhCEM | 1 | 1.24 | Annual internal sewer flooding | 1 |
| 1.03 | R-MeX | 1 | 1.25 | Internal sewer flooding register | 2 |
| 1.04 | hCEM | 1 | 1.26 | Annual external sewer flooding | 2 |
| 1.05 | UKCSI | 1 | 1.27 | External sewer flooding register | 2 |
| 1.06 | Communities | 4 | 1.28 | WwTW compliance | 1 |
| 1.07 | Total leakage | 1 | 1.29 | Serious pollution (EPI Cat 1/2) | 1 |
| 1.08 | Zonal leakage | 2 | 1.30 | Total pollution (all categories) | 1 |
| 1.09 | Business demand | 3 | 1.31 | Sludge compliance | 1 |
| 1.10 | Per capita consumption (PCC) | 3 | 1.32 | Unsatisfactory intermittent discharges (UIDs) | 2 |
| 1.11 | Low pressure | 1 | 1.33 | River water quality | 4 |
| 1.12 | Unplanned interruptions | 1 | 1.34 | Net Zero Emissions | 2 |
| 1.13 | Minutes lost | 3 | 1.35 | Operational emissions (W) | 3 |
| 1.14 | Repeat ITS | 2 | 1.36 | Operational emissions (WW) | 3 |
| 1.15 | Worst historic drought | 3 | 1.37 | Baseline emissions | 3 |
| 1.16 | Peak demand | 3 | 1.38 | Operational emissions (net) | 3 |
| 1.17 | Taste & odour | 2 | 1.39 | Embodied carbon | 3 |
| 1.18 | Discoloration | 2 | 1.40 | Carbon capture/sequestration | 3 |
| 1.19 | Lead SW networks | 2 | 1.41 | Biodiversity land-use | 3 |
| 1.20 | Lead customer pipes | 2 | 1.42 | Biodiversity outcomes | 4 |
| 1.21 | Drinking water compliance | 1 | 1.43 | Resource recovery | 4 |
| 1.22 | WRAP | 2 | 1.44 | Asset health | 2 |

Key

1 Expected to be a target outcome
2 Potential for it to become a target outcome
3 Not expected to be a target outcome, but reported
4 Not expected to be a target outcome or reported

# 8 Conclusion and next steps

In conclusion, we have built on previous engagement with WICS to develop and forecast an ambitious set of outcomes that we believe represents a balance of service and value to our customers, taking into account the challenges that Scottish Water faces. While we have provided forecasts for the vast majority of the 44 outcomes identified by WICS, a minority will require further development between DBP and FBP (and in some cases, beyond) in order to ensure that they are effective measures of performance. We have also proposed two additional measures, a strategic tracker and a customer awareness measure, that we think could bring additional insight into Scottish Water's performance.

We have laid out initial proposals as to how these outcomes could be best combined and built into a performance framework for Scottish Water over SR27. We will continue to progress the development of this approach, and will take account of stakeholder feedback ahead of final proposals in the FBP.

We welcome further engagement on our outcomes approach, forecasts and performance framework proposals as we continue to develop our position.

# Annex: supplementary information

## Annex A – WICS Guidance

*Table 21: The key relevant elements of WICS' guidance and how we have responded*

| Subject | Detail | Our response |
|---|---|---|
| Purpose | Scottish Water's outcomes and associated levels of service for customers, the environment, and other stakeholders from SR27 – SR45 and alternative scenario outcomes for SR27 | Sections 4&5, and Data Table 1 |
| Translation of Contribution | Scottish Water is expected to translate its contribution towards the high-level outcomes from the Water Sector Vision (WSV) into tangible measures and milestones over the long term. | Section 2 |
| Investment Plan | Scottish Water should then set the investment plan (investment outputs) consistent with making that progress and the required resources (inputs) over 2027-33 | This is included through consistency with other tables |
| Initial View of Outcomes and Performance Measures | As Scottish Water develops its Business Plan, it may propose alternative or additional measures | Additions in Section 4, new areas to SW monitoring in Section 5 |
| Evidence for Alternative Measures: | Scottish Water should provide evidence to explain why alternative or additional measures are appropriate. | Section 4 |
| Final List of Outcomes | The final list of outcomes from the Business Plan should be used to measure Scottish Water's performance during SR27 | This is progressing towards the FBP |
| Mapping Against 2050 Vision and Principles: | The initial list of outcome measures is mapped against the 2050 WSV r and the Scottish Government Water Sector Principles. | Section 2 |
| Alignment with National Performance Framework | Scottish Water should examine how its proposed outcome measures map onto the Scottish Government's National Performance Framework (NPF). | Section 1.6 and 6 |
| Forecast Performance | As part of its business plan, Scottish Water should provide its forecast performance on each measure over the regulatory period. Scottish Water should then identify which of the forecasts represent targets against which it will be held accountable for delivering to customers over the regulatory period as part of the regulatory contract | Section 3 |
| Annual Targets | By setting out its annual targets before they come into effect, Scottish Water provides WICS and other stakeholders with an opportunity to comment on their reasonableness. | Section 3 |

| Subject | Detail | Our response |
|---|---|---|
| Further Development of Outcome Measures | Following consultation on the DBP tables and guidance, several outcome measures require further development, covering benefits to customers and communities, the impact of Scottish Water's partnerships, environmental performance, and sewerage infrastructure discharges. | Plans for FBP in Section 5 |
| Principles for Finalising Outcome Measures | In finalising outcome measures and setting targets, Scottish Water should commit to principles such as alignment with Scottish Ministers' Objectives, stretching annual targets, stakeholder engagement, demonstrating progress against commitments, and proposing annual targets or commitments on performance measures | Plans for FBP in Section 5 |
| Performance Assessment: | WICS and Scottish Water should assess performance against the measures set out in the Final Determination with any management or employee incentives aligning with these measures. | Section 6 |
| Mapping to National Performance Framework: | Outcome measures should cover all benefits that customers receive, and these measures should be mapped to the Scottish Government's National Performance Framework (NPF). | Data Table 1 commentary |
| Quality Assurance | Data submitted should be subject to a rigorous, high-quality assurance process. | Progressed through audit review |
| No Blank Input Cells | Scottish Water should ensure that no input cell is left blank and can include zero if applicable | Nil entries have been applied in Table 1 where data is not available. |
| Commentary on Information Source | The commentary should explain the source of the information and the basis for any assumptions used to populate the tables. | Data Table 1 commentary |

## Annex B – Definitions and outcomes

*Table 22: Definitions developed by Scottish Water*

| Reference | Measure of Level of Service | Level of Service | Unit | Updated SW Definition |
|---|---|---|---|---|
| 1.02 | CEM | nhCEM Non-Household Customer Experience Measure | Number | The Non-Household Customer Experience Measure (nhCEM) score, measuring service to businesses and licensed providers. Scottish Water should provide its minimum expectation for performance in each year.<br><br>[Re potential update to the definition of CEM: Scottish Water values the insight and trends that it receives from the nhCEM and will continue to track the established metrics as a means to understand how it is delivering improvements in services for the business and LP community. However, we have now established the R-Mex as a bi-annual survey, in full alignment with the Ofwat programme and publication of performance to allow benchmarking of wholesale services. |
| 1.04 | CEM | hCEM Household Customer Experience Measure | Number | The Household Customer Experience Measure (hCEM) score. Scottish Water should provide its minimum expectation for performance in each year.<br>[Re potential update to the definition of CEM: Scottish Water is keen to maintain the hCEM in its current form, it has provided invaluable insight and sits at the heart of a number of service excellence improvements delivering benefits to customers. Maintaining the measure as it provides a clear line of sight on performance improvements. We will always take time to consider potential changes to the hCEM, which has evolved since it was first introduced in 2015.] |
| 1.09 | Business Demand | Percentage reduction of consumption at non-household premises* | % | The percentage net reduction of three-year average measured business demand in mega-litres per day (Ml/d) from a 2024-25 baseline. Three-year average values are calculated from annual average values for the reporting year and two preceding years expressed in Ml/d. non-household premises include businesses, charities and public sector organisations. Methodology to be further developed to accommodate economic changes e.g. new industrial demand or loss of industrial demand |
| 1.14 | ITS Repeats | Repeat interruptions to water supply | Number | The number of postcodes with repeat contacts of either<br>• ≥ 6 property contacts within 1 year<br>• ≥ 10 property contacts within 3 years. |
| 1.15 | Water availability | Customers supplied by systems not capable of meeting demand during a worst historic drought | Number | Population of customers supplied by systems not capable of meeting demand during a worst historic drought<br>Definition includes:<br>• Worst Historic Drought (assumed 1:150)<br>• Climate change adjustments would be made in line with climate adaptation plan.<br>• the use of documented drought measures. |

| | | | | |
|---|---|---|---|---|
| 1.16 | Water availability | Customers supplied by systems not capable of meeting peak demand. | Number | Population of customers supplied by systems not capable of meeting peak demand<br>Definition is based on:<br>• peak period against WTW capacity and CAR licence (both summer and winter)<br>• not considered peak network constraints<br>• allows for Scottish Water tankering policy. |
| 1.19 | Drinking water quality | Estimated number of lead pipes in public network | Number | Estimated number of communication lead pipes remaining in public network. |
| 1.21 | Water Quality | Total drinking water compliance | % | Total Water Quality compliance as reported in DWQR including samples at taps, service reservoirs and treatment works.<br>Current definition is based on regulatory samples across all asset base – zones to use baseline sampling - including Cryptosporidium (non-UV irradiated). Detailed methodology to be agreed with DWQR for the FBP. Test volatility of risk based zonal sampling to confirm impact if any before Jan 2027. If low impact, we will add risk zonal samples into the measure. |
| 1.22 | Water Risk Measure | Drinking water quality risks across all systems above long-term tolerable threshold. | Number | The number of WQ WSZ & Hazard Pairs above long-term tolerable threshold (including those considered significant), based on thresholds of 42 from WRAP using likelihood x consequence. |
| 1.32 | Sewerage Discharges | | Number | Number of UIDs (Unsatisfactory Intermittent Discharges), classified and prioritised in collaboration with SEPA. |

*Table 23: Outcomes where there is an additional suggested improvement by Scottish Water*

| Reference | Measure of Level of Service | Level of Service | Unit | Reason that measure will not be submitted in the DBP |
|---|---|---|---|---|
| 1.20 | Drinking Water Quality | Indicator of lead in customer supply pipes. | % | Current WICS definition: Percentage of random daytime regulatory samples with lead levels greater than 3 µg/l<br><br>*Scottish Water proposal:* Percentage of random daytime regulatory samples with lead levels **not** greater than 3 µg/l<br><br>Scottish Water proposes that this metric is more effectively framed in the positive. Whilst a simple inverse of the definition in the guidance this approach would better align with internal reporting approaches. |

*Table 24: Outcomes that require further development prior to forecasting*

| Reference | Measure of Level of Service | Level of Service | Unit | Reason that measure will not be submitted in the DBP |
|---|---|---|---|---|
| 1.42 | Climate Change Mitigation | Biodiversity and Nature Based Solutions (final measure) | Biodiversity net gain or improvement | Biodiversity and nature-based solutions combined into a Biodiversity net gain unit aligned with NatureScot and Scottish Government. Full definition and unit to be agreed as the development work with NatureScot progresses. |
| 1.43 | Resource recovery | Resource recovery | tCO2e | A resource recovery measure will require much more engagement and development to ensure that it is a meaningful additional datapoint. Scottish Water notes that such a measure may be linked to the deployment of Advanced Anaerobic Digestion technology at Bioresource facilities. Scottish Water also notes that the benefits of resource recovery activities may already be captured as a reduction in carbon across operational or capital measures. Further engagement with WICS is needed to understand the role and potential timeline involved in this type of measure. |
| 1.44 | Asset Health | Equipment/asset health index | | As previously communicated, work continues to assess the best approach to a single asset health measure that gives an accurate representation of the development of the health of Scottish Water's assets whilst complementing the detailed asset health data available in Table 3b. Scottish Water is also aware of the significant attention that Ofwat and companies in England and Wales are giving to the development of asset health measures and we are keen to ensure that we align with any developing best practice before 'locking in' a measure in this area.<br>We continue to work on two primary options in the development of a single asset health measure:<br><br>Option 1: A combination of service-related metrics across relevant areas (e.g., burst rates, AC main replacement, MEICA mean time to fail); and<br><br>Option 2: An EHI-based metric (i.e., Table 3b data 'rolled' up to 1 line).<br><br>Given the importance but practical difficulties of representing asset health in a meaningful 'one line' measure – we propose a joint SW-WICS Working Group should be formed to progress this work and achieve a joint understanding of the most effective measure to be used in SR27. |

*Table 25: Outcomes that Scottish Water does not consider it appropriate to submit*

| Reference | Measure of Level of Service | Level of Service | Unit | Reason that measure will not be submitted in the DBP |
|---|---|---|---|---|
| 1.06 | CEM | Communities experience measure | | Scottish Water considers this measure to be repetitive of data already collected through the currently reported CEMs and through the proposed inclusion of the UKCSI measure. Further benefit may come from the development of a new 'Awareness' measure that would measure progress aligned to our LTS. |
| 1.33 | River water quality | | | Scottish Water does not think it is appropriate to forecast or set outcomes for river water quality as this issue sits within the remit of SEPA. While acknowledging our key role in river water quality, we consider it more appropriate for any such measure to be owned and reported by SEPA. |

# Annex C – Summary of joint discussions on the proposed Outcome measures

This summary position was submitted to WICS in October 2024 to set the result of the joint discussions on the proposed Outcome measures that will be used for reporting in SRC27.

### Context

On **19 September 2024** Scottish Water received the draft data tables and associated guidance from WICS for SRC27. The expectation from WICS was for Scottish Water to provide feedback on the Table 1 (Outcomes) by **22 October 2024**. WICS' current expectation is that the final list of outcomes from the Business Plan should be used to measure Scottish Water's performance during SRC27 through the Scottish Government Investment Group (SGIG).

WICS confirmed in the written guidance provided with the draft tables that as Scottish Water develops its SR27 Business Plan, it may propose alternative or additional measures, recognising that it may want to test measures through customer research or that other measures may be more appropriate to capture given the composition of the investment programme. It would be expected that Scottish Water would provide evidence to explain why alternative or additional measures are appropriate.

The proposed Outcome measures and other draft tables were made available for public and stakeholder consultation on the WICS website as part of the Draft Business Plan Guidance Consultation | WICS.

This consultation ran from **8 October – 5 November 2024**, with feedback updated on the **12 December 2024**.

### The draft list of outcome measures

The initial list of 43 Outcome measures was discussed through 12 workshops with WICS, external stakeholders and Scottish Water Subject Matter Experts (SME). These are shown in *Table 26* below.

We have also colour coded the table to indicate the level of agreement or development still to be done at the working level between SW / WICS / Quality Regulators. Of these:

- 31 had been agreed in draft with WICS through the workshops (shown in green in *Table 26*).
- A further 4 (shown in yellow in *Table 26*) were committed to joint DWQR and Scottish Water input ahead of the **5th November** consultation deadline, with a DWQR session planned for the **23rd October** (Water Aesthetics (x2), Drinking Water Quality Compliance at customer taps and DWQR declared incidents).
- A further 3 (shown in blue in *Table 1: Summary of proposed SR27 outcomes*) were agreed to develop prior to the Draft Business Plan submission with DWQR (Lead and water quality risk position).
- There were 2 measures (shown in grey in *Table 26*) proposed for Water Availability which were to be discussed with WICS. This will need to be agreed ahead of the Draft Business Plan submission.

- A further 2 (shown in purple in *Table 26*) were committed to joint SEPA and Scottish Water input ahead of the draft Business Plan submission (River Water Quality and Sewage Infrastructure Discharges),
- 1 final category (Asset Health Index) needs further work but is likely to be a shadow measure for SR27.

*Table 26: Draft outcomes jointly discussed with WICS, October 2024*

| | | | Indicator of Change | | Forecast annually for SR27, 2039 and 2045 | | | |
|---|---|---|---|---|---|---|---|---|
| **Ref** | **Level of Service** | **Agreed with WICS** | **Existing/ new/changing** | **Notes** | **Draft** | **Final** | **SR27 period** | **Shadow only in SR27** |
| 1 | dCEM | Yes | Existing measure | Value add components of dMeX to be added to AR25. Separate action to pick up. | Yes | Yes | Yes | NA |
| 2 | nhCEM | Yes | Existing measure | No changes | Yes | Yes | Yes | NA |
| 3 | R-MEX | Yes | Change to existing measure | Increases the frequency of the R-MeX survey (to twice a year) but removes the LP Annual survey | Yes | Yes | Yes | NA |
| 4 | hCEM | Yes | Existing measure | Work to action 'mechanics' of the calculation between WICS and SW. | Yes | Yes | Yes | NA |
| 5 | UKCSI | Yes | New measure | SW utilise this measure already- but not as a formal outcome measure. | TBC ahead of Draft Business Plan | TBC ahead of Draft Business Plan | TBC ahead of Draft Business Plan | NA |
| 6 | Net Zero Emissions | Existing | None | Yes | Yes | Yes | No | No |
| 7 | Operational Emissions (Water) | New | Carbon intensity for W/WW only currently (included in the NZ routemap) | Forecastable ranges for SR27 and future years | Forecastable ranges for SR27 and future years | Forecastable ranges for SR27 and future years | NA | NA |
| 8 | Operational Emissions (Waste water) | New | Carbon intensity for W/WW only currently (included in the NZ routemap) | Forecastable ranges for SR27 and future years | Forecastable ranges for SR27 and future years | Forecastable ranges for SR27 and future years | NA | NA |
| 9 | Operational emissions (reduction to baseline 06/07) | No | NA | Forecastable ranges for SR27 and future years | Forecastable ranges for SR27 and future years | Forecastable ranges for SR27 and future years | NA | NA |
| 10 | Operational emissions (net emissions) | Change- (operational emissions minus sequestered emissions) | Yes- reported overall net position to date | Forecastable ranges for SR27 and future years | Forecastable ranges for SR27 and future years | Forecastable ranges for SR27 and future years | NA | NA |
| 11 | Investment Emissions | New | None | Forecastable ranges for SR27 and future years | Forecastable ranges for SR27 and future years | Forecastable ranges for SR27 and future years | NA | NA |
| 12 | Carbon Capture/Sequestration | New | None | Forecastable ranges for SR27 and future years | Forecastable ranges for SR27 and future years | Forecastable ranges for SR27 and future years | NA | NA |
| 13 | Biodiversity and Nature Based Solutions (interim measure) | New | None | No | No | Tracker only by SR27 | NA | NA |

| | | | Indicator of Change | | Forecast annually for SR27, 2039 and 2045 | | | |
|---|---|---|---|---|---|---|---|---|
| **Ref** | **Level of Service** | **Agreed with WICS** | **Existing/ new/changing** | **Notes** | **Draft** | **Final** | **SR27 period** | **Shadow only in SR27** |
| 14 | Biodiversity and Nature Based Solutions (final measure) | New | Timeline dependent upon work with NatureScot and Scottish Government. | No | Yes when available | Tracker only by SR27 | NA | NA |
| 15 | Resource recovery | New | None | No | No | Tracker only by SR27 | NA | NA |
| 16 | Percentage reduction of three-year average leakage* | Yes | Change to existing. | Previous leakage measure has been total leakage volume expressed as MLE in single reporting year (Fiscal) | Y | Y | Y | NA |
| 17 | Leakage reduction in areas with supply-demand balance deficit | Yes | New | N. A forecast for 2027 to 2033 will be provided based on the set number of zones reported to be in yield deficit. We cannot provide a forecast beyond the 6 year cycle as the number of zones in deficit may change. | Y | Y – should be regarded as a shadow measure | | Yes |
| 18 | Percentage reduction of consumption at non-household premises | No- see notes | New | Further development work on the definition and methodology required. Methodology to accommodate economic changes e.g. new industrial demand or loss of industrial demand. | TBC | TBC | TBC | TBC |
| 19 | Three-year average per capita consumption | Yes | Change; existing reporting is per household | This will be based on calendar year to align with other elements of the annual water balance. Reporting will begin from January 2027. | Yes | Yes | Yes | Yes |
| 20 | Number of properties on the low pressure register | Yes | Existing measure | No change | Yes | Yes | Yes | NA |
| 21 | Weighted Unplanned interruptions greater than 6 hours, excluding 3rd party | Yes | Existing | Yes | Yes | Yes | Yes | NA |
| 22 | Average minutes lost due to water supply interruptions (over 3 hours)* | Agreed as a placeholder | Existing | Customer research might be useful in informing whether to take forward (3 hr threshold vs. repeats). Will be agreed prior to Draft Business Plan submission. | Yes | Yes | Yes | NA |
| 23 | Repeat ITS | Yes- in principle only- see notes | New | Currently reported to SW Board, thresholds under review in Management Approach. Definition to be further developed. Timeline for definition and methodology for agreement TBC in advance of the Draft Business Plan submission. | TBC | TBC | TBC | TBC |

| | | | Indicator of Change | | Forecast annually for SR27, 2039 and 2045 | | | |
|---|---|---|---|---|---|---|---|---|
| **Ref** | **Level of Service** | **Agreed with WICS** | **Existing/ new/changing** | **Notes** | **Draft** | **Final** | **SR27 period** | **Shadow only in SR27** |
| 24 | Customers supplied by systems not capable of meeting demand during a worst historic drought | No- see notes | New | Methodology and approach to be developed and applied and agreed with WICS. Timelines to be confirmed ahead of the Draft Business Plan submission. | Yes | Yes | Yes | NA |
| 25 | Customers supplied by systems not capable of meeting peak demand | No- see notes | New | Methodology and approach to be developed and applied and agreed with WICS. Timelines to be confirmed ahead of the Draft Business Plan submission. | No | Yes | Yes | NA |
| 26 | Taste and odour contacts | No- see notes | Development of existing reporting | Agreed proposal to be submitted prior to 5th November. Agreement with DWQR required. | Yes | Yes | Yes | NA |
| 27 | Discolouration (and possibly aeration) contacts | No- see notes | Development of existing reporting | Agreed proposal to be submitted prior to 5th November. Agreement with DWQR required. | Yes | Yes | Yes | NA |
| 28 | Lead pipes in public network | No- see notes | New | Tracking progress to lead free network in line with Ministerial objective. Agreed with WICS and DWQR that this measure can be developed in advance of the Draft Business Plan submission. | Yes | Yes | Yes | NA |
| 29 | Indicator of lead in customers supply pipes | No- see notes | New | Not directly controlled by SW – no target. Agreed with WICS and DWQR that this measure can be developed in advance of the Draft Business Plan submission. | TBC | Yes | Yes | NA |
| 30 | Improvement in drinking water compliance at customer taps | No- see notes | New | Impact of risk-based sampling to be assessed. Agreed proposal to be submitted prior to 5th November. Agreement with DWQR required. | TBC | Yes | Yes | NA |
| 31 | DWQ risks across all systems above long-term tolerable threshold. | No see notes | New | Tracker as may move up and down with changing environment. Agreed with WICS and DWQR that these measures can be developed in advance of the Draft Business Plan submission. | TBC | Yes | Yes | NA |
| 32 | Number of DWQR declared incidents | No- see notes | New | All incidents will need declared by March – can take until May. Agreed proposal to be submitted prior to 5th November. Agreement with DWQR required | No | Yes | Yes | NA |
| 33 | Number of internal sewer flooding incidents | Yes | Extension of existing measures | Approach to forecasting and measuring incidents due to severe weather requires development. Severe weather cannot be forecast. | Yes | Yes | Yes | NA |

| | | | Indicator of Change | | Forecast annually for SR27, 2039 and 2045 | | | |
|---|---|---|---|---|---|---|---|---|
| **Ref** | **Level of Service** | **Agreed with WICS** | **Existing/ new/changing** | **Notes** | **Draft** | **Final** | **SR27 period** | **Shadow only in SR27** |
| 34 | Number of properties at risk of internal flooding | Yes | Existing | Count of the number of properties on the Internal at Risk Register and is based on current Annual Return methodology. | Yes | Yes | Yes | NA |
| 35 | Number of external sewer flooding incidents | Yes | Extension of existing measures | Approach to forecasting and measuring incidents due to severe weather requires development. Severe weather cannot be forecast. | Yes | Yes | Yes | NA |
| 36 | Number of areas at risk of external sewer flooding | Yes | Existing | Count of the number of areas on the External at Risk Register and is based on current Annual Return methodology. | Yes | Yes | Yes | NA |
| 37 | Percentage compliance with SEPA discharge permits* | Yes | Existing | WICS agreed to use existing measure until SEPA EPAs detail confirmed. Action to understand if this will be before the Final Business Plan. | Yes | Yes | Yes | NA |
| 38 | Number of serious pollution incidents* | Yes | Existing | Assume Calendar year, and W&WW. Sum Cat 1&2 only of | Yes | Yes | Yes | NA |
| | | | | B11a.13 Total (sewage and water and surface water) related premises. | | | | |
| | | | | WICS confirmed 10/10 to include W &WW. | | | | |
| 39 | The total number of pollution incidents from a sewerage asset affecting the water environment* | Yes | Existing | Assume Calendar year and WW only. Sum of Total number (Cat 1-3 incidents) for<br>Assume Calendar year and WW only. Sum of Total number (Cat 1-3 incidents) for<br>B11a.1 Sewage treatment works<br>B11a.2 Storm tank<br>B11a.3 Combined sewer overflow<br>B11a.4 Foul sewer<br>B11a.5 Pumping station<br>B11a.6 Rising mains<br>B11a.7 Other | Yes | Yes | Yes | NA |
| 40 | Percentage unsatisfactory sludge disposal | | Existing | No change | Yes | Yes | Yes | NA |
| 41 | TBC- timescale and definition dependent on RBMP4 content | | New | WICS/SW/SEPA agreed to holding line only until RBMP4 development to ascertain a suitable measure for River Water Quality specific to SW. | No | Possible | Possible | Possible |
| 42 | TBC | Holding Line agreed | TBC | Definition to be agreed in conjunction with SEPA. | TBC | TBC | TBC | TBC |
| 43 | Equipment/asset health index | | | | | | | |

# Customers and Communities

## Technical Appendix 015

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# 1 Executive Summary

Our customers, communities and stakeholders are fundamental to the service that we offer, and we want to continue to delight them in SR27 and beyond. We recognise that in a period of declining trust in the water sector more generally, we must actively listen to our customers and community stakeholders, taking action to continue to involve them in our business, communicate with them and help them engage with us when they need to.

During SR21 we have made good progress in improving how we support and work with our customers and communities, with several notable achievements including the highest household customer satisfaction level (94.15%) since we established the survey, first place ranking for 'overall service' for our Retailer Measure of Experience, and our Development Customer Experience Measure is tracking above target. Our ongoing customer research tells us that our customers are happy with the way we engage with them, however we recognise that as customer expectations and technology evolve, we must continue to invest to meet them taking opportunities to find the most efficient and effective ways.

For SR27, customer and community excellence will be at the heart of everything we do. Our ambition is to improve our performance across all of the customer and community performance metrics in the period in line with the Ministerial Objective 1a and 1b; Scottish Water must maintain or improve current levels of service over the long term and Scottish Water must engage with stakeholders and customers to establish appropriate standards of services for the 2027-33 period and beyond.

As a result of our learnings from SR21, coupled with feedback from our customer and community stakeholders, our SR27 ambitions and our awareness of the changing landscape in which we operate, in SR27:

1. We will **continue to listen to all of our customers** and evidence where we have used their voices in our strategic and day to day decision making – ensuring customers continue to be at the heart of all we do
2. We will **use technology and data** to ensure the most effective and efficient use of funding through streamlining, simplifying, personalising and improving contact channels and service for customers, whilst maintaining our commitment to human contact where we can show we care
3. We will **continue to invest in our ability to predict and prevent** issues to protect our customers from disruption whilst optimising our ability to complete first time fixes.
4. We commit to further development and **commitment of our service for customers with vulnerabilities**
5. We will continue to **develop our workforce** to become accredited customer service professionals
6. We will grow our presence in the lives of our customers and communities through **community engagement**, building positive relationships and contributing to a flourishing Scotland

Throughout SR27 and in the delivery of the above six areas of focus, we will focus on working efficiently, driving productivity and improving our overall performance for customers, ensuring we get the most value for them for every pound we spend.

To deliver these priorities in SR27 we are investing £3m directly through customer and community initiatives as described below in **Table 1**. In addition to the investment described below the delivery of these six priorities will be achieved through investment in digital technologies such as

further developments in customer self-service digital solutions and an improved customer satisfaction (CSat) platform capability (further detail on these digital initiatives can be found in our Digital Technical Appendix).

*Table 1: Customer and Community Investment*

| Investment Summary | Investment |
|---|---|
| **Customer Research** | £1.2m |
| **Priority Service Register Improvements** | £2.5m |
| **Totals** | **£3.7m** |

As a result of this investment aligned to our priorities, we are forecasting a continual increase in all our Customer Experience Measures as well as maintaining upper quartile of the UK utility companies on the UK Customer Satisfaction Index and upper quartile performance in the Retailer Measure of Experience.

# 2 Background

## 2.1 Context

We know our customers are proud of their tap water and Scotland's beautiful water environments, but we also want them to be proud of, value and trust Scottish Water as custodians of our most precious, natural resource. Customers and communities form the foundation of everything we do at Scottish Water, and we will always strive to deliver the excellent service our customers expect.

Whilst we continue to face water sector challenges including those presented by climate change, aging assets and an ever changing and aging population, we will continue our drive to continually deliver service and customer excellence.

Scottish Water will face many challenges over the years which have the potential to impact on service and levels of customer trust. We recognise we need to work hard to meet these challenges whilst we continue to serve our customers, keep them informed and nurture relationships with them.

## 2.2 SR21 has built us a strong foundation for SR27

Throughout SR21 we have focused on 3 key areas to deliver customer and community excellence:

1. *We continue to listen to customers, in particular about their experiences and feedback regarding all we do and how we do it*

Listening to our customers is fundamental to achieving Service Excellence as their views aid our understanding of their needs, expectations and perceptions of what Scottish Water and Service Excellence means to them. Our robust research programme will continue to inform our improvement activities and decision making whilst helping us to build and strengthen relationships with customers and communities and demonstrate just how much we care.

Throughout SR21 and previous periods we continued to monitor the experiences of our customers and key stakeholders to ensure that we are in tune with their experiences. We track, monitor and learn from customer feedback, ensuring the voices of our customers sit at the heart of our business. As well as collating transactional satisfaction information from our customers (our current (household) customer satisfaction levels are at 94.15% (week 37 2024/25)) we seek customers' views and engage with them on strategic direction and performance through our wider research programme, reaching tens of thousands of customers on an annual basis (see our Customer Engagement Research Technical Appendix for further detail).

With regards to Licensed Providers (LPs), our ambition is to be a great wholesaler who is easy to do business with. We are passionate about getting things right first time, working collaboratively, and delivering great value to our LPs and business customers. Our service performance, as measured by our non-household Customer Experience Measure (nhCEM) and wholesale KPI remains strong and we continue to enhance all aspects of the customer experience, as evidenced by recent UK-wide benchmarking results. (See Figure 2)

The Retailer Measure of Experience (R-MeX) survey, conducted by the Market Operator for English water companies (MOSL), assesses LP satisfaction with wholesaler services in England. Scottish Water also conducts a similar, independent benchmarking survey to measure our performance against other wholesalers. We are proud to have recently achieved 1st place ranking

for 'overall service' in both 2024/25 surveys, marking a significant milestone in our journey to Service Excellence.

We support Scotland's growth by aiming to connect our customers "just ahead of need" to enable building and housing developments. We receive positive feedback from our customers and the Development Customer Experience Measure (dCEM) is currently tracking above target, indicating that we are providing a high level of service. (See Figure 1) Further detail on our development plans in SR27 can be found in our Enabling Growth Technical Appendix.

As well as listening to customers directly, Scottish Water is an active member of the Institute of Customer Service, which publish the UK Customer Satisfaction Index (UKCSI) every six months, allowing us to benchmark our service against other water companies, utilities, and a variety of other sectors. In the most recent January 2025 survey, the UKCSI showed Scottish Water's results were notably higher than the water sector, utilities, and Scottish averages. Scottish Water has maintained the top spot for UK water companies for 4 consecutive waves since July 2023. (See Figure 4)

*2. We have simplified the promises that we make to our customers making it more accessible and easier to understand*

In the past few years we have made significant improvements to service provision, including the refinement of Our Promises. Otherwise known as our Code of Practice, this document sets out the commitments we make to our customers and communities, detailing how we will remedy the situation should things go wrong. It is now easier to access and understand, with several of the promises being simplified and caveats removed, to drive Scottish Water towards improved and efficient service delivery performance.

*3. We have implemented a number of technology solutions to support the experiences of our customers and communities and are seeing positive feedback as a result of our initiatives*

**Improved speed of response:** As part of our ongoing commitment to transform our speed of response we now have a fully integrated remote diagnosis offering. Through digital connections customers can simply transfer images and videos to Scottish Water allowing diagnosis of the issue, and often, resolution at first point of contact.

The team has proven effective in resolving customer issues remotely, driving service, cost and carbon efficiencies through eliminating the need for field visits in ~40% of cases. This approach has not only led to significant cost savings but has also reduced $CO_2$ emissions and improved resolution times for customers. Year on Year net Financial Benefit of £350k and Carbon savings of 104,722kg $CO_2e$ have delivered with savings from both Water Supply and Wastewater Operations. Moving into the future we will look to use this triage approach for a broader scope of service issues, with an ambition that this becomes an opportunity for customers to self diagnose in some instances. For example, a customer could use the diagnosis tool, understand the required next step, and book and manage the job or appointment online.

We will continue to seek opportunities to deliver the most effective and efficient use of customers money – looking to the use of dynamic customer response service level agreements (SLA's) that will be informed by customer demand information and will be visible to staff throughout the journey to enable accurate customer engagements. We have also introduced technology which allows customers to track their named engineer. If our customer is expecting a visit, they can monitor their progress as is often seen with deliveries. This has been warmly welcomed by our customers as illustrated in the following feedback; *"Very impressed with first point of contact and being*

*informed of progress by text again was very helpful. Very impressed with the customer service"* and *"We were contacted in advance by phone AND text. The operator arrived in time. He was polite, quick and efficient. All in all an excellent job."*

Both initiatives will continue to develop in the future, further improving customer experience.

**Proactively alerting customers to service issues**: As Scottish Water does not directly bill household customers, we do not hold any personal data. This means it is hard for us to proactively alert customers should we anticipate or encounter a service issue in their area. To help overcome this, we have launched a Text Alert service which encourages customers to register their details with us so we can keep them informed in the future. This has led to an immediate reduction in inbound contacts, driving efficiency in the way we support our customers and allowing our people to focus on those who need help the most.

**Streamlined service standards payments**: A complementary improvement is the introduction of the PayMe app, which means we can immediately transfer service standard payments to customers. This is a much faster and more secure way of transferring money to customers if we have breached one of our promises. Welcomed by customers, this process helps to protect customers personal data as well as ensure quick redress at times when they need it most, we will continue to progress with enhancements in this offering aligned with customer expectations.

**Using insight to improve our decisions**: Knowledge is key in the improvement of service excellence and through continued investment in the development of intuitive customer insights, we will ensure that decisions at all levels in Scottish Water can demonstrate where they have been informed by customers. In particular, the use of our Customer Powered Insight Dashboard (CuPID) allows Scottish Water people to see at a glance, the real time impact of incidents and service issues on customers and communities, facilitating informed, accelerated and more timely decision making.

**Improving Licensed Providers' experience**: Our commitment to service improvement is demonstrated through key initiatives such as our Wholesale Resolutions Team, which focuses on improving first-time resolution through triage and additional support to identify and resolve complex issues. We have also strengthened our digital capabilities through an overhaul of our self-service platform for Licensed Providers, enabling them to provide a more responsive service to business customers. Platform improvements have included a new help centre, redesigned web forms, intuitive process picker and a new service tracking feature, making interactions more streamlined and accurate.

As a result of these initiatives, each of our performance outcome measures has seen an overall increase since the start of SR21.

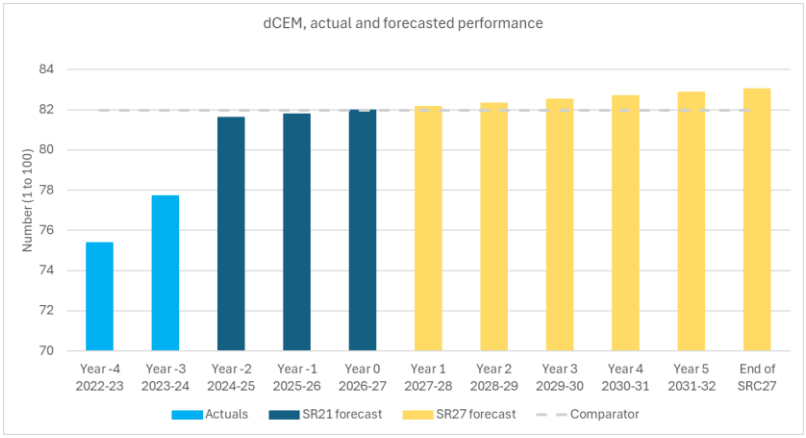


*Figure 1: Our dCEM actual and forecasted performance*

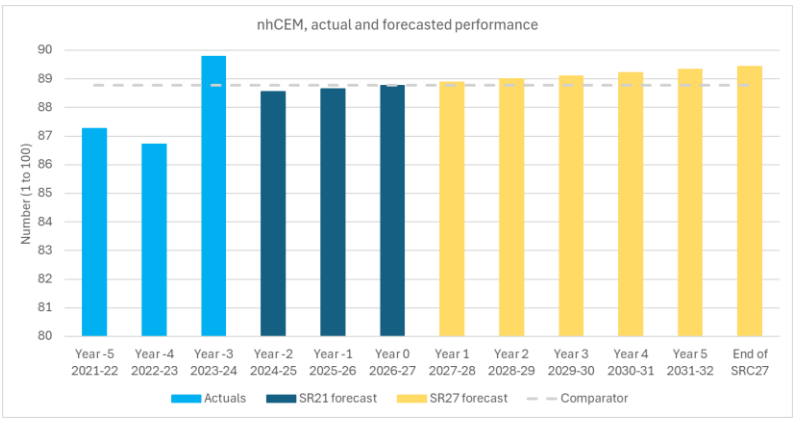


*Figure 2: Our nhCEM actual and forecasted performance*

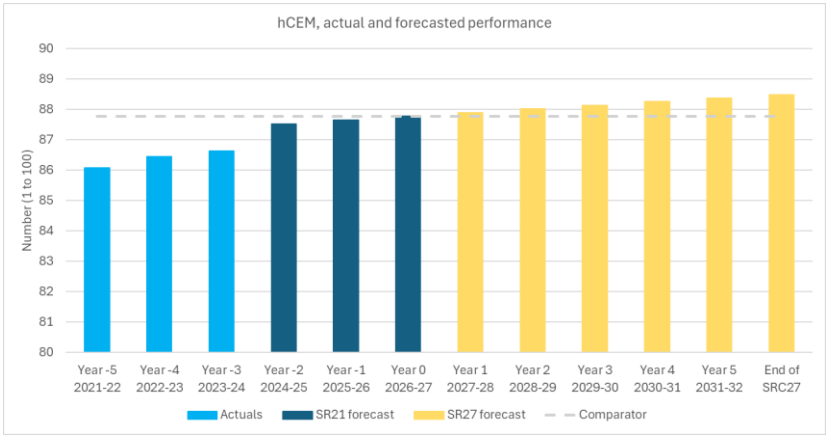


*Figure 3: Our hCEM actual and forecasted performance*

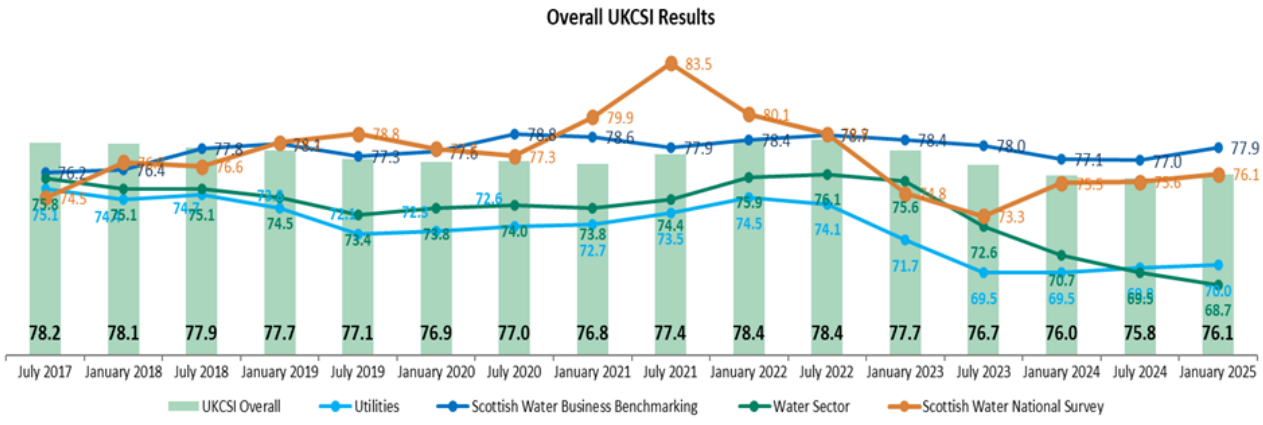


*Figure 4: Our UKCSI historic performance*

## 2.3 What has changed since SR21

Whilst overall customer satisfaction has increased since the beginning of SR21(now at 94.15%), which reflects the positive experience our customers have when they have a direct transaction with us, as we enter our new strategic planning period there is a declining trust level of 67.4% (Q2 2024/25) which has fallen from a high of 80.52% at the end of the previous regulatory period. Table 5 (below) demonstrates Overall Trust score over time.

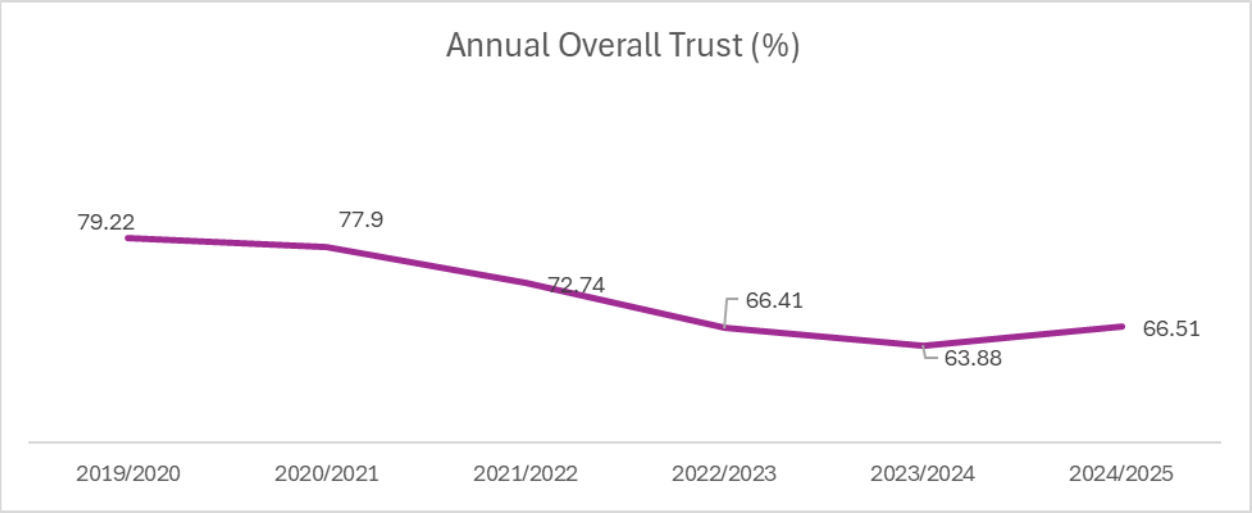


*Figure 5: Our Overall Trust Score*

This decline is driven by negative media coverage predominantly focused on English and Welsh utilities, but Scottish Water has felt a significant impact. Scottish Water's service quality has improved year on year but ever-growing customer expectations, alongside negative media coverage means we must work harder to regain some of our customers' trust and that is integral to our plan moving forward.

We recognise the ongoing concerns around the water industry, and we see the impact this has had on our customer trust levels. Through ongoing research, we know that our customers trust us more because we are publicly owned, and this has informed our media campaign Piped by Us, Owned by You which we launched in 2024. This is the beginning of a conversation with all our customers and communities where we aim to increase understanding of Scottish Water and our public ownership model. We commit to ongoing engagement with our customers to help them understand the value of water as a precious resource, the importance of waste-water processes particularly with regards to our natural environment, and the impact climate change is having on the services we provide. We have seen an increase (2023-24 year end 63.88% to 2024-25 year end 66.87%) in our trust level over this period, however, further work is required to better understand the direct benefit of this campaign.

# 3 The focus of our Customers and Communities Strategy in SR27

## 3.1 Our approach

For SR27, customer and community excellence will be at the heart of everything we do. Our ambition is to improve our performance across all of the customer and community performance metrics in the period in line with the Ministerial Objective 1a and 1b; Scottish Water must maintain or improve current levels of service over the long term and Scottish Water must engage with stakeholders and customers to establish appropriate standards of services for the 2027-33 period and beyond.

Service Excellence is one of Scottish Water's 3 strategic ambitions which ensures the whole business is considerate of the impact they have on our customers and the communities to which they belong in terms of service delivery, cost and environmental impact.

To support the fulfilment of these strategic ambitions in SR27 we have recently conducted research with customers to learn more about their expectations for service fulfilment and this informs our drive to improve and develop of dynamic customer response SLA's from 2027 onwards. Further work will progress to ensure we simplify the commitments made to customers across wastewater services in the same way that we have water services.

Specifically, this research has driven us to focus on six key priorities relating to customer and community excellence in SR27:

- We will **continue to listen to all of our customers** and evidence where we have used their voices in our strategic and day to day decision making – ensuring customers continue to be at the heart of all we do
- We will **use technology and data** to ensure the most effective use of funding through streamlined, simplify, personalise and improve contact channels and service for customers and communities
- We will **continue to invest in our ability to predict and prevent** issues to protect our customers from disruption, whilst optimising our ability to complete first time fixes.
- We commit to further development and **commitment to our service for customers with vulnerabilities**
- We will continue to **develop our workforce** to become accredited customer service professionals
- We will grow our presence in customers' and communities' lives through **community engagement**, building positive relationships and contributing to a flourishing Scotland (e.g. access to our reservoirs).

## 3.2 What we will deliver in SR27

*1.We will continue to listen to all of our customers and evidence where we have used their voices in our strategic and day to day decision making*

We will continue to listen to our customers through our established and robust research programmes both to improve day to day service and inform investment and future strategy decisions. Our research programme ranges from feedback on service issues, seeking opinion on specific investment projects or topics, to gaining opinion on long term business strategy. Our full programme of customers research is ongoing and continuous, gathering feedback on the quality of our interactions with customers, tracking levels of trust, awareness and satisfaction, and seeking insights from our customers on specific investment projects or topics. These are supplemented by strategic investment research, to inform both the Long-Term Strategy and the SR27 Business Plan. As set out in the Customer Research Technical Appendix, the role of

customers in the Review process has been strengthened by the Memorandum of Understanding, between WICS, Consumer Scotland and Scottish Water, which retains the Independent Customer Group to support and challenge Scottish Water's understanding and incorporation of customers' needs and expectations in its Business Plan.

To complement our CuPID (Customer Powered Insight Dashboard) tool, we will continue development and functionality of our Community Map dashboard allowing us to understand service impact on communities of place, informing everything from strategic decision making to tactical engagements. These tools make customer insight accessible and practical, enabling more timely decision making whilst bringing the voice of the customer into the hands of all our people and the dynamic, real-time data will inform tactical and strategic planning.

*2. We will use technology and data to ensure the most effective use of funding through streamlined, simplify, personalise and improve contact channels and service for customers and communities*

We will always continue to pride ourselves on our Scotland-based 24/7 Customer Engagement Centre, allowing customers to reach a human being when required. This is reflected in the customer satisfaction levels that we receive from the interactions with our customers (94.15%). It is appreciated by our customers in that they speak to a person to support them when they have a challenge or require support from us. Our advisers are skilled and empathetic experts, with access to real-time field updates and we dynamically update our responses and processes through our new and real-time online library of resources.

To build on our contact channels with our customers, we will exploit established technology so customers can tailor our services to suit them. This will be achieved through the provision of digitally supported and tailored portals for each of our main customer groups. Our commitment is that we will always be easy to contact and to interact with. We will continue to monitor contact preferences and look to specifically establish contact using existing and emerging channels. Where possible we will enable customers to book their own appointments, provide customers advance warning of potential issues so they can prepare, and provide a transparent view of how work is progressing. These activities will reduce on our Engagement Centre and enable our people to focus on the more complex and challenging customer issues.

Our website will be redesigned to be dynamic, intuitive, and accessible, offering self-help articles, videos, and information tailored to customers' locality or interests within SR27. The website will provide personalised access to our customers, and provide powerful analytics to allow us to continuously improve and enhance the user experience. We will explore and adopt opportunities presented by AI predominantly to support our employees continue to deliver human experiences.

Looking ahead to the next regulatory period (SR27), we will continue to build on these foundations while seeking to maximise value for our customers. Our plans include implementing smart metering for business customers. By working collaboratively with LPs, we expect this new technology to empower customers to improve their water efficiency and take control of their bills and environmental footprint, through increased transparency of their usage. Smart Metering is also one of a number of enablers for Scottish Water to provide a more proactive service, identifying and resolving issues before customers or Licensed Providers become aware of them. We will further enhance our digital capabilities to deliver a more seamless service, maintaining Licensed Providers' and customers' trust and confidence while continuing to deliver service excellence.

*3. We will continue to invest in our ability to predict and prevent issues to protect our customers from disruption, whilst optimising our ability to complete first time fixes.*

In SR27, will continue to develop the fully integrated remote diagnose offering that we have rolled out in the SR21 period. This is where customers are able to send photos or videos which allow us to identify problems and solutions remotely e.g. a burst water main. This allows us to resolve more issues first time, reducing impacts on customers.

Increasingly, as information from our assets improves, and we secure more customers' contact information, we aim to proactively engage increasing numbers of customers in service issues in their area, helping them prepare and minimise any impact on them. Dynamic web links are provided with each text sent to customers, which enables them to see what the issue is, what progress is being made and how they can help themselves maintain supplies. As we build customers data, we will be looking at ways we can enhance this service, personalise updates and support our customers when they need it most. Commitment will be made to explore options to further expand the customer contact data that we hold to enhance our proactive and real-time personalised service offering.

Using customer powered data tools, alongside our asset data, will enable us to identify more issues before they affect our customers, minimising disruption, and giving as much proactive notice as we can. Examples such as monitoring energy consumption to understand if assets are starting to fail, if interventions are required to maintain services and where prevention has not been possible making a clear commitment to our customers that we know our assets and we no longer rely on customers having to notify us of issues – monitors inform our actions and response in an intuitive and dynamic way. Further information on this can be found in our Transformation and Innovation Technical Appendix. Our goal is that all this data is made easily accessible for our customers and communities in an intuitive and relevant way. Ultimately, we aim to make this combination of customer and asset data more accessible to customers, which will allow them to learn where their water comes from, the specific quality, and access any relevant service information as and when they need it, we will start this in SR27.

We will also use technology and our increasingly intelligent assets and systems to connect data points and enable us to protect customers from service issues as we are enabled to predict or even prevent issues from occurring. For example, by placing monitors within our water mains we can detect an issue and work to resolve it before it impacts customers.

*4. We commit to further development and commitment to our service for customers with vulnerabilities*

All our customers are individuals, and we aim to recognise, support, and meet our diverse customers' and communities' requirements in an inclusive and accessible way We will continue to do all we can to personalise our services. We appreciate that many of our customers face personal challenges which may place them in vulnerable circumstances, and we have focused on how we can support them through our expansion of our Priority Services Register. As well as raising awareness through promotion, we have established meaningful partnerships with Age Scotland and other utility companies, enabling us to better support those customers who need us most when services are interrupted. This work will evolve as we ensure we reach all our customers who need some extra help via agencies, the NHS, community groups and our partnerships. The range of services and support on offer will expand as we increase our Register of customers, promoting personal resilience alongside increased accessibility, prioritised care and tailored communications. As the Register grows, we will categorise customers' needs, prioritise assistance and ensure the most vulnerable are looked after first.

### *5. We will continue to develop our workforce to become accredited customer service professionals*

We continue to drive Service Excellence by investing in our people through learning and training, promoting the professionalisation of customer service skills, and encouraging career development within customer-facing teams. Ensuring Service Excellence is a priority for everyone in our business, regardless of their role, we will continue to accredit and qualify individuals with appropriate skills via the Institute of Customer Service's training and development programmes. People are the backbone of Scottish Water and nurturing talented sector individuals to be ambassadors for service and our customers is a key priority for the future. Further details can be found in our People Strategy.

As more services can be delivered online, we may need to provide support to our customers to help them achieve this, and as more customers use these online tools, it will ensure our advisers have more time to spend on complex issues, or with customers who need personalised assistance.

### *6. We will grow our presence in customers' and communities' lives through community engagement, building positive relationships and contributing to a flourishing Scotland*

We are proud of our growing network of Top Up Taps, allowing everyone to stay hydrated whilst out and about. This not only saves our customers money but also the equivalent of 13.8 million 330ml single-use plastic bottles (at December 2024). Our successful campaigns will continue to strengthen key messages for our customers and communities. Nature Calls will build momentum and increase its focus on flooding and how everyone can play their part in reducing the impact of the changes to our climate. Our campaign to promote public ownership Piped by Us, Owned by You will galvanise Scotland to notice and nurture water as a precious resource, in which we all have a stake. We will take a step change in the promotion of the efficient and mindful use of water by all customers, focusing on helping everyone reduce consumption to levels seen elsewhere in the UK whilst continuing to campaign nationally to implement a ban on harmful products such as plastic wipes.

In terms of engaging further we will take a holistic, place-based, demand driven, approach in hotspot areas such as communities with high water consumption, drought risk or sewer blockages, promoting our education programme, specific and relevant campaign messages, outreach events, partnerships with local press and additional media presence. Boldly, we will increasingly open our local assets to communities to educate and inform the local community, build relationships through trust, and open the water industry as a potential career for young people. Driven in part by the needs of the capital programme. We will also build on the success of our live access to Combined Sewer Overflow monitor data to inform our customers of real time water quality (further detail can be found in our Water Quality Technical Appendix).

Recognising how increasing numbers of customers, in particular customers of the future, consume information we plan to begin a series of podcasts getting under the skin of some of the perceptions and interesting topics from within the water and waste-water sectors, removing industry jargon and making information interesting and accessible for all our customers.

Customers often ask us for information about all we do, we will respond to this and build an informed generation of responsible water citizens. Our new Generation H2O programme provides age appropriate, tailored, engaging materials for schoolchildren and future customers to learn about how water is a precious resource. Launched in September 2023, in its first 15 months the programme has reached over 786 teachers and 42,670 young people. This is just the beginning,

we will broaden the scope of Generation H2O through expanding our programme of school visits, and via our Capital Investment programme, promoting STEM skill challenges in communities to address skills gaps and establish lifelong partnerships founded on customer appreciation. This will complement the desire for Scottish Water to nurture our customers as partners who understand their role in the success of our business, whether through taking an active role in using less water or ensuring only the correct items are flushed.

We will continue to develop our engagement approaches with our LPs and developers, including building upon the established relationships across the development community through critical in-person events. For example, the annual Development Forum provides an opportunity to engage development customers as well as educate and inform on best practice initiatives that benefit Scotland as a whole.

Through our established and trusted relationships with organisations such as Homes for Scotland (HFS) we will continue to work alongside industry stakeholders to inform best practise and transformational shifts that are required to reduce development impacts on existing customers and communities as well as the local environment.

## 3.3 The investment required to deliver our SR27 strategy

To deliver the above initiatives and ultimately the six priorities that will support our customers and communities throughout SR27 we are proposing to invest £3.7m.

It should be noted however that this £3.7m will be further augmented by investments described in the Digital Technical Appendix and that form part of the wider digital ecosystem build as part of SR27.

*Table 2: Our proposed SR27 investments*

| Investment Summary | Investment (23/24 prices) |
|---|---|
| **Customer Research** | £1.2m |
| **Priority Service Register Improvements** | £2.5m |
| **Total** | **£3.7m** |

## 3.4 The outcome of our strategy

Through the investment in and delivery of these activities we will continue to improve our customer experience across all measures, with this performance aligning with our long-term projections and aspirations (detailed in our Long-Term Strategy). To complement these measures, we will look to raise the prominence of established Trust tracking as a further indication of our reputation and performance in delivering Service Excellence:

*Table 3: The outcome of our strategy*

| Level of Service | Year 1 2027-28 | Year 2 2028-29 | Year 3 2029-30 | Year 4 2030-31 | Year 5 2031-32 | Year 6 2032-33 | SRC33 | SRC39 | SRC45 |
|---|---|---|---|---|---|---|---|---|---|
| **dCEM** | 82.17 | 82.34 | 82.52 | 82.70 | 82.87 | 83.04 | 84.06 | 85.01 | 85.91 |
| **nhCEM** | 88.89 | 89.00 | 89.11 | 89.22 | 89.33 | 89.43 | 90.07 | 90.66 | 91.22 |
| **R-MeX** | SW score to be in the upper quartile of the list of UK Wholesalers | | | | | | | | |
| **hCEM** | 87.90 | 88.02 | 88.14 | 88.26 | 88.38 | 88.49 | 89.18 | 89.83 | 90.44 |
| **UKCSI** | SW score to be in the upper quartile of the [list of UK utility companies] | | | | | | | | |

## 3.5 Why we are confident in our strategy for SR27

The activities we describe above and the investments we are proposing are based on both our long-standing approach to working with customers and communities and our continuous improvement of engagement approaches, tools and techniques developed historically including in SR21. The plans for SR27 build on the momentum established in the SR21 period, elevating our service experience and offerings and aligning with increasing customer expectations and demand.

## 3.6 What are they key assumptions of our strategy?

One fundamental key assumption is that Scottish Water secures the funding that will ensure the maintenance of service levels at those currently benefiting customers, whilst utilising customer and asset data to inform decision making with regards to investment prioritisation and planning. Should there be a material reduction in investments proposed we will revisit our six priorities and the investments proposed under each to ensure that our customers and communities continue to receive our full support in the most appropriate manner.

As described in Section 3.3 a large proportion of activities proposed are digitally enabled and therefore the strategy presented within this document is predicated on the delivery of the Digital Strategy.

# 4 Implementation

We will measure our success on this journey through the evolution of key customer listening metrics such as the Customer Experience Measures, complemented through ongoing trackers such as the UKCSI benchmark and public perception and reputation monitoring of aspects such as customer Trust. We also plan to develop an industry leading, holistic Service Excellence Assurance Model which will clearly illustrate how the work we do is positively, or negatively impacting our ambition to deliver Service Excellence, holding each area of the business to account on behalf of our customers (early SR27). This will be developed collaboratively with each business unit and will ultimately allow each employee to clearly see how the work they do contributes to Scottish Water's Service Excellence overall. The Model will also enable us to shine a light on much of the positive feedback and accolades we proactively receive from our customers.

# 5 Conclusion

It is vital to the success of our SR27 plan and our LTS that our customers trust us and see themselves as partners with a personal share in all we do. We will continue to foster a relationship of openness and transparency with our customers and communities, so they understand who we are, what we do and how we do it.

Our journey to Service Excellence will never stand still. As customers' expectations increase and technology advances, we will continue to strive to be the best we can be for our customers, listening monitoring and adapting to meet their growing expectations. We are proud to serve our customers and the communities of Scotland and will never stop working to make it as easy as possible for them to contact in the way that suites them and keep them informed as their journeys progress. We will keep our promises and work together as One Team for the benefit of all our customers, to help them, their communities and Scotland flourish.

# People
## Technical Appendix 016

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# 1 Executive summary

Our people have always been core to the delivery of Scottish Water's long-term ambitions and SR27 is no different. Our people, their skills, behaviours and engagement will continue to make a direct impact on our ability deliver *Service Excellence*, *Beyond Net Zero Emissions*, and *Great Value & Sustainability.* We know that our people are key to delivering our success and we have a constant focus to ensure they are clear on their role, capable of all we ask of them, inspired by great leadership, and have all the right tools and environments to be successful.

Scottish Water has a proven track record of positive engagement with our people, with the success of our people proposition and experience being recognised in the through the positive feedback our people have provided in our employee engagement surveys. This has also been recognised through numerous external awards including the 'Best Public Sector Employer in the Family Flexible Working Awards' and 'Investors in Young People – Platinum level'. We will build on this success and take our SR21 learnings as the foundation of our SR27 People Strategy.

Our people strategy for SR27 is more ambitious than ever before. It will build upon the achievements of SR21 and enable us to operate well in a significantly changing business environment where we face challenges including greater competition in the construction labour market, increasing need for new skills to tackle issues such as climate change adaption and rapid advancements in digital tooling.

Our focus in SR27 will be to evolve how we work, think, and deliver in a way that is successful for future challenges. We must develop new ways of collaborating and gain value from the diversity of thinking that will emerge as we broaden partnerships. We will continue to ensure that the customer remains at the heart of all decision making in our people practices and training. Our Scottish Water characteristics – to be bold, inspiring, responsible and caring remain critical. This People Strategy sets out the investments, capabilities, culture and mindset we need to deliver that shift. In summary our People Strategy is centred on 3 pillars, under which we have designed our SR27 People Strategy initiatives:

### Clear, Capable People

- Ensure everyone working for customer good for Scottish Water is clear on the part they play in our success, and feels empowered to do the right thing
- Widening our approach to Technical Skills Academies – to support the larger and more diverse investment portfolio planned for SR27
- Continue to build our digital capability as digital offerings change
- Undertaking Strategic Design and Resourcing – to ensure that our people are appropriately structured and aligned to the technical needs of our wider business plan.
- Further embed our performance management approach, ensuring we are a productive, high performing organisation.

### Inspiring and Empowering Leadership

- Focus on the role of the leader in setting the vision and purpose, managing performance, empowering, communicating, and supporting their team to adapt to the changing needs of their roles.
- Ensuring our leaders lead through Character, embodying bold, inspiring, responsible and caring in how they lead

- Create a leadership blueprint for the future, aligning talent management, succession planning and development to support this.

### Inclusive Engaging Environment

- Building a progressive, strong employee listening and engagement strategy informed by and measured through surveys
- Accepting of and benefitting from the diversity that our employee make-up gives us and changing our practices when this is relevant.
- Building on fair and transparent reward practice with an increased focus on total compensation
- Changing people practice that are both people centric and deliver business outcomes as new requirements evolve e.g. changing working patterns due to digitisation
- Creating a balanced workforce composition, encouraging learning from partnerships
- Raising our public profile as an employer

Our people are proud to provide the excellent water and waste water services that are essential to everyday life for households and businesses across Scotland: making a critical contribution to the country's health, wellbeing, economic prosperity and natural environment. Customers expect us to provide an affordable, sustainable, low carbon services – and the changing climate will increasingly threaten our ability to deliver these services. To deliver this; we have developed a clear People Strategy that underpins our SR27 Business Plan.

We expect to invest a similar amount to that required in SR21.

*Table 1: Summary of our people strategy needs*

| Investment Summary | Projected Cost | Projected Benefit | AR3 or Enhancement |
|---|---|---|---|
| **Clear Capable People**<br>Technical Skills Academies<br>Digital capabilities<br>Strategic Resourcing | £5-10m | New technical skills academies<br>• Enhanced digital capabilities e.g. AI improves quality and productivity<br>• Appropriately designed and resourced organisation | Enhancement |
| **Inclusive Engaging Environment**<br>Working patterns changes<br>Changes to workplaces<br>Improving employee involvement and participation | | • Organisation enabled with working practices that are both people centric and delivery business outcomes<br>• Organisation has workplaces that are inclusive and meet the needs of all employees<br>• Organisation has strong employee involvement and participation including a productive employee relations environment | Enhancement |
| **Total** | £5-10m | | |

The proposed investment in Table 1 reflects our current assessment of the cost of initiatives described within this People Strategy. We have not yet allowed for these costs in our proposed Investment Baseline, rather - between Draft and Final Business Plan submission - we will further build out the detail of the initiatives allowing us to assess how best to account for them within our business plan.

# 2 Background

## 2.1 Context

Scottish Water has developed a new People Strategy aligned to SR27 with a view to our Long-Term Strategy. It demonstrates our commitment to our people, and understands the role our people play in delivering for our customer and our environment. It will ensure we balance getting the most capable employees, with the right resource levels, using well-crafted meaningful roles, to ensure we deliver the outcomes required in SR27.

We rely on skilled diverse employees with a broad range of different job types to be able to strive for achieving service excellence, environmental sustainability and great value. It is incumbent on us to attract and retain the right skilled resources, create the conditions for motivation, and work together to become capable and productive.

Our new People Strategy considers how to best achieve this in a changing context, where these changes include:

- **Increasing construction demand –** the scale of our investment will impact on our ability to resource. Construction roles will become increasingly hard to fill, and competition for key skills will increase
- **Changes to weather** – we must adapt our practices to respond to the challenges caused by changing weather systems. This will require innovation and dialling up specialised skills.
- **Advancements in digital technologies** – digital advancements are rapidly changing how we work and we must continue to consider their effects on job roles, and skills.

These changes mean that we must build an employee base who are diverse and inclusive, proud and engaged, and advocates for Scottish Water in the communities in which they live.

## 2.2 Building on SR21 foundations

We have consistently delivered key people initiatives to support the success of our business. Progress has included:

**Technical Skills Academies**

In advance of 2015 we introduced our technical skills academies. The academies contained three faculties which focused on core service areas of water distribution, water resources and treatment of both water and waste water. Our academies have been central to the development of our youth pipelines and the management of our apprenticeship programmes. Our apprenticeship programmes help ensure we have the operational and technical knowledge required to run the business and supports positive movement in our age profile.

During SR21 we have seen 207 apprentices enter into our academies, 87% of whom have been retained within our business. We also have a Customer Experience Academy which has played a key role in developing the skills of our customer facing employees and the improvements we have made in our customer experience scores which is at time of writing sitting at 94.15%.

During SR21 we extended our academy model with the introduction of a new Digital Skills Academy which underpins our investment in technology and provides employees with the skills and confidence to use new digital applications, software and operational technologies.

### Enhancing clarity on strategic direction

In SR21 our employee feedback suggested that our people were not clear how their role fitted into the strategic direction of the business. Our people needed understand the importance of their job, and how it contributed to our strategic ambitions, and how we deliver for customers. So we made changes to how we communicate and engage to drive increase connection. To improve this we:

- Created “Plans on a page” for each directorate to be clear on how they contributed to strategic direction. This enabled a clear cascade from business objectives to personal objectives
- Made a significant investment in an All Employee event ‘Connecting with purpose’ which increased our survey score by 8% with a 26% increase in connecting with Strategic Ambition since 2023.
- In 2023 we implemented a new Performance Management capability called My Story. (See performance management section for further details)

### How we work

Scottish Water adapted early to flexible working, when we rolled out an initiative in 2013 called ‘agile working’. This gave employees permission to work more flexibly against one of four workstyles (fixed, agile, field or free). We rolled out relevant technology aligned to the needs of the role and training. This put us ahead of the curve in COVID where we were able to get all employees who could work from home enabled within the first few days – much in advance of the water utilities generally. Our ability to keep all employees productive was praised. This approach has developed into hybrid working, where we aim to balance the need for choice over how we work, with the need to have strong connection with regular time spent in the office. This outcome aligns with our ‘intent to stay’ measure in our employee survey which is currently 77% - 18% above the UK wide benchmark.

### Wellbeing and Inclusion

Our Public Sector Equality Duty (PSED) outcomes focus on providing opportunities for young people, increasing workforce diversity, improving leadership diversity, and achieving high engagement and retention among under-represented groups. Our youth programmes, supported by partners like MCR Pathways and Career Ready, support young people from areas of social deprivation. Our efforts were recognised with the 'Investors in Young People – Platinum level'. Positive actions in recruitment and support for neurodivergent individuals earned us recognition as a ‘Neuro Champion’ at the 2024 Celebrating Neurodiversity Awards. We were also finalists in the 'HR Network Awards 2022 - Diversity & Inclusion Award of the Year'.

The Wellbeing & Inclusion team has enhanced our organisational culture and fostered workplaces where everyone can thrive. Achievements include awards: 'Best Public Sector Employer in the Family Flexible Working Awards' and the 'Top Employer Awards 2020'. In 2022, we secured ‘Flexibility Works Scotland's Top 10 Flexible Employees’ award and achieved Employer’s Network for Equality & Inclusion (ENEI) silver status in 2023 and 2024, recognising our efforts in diversity and inclusion. Our Belong groups, now comprising 10 active groups, have contributed to fostering a sense of community. They promote respect and understanding by sharing information and

raising awareness on various topics, providing platforms for connection and support. We've created & implemented a Diversity, Equality & Inclusion (DEI) dashboard, providing Senior Leaders with visibility into our DEI metrics compared to Scottish census data. This tool helps track progress, identify areas for improvement, and guide strategic decisions, and drive meaningful change.

Our Wellbeing programme has won awards such as the 2022 HR Network National Awards - Health and Wellbeing Award of the Year and the 'Best Wellbeing Strategy in the Public Sector' at the Great British Workplace Wellbeing Awards in March 2025. Employee Engagement surveys consistently show high scores in the Wellbeing index, reflecting the programme's value.

**Reward Architecture**

A robust reward architecture is critical to ensure our people have a structure that is fit for purpose, well understood, and feels transparent and fair.

In 2024 we implemented an entirely new framework for employees which significantly improved how we reward our people.

We implemented:

- **New Job Profiles**
  This replaced out of date job profiles which didn't work well for the jobs we do today and removed duplication. These were created using a digital tool to ensure consistency.
- **New Role Catalogue, and Job Evaluation Process**
  This replaced a SW specific job evaluation system that had been in place since 2003. It created a clear role catalogue which described levels and type of work, so everyone can see where jobs sit across the organisation. Jobs are evaluated and mapped to this role catalogue which is underpinned by Hay Evaluation.
- **New Salary Structures**
  We now have 8 clear grades, with less overlap than previously existed, which have been set with better alignment to market rates of pay.
- **New Pay Progression**
  We have created clear and transparent pay progression points with a target rate in each salary range, so everyone can see what is required to move through the ranges, and it is applied consistently.

This was then followed by a similar exercise for our management population.

Both exercises made some step improvements in transparency and clarity which improved our Equality Impact outcomes. They provide a robust framework on which to make further progress on career development in the future.

**Performance Management**

In 2023 we implemented a new Performance Management capability called "My Story". This allows employees to have open and honest conversations about how they are performing, support in their performance and learning, while ensuring connection, and supporting Scottish Water's delivery of our purpose to support a flourishing Scotland. We have continued to build our experience of managing performance in this way, and this year we used it for end of year

contribution ratings which will impact on pay, linked to the pay progression implemented in our reward architecture.

*Figure 1: The My Story Conversation Flow*

**Leadership Development**

Leadership Development is critical as strong leaders drive success, performance, and are key to our employees' experience of Scottish Water. It has always been an area of focus for us, and the role of the leader has developed throughout Scottish Water's evolution. We have a proven track record of developing leaders. During SR15 we placed an emphasis on the development of future leaders to ensure we had a sustainable pipeline of business managers and senior leaders to lead our business.

We undertook work with occupational psychologists and select groups of internal talent spotters to identify people with the potential and aspiration to move into business management (BM) positions. We then introduced a structured learning programme working with a leading UK business school, selected leadership development providers and with bespoke internal interventions (mentoring, director discussion groups, stretch assignments, business projects and job moves) supported by our own Executive Leadership Team.

These programmes were extremely successful and 48% of our current senior leader population is made up of people who progressed through our future leader programmes. These programmes were also very successful in relation to equality, diversity and inclusion (ED&I) and developing women to take on BM roles and while only 31.2% of all employees are female 41% of our BMs are female, with many of this group progressing through our future leaders' programmes.

During SR21 we introduced our Role of the Leader Model and what it means to be a leader in SW. This model was created based on external research, our knowledge of business transformation in Scottish Water and feedback from internal leadership focus groups and employee experience surveys. Our Leadership Development has focused on this model, seeking to develop leaders who are skilled in communications, leading change, managing performance and supporting employee growth and development. There is also an emphasis on creating the

right environment for success – one which is psychologically safe – and the key behaviours and mindsets that our leaders need to lead with character, accountability and agility.

We also shifted our focus during the SR21 period towards the development of a talent pool of future leaders for first line leadership with our Take the Lead Programme, with a focus on inclusion we created opportunities for over 300 people who expressed an interest in becoming leaders. We have successfully revitalised our talent pool for entry level into leadership and almost 50 people have already moved into their first leadership positions from within this group.

## 2.3 We must continue to evolve our people strategy to meet future demands

Our People Strategy must ensure are people are equipped to work on our future challenges, with some big shifts that our people strategy must address:

**Putting Customers at the Heart of Decision Making**

Our people require the skills to put the customer at the heart of every decision. This means we must continue to grow our customer centric behaviours and adapt them as customers seek to engage with us in more digital ways. We must develop our ability to innovate to reduce customer demand and create a workforce of advocates who work across Scotland to influence customer behaviour.

**Partnerships delivering value for money**

Increasingly we will work in partnership though an Enterprise model to invest in the repair, refurbishment and replacement of our aging assets, and so our People Strategy must go beyond the people of Scottish Water and consider the resources and skills we need in partnerships and throughout the supply chain. We must consider resourcing, skills, reward, and engagement in its widest context ensuring that our strategic partnerships can feel part of Scottish Water.

**Increased use of digital solutions**

As digitisation, automation and AI further improve the way we work, we must consider the impact on job design, and digital skills requirements including the capabilities to harness the power of AI and cyber security skills. A business that once relied on the skills to solve and recover when a problem occurred, must now learn the skill of data analysis, prediction and prevention. See our Digital Technical Appendix for further information on our future digital plans.

**Protecting the services we rely on**

As we move to influence our customers and communities and the choices they make around the use of our systems, we must build an employee base of advocates for Scottish Water so that our employee reach can form part of our influence to protect the services we rely on. We must also create a resourcing profile that can deal with increasing extreme weather events in the face of a changing climate.

**Use of nature-based solutions and creation of more green spaces**

Our depth of capability particularly in relation to flooding, nature based solutions, and creation of more green spaces will be important, as will learning to work with new and emerging stakeholders. In SR27 this will become a key part of some job roles, and new skill sets to manage this will emerge. See our Managing Waste Water Flows Appendix for further information on our future flooding plans.

### Embracing circular economy principles

Our people must develop the capability to not regard anything as waste and seek to reuse and repurpose as a key part of what they do. This involves developing those who can be part of the larger transformations such as bioresources, and small behaviour change in our people and how they approach all aspects of their work.

### Continued trend towards flexibility, diversity and wellbeing

All organisations must recognise the individual needs of the employees and the factor it plays in motivation and engagement. We are no different - our people expect that flexibility, diversity and wellbeing are all now key in how they expect to be treated at work, so we must continue make progress towards and beyond our PSED outcomes and align with the Equality Act. From a wellbeing perspective employers will be expected to make further strides to ensure employers make every effort to support a culture of wellbeing.

# 3 The focus of our People Strategy for SR27

## 3.1 Our approach

We have distilled our People Strategy vision statement into three people strategic objectives, initially created in 2024, but which remain our pillars for SR27. This builds upon our strong track record of delivery of people initiatives in SR21 and aligns to the needs for SR27 (as described in Section 1.3), and give us the opportunity to ensure that our people are capable of delivering in the future.

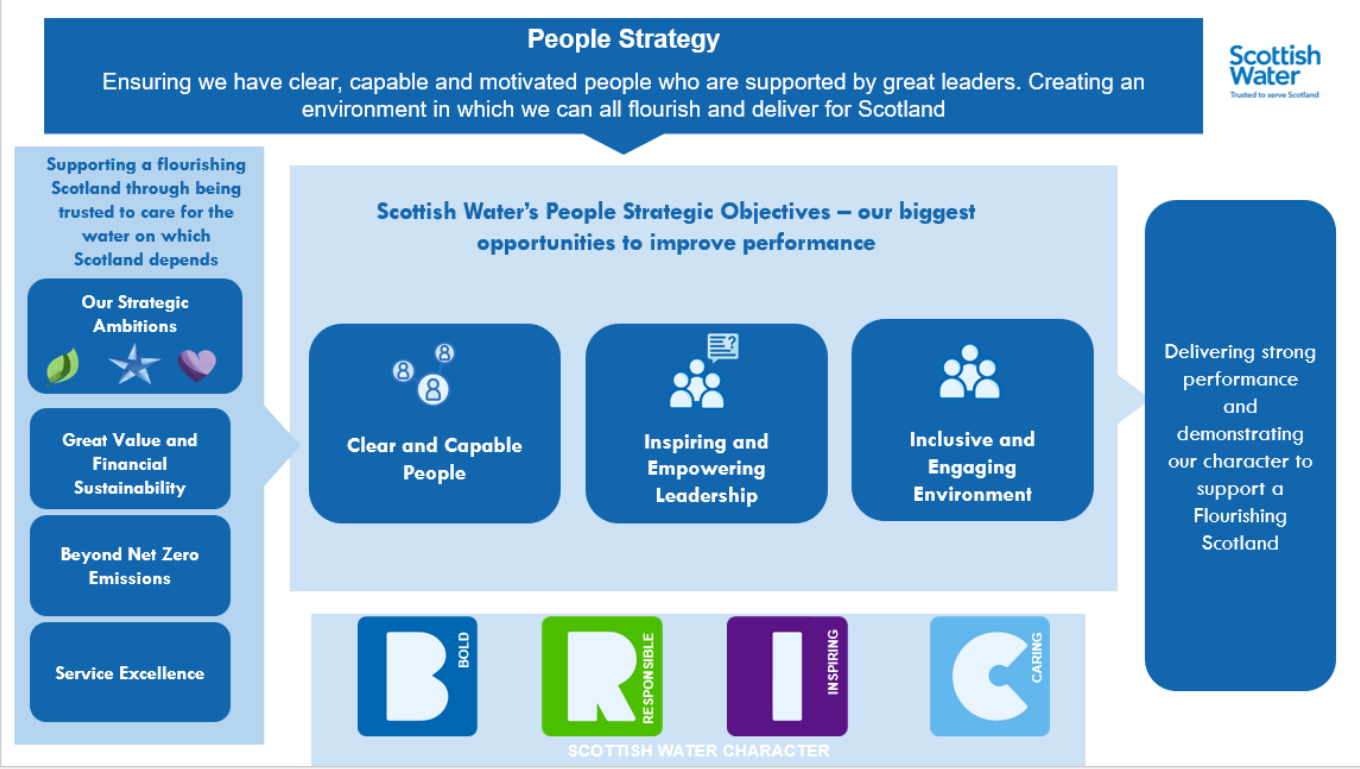


*Figure 2: A summary of our People Strategy*

## 3.2 We have developed clear activities under each of our key SR27 pillars

### *3.2.1 Clear and Capable People*

In SR27 we will:

- **Create a strategic resourcing plan across Scottish Water and supply chain.** The external environment is extremely challenging in relation to the availability of skilled resources (as described in Section 2.1), with significant investment taking place in Scotland and across the UK in critical national infrastructure, renewables, and the water sector. We fully anticipate that skills shortages, hard to fill vacancies and high wage inflation in the areas we need to deliver our service and capital delivery will further increase during the SR27 period as a result of this increase investment. This is likely to require investment in extending our academy type model as part of our Capital Investment Programmes moving forward. We will work prudently in the run up to the start of the SR27 period to plan for this (i.e. through to Final Business Plan submission) using skills requirements identified in our wider technical appendices but expect it to remain a focus throughout the SR27 period.
- **Ensure our organisation is designed for success.** In order to ensure that all our people are clear and capable we must have a fit for purpose organisation design. In SR27 our core principle will put the customer at the heart of all decisions. We will also ensure we design for accountability, value, capability and simplicity. This will help ensure people can

navigate our organisation easily and be clear where accountability sits. This will also align with our strategic resourcing plan and may require investment where we need to make changes to resource levels.

- **Improve business performance through performance management and connection** of our people. We will ensure that individual objectives flow through to outcomes, and we manage any areas of underperformance. We will move from ensuring compliance to a focus on quality conversations and performance management. In SR27 we aim to use clear performance management to drive productivity, in order to achieve efficiencies. We will continue to make the link between the work our people undertake, the output of their team, department, directorate, and the wider impact on our strategic ambitions, and contribution to Scotland.
- We will **develop meaningful essential training, technical competency frameworks** to make sure we can build the right new capabilities for the future, in order that our people can work in a skilled and confident manner, beyond zero harm. This will require investment to move towards employees being able to work in increasingly digital ways.

### *3.2.2 Inspiring and Empowering Leadership*

In SR27 we acknowledge that our leadership remains a cornerstone of organisational success. Our approach to leadership will continue to emphasise the behaviours expected of our leaders – bold, inspiring, responsible and caring, as these remain relevant for a commercially run, independently regulated and publicly owned water utility.

We will focus on creating the right leadership blueprint for Scottish Water, with leaders focused on setting the vision and purpose, managing performance, empowering, communicating, and supporting their team to adapt to the changing needs of their roles.

The success of this focus will be measured by our employee survey, retention, and overall company performance.

In SR27 we will continue with these types of talent and leadership interventions that have served us well, however we expect these to be much more digitally able, using people analytics to help inform our leaders into their leadership style. Technology for assessing leadership style and gaining feedback will be inbuilt. We will also consider the extent to which these can be used throughout our Enterprise Model.

In SR27 the focus will remain on creating future leaders, and we will determine the levels of leaders we need to build in the run up to SR27.

We also plan to introduce a more consistent systemised approach to talent and succession management and strengthen our internal resources for coaching and mentoring.

### *3.2.3 Inclusive and Engaging Environment*

Our people must be surrounded with everything they need to thrive. This includes the tools we use at work (the right technology and digital tools), to the environment (workplace, vehicles), to being supported correctly (with a focus on inclusion), to people being accepted for who they are (welcoming diversity).

### How we work

How we work will continue to be important and we will balance carefully the need for people to have some choice over how and where they work, with the need to connect and gain energy from each other. We recognise that our roles are different, and ensure that whether work revolves round visiting sites, or data analytics, we will create the right environment for productive work, and strong relationships. People are also different, and must feel able to come as they are, where their differences are harnessed and celebrated. This may require investment in our workplaces which may become significant as Equality Legislation changes.

### Reward

We will continue to embed our fair and transparent reward foundation. We will dial up our employees understanding of their total compensation package, as there are many aspects of working for Scottish Water that can go unnoticed. We will promote the overall employee value proposition, in collaboration with other teams in the Directorate and across the business, linking this to the reasons why people want to work at SW. We will also consider the shape of our incentive plans for SR27, working with government and regulators to ensure all reward mechanisms support delivery of outcomes and efficiencies for our customers.

We understand there will be a continued focus from our owner around how we enable people to work differently – for example 4 day working. Echoing the approach taken for implementing a 35-hour week, this will take considerable investment to consider different working patterns and ways of operating to support progress in this area.

### Governance

In SR27 we will review our People Policies and processes to ensure that they are simple, and effective. We will create appropriate controls on the size and shape of our organisation to manage headcount and potential grade drift, which will remain governed by a Business Design Authority.

### Inclusion and Wellbeing

In SR27 we make progress towards our 2025 – 2029 PSED Outcomes and form our future outcomes. This will move us towards recognising, supporting and meeting our diverse customers and communities' requirements in an inclusive and accessible way, and ensuring our employees reflect Scotland's diversity in relation to women, minority ethnic people and disabled people. The employee experience will be inclusive for diverse groups, and focused attention will be given to enable us to increase opportunities for individuals whose career and development opportunities may be limited due to their background or the place where they live and provide enabling environments in the early stages of their careers with us. We will continue to improve on our offering with regard to Occupational Health, Physio, Employee support programmes etc with a focus on Wellbeing. They will continue to give our employees a number of ways of seeking appropriate help.

### Engagement and Advocacy

We will work hard to understand what our people need from a quickly changing work environment. In SR27 we will continue to roll out our listening strategies to allow our employees to shape our plans and strategies. Surveys and action planning will help us make the right improvements. We will build a programme of employee advocacy which encourages SW employees to engage with customers and communities, providing them with the tools and information to do that easily and professionally.

Critical to delivering our Long-Term Strategy, is a wide consideration of how to engage our employees, their relationship with their employer, our employee relations context from their relationship and ensure these are successful alongside all the other ways in which employees connect. We will invest to improve the context in which we work, delivering more effective ways of working together that enable involvement and participation. This will promote better decision making, engagement, ownership of change and ultimately enable us to deliver our key strategic priorities.

## 3.3 We are confident that our People Strategy will provide and sustain the necessary skills and capabilities to deliver our SR27 plans

Historically our focus on people has been strong and has led us to create high performance environment with a workforce that feels engaged and empowered and we will continue this trajectory in SR27.

The activities we have designed to deliver our SR27 People Strategy (as described above) are driven by our SR27 plans (and the capabilities identified to deliver these investments) and our deep understanding of the underlying wants and needs of our workforce more broadly. We have used each of our main Technical Appendices to identify these capabilities and then overlayed the initiatives that we know are critical to successfully operate an organisation where we have capable and motivated people who are supported by great leaders, creating an environment in which we can all flourish and deliver for Scotland

However, we recognise that the landscape we operate may change, sometimes rapidly (i.e. COVID-19). Therefore, we will remain agile, reviewing our strategy and its constituent activities on a yearly basis such that we can remain flexible and adaptable to changing conditions; pivoting where appropriate to support our people and the service they provide our customers.

# 4 Implementation

## 4.1 We will continue to evolve our People Strategy implementation plan in line with Final Business Plan submission

Our People Strategy must be strictly linked to the investments we have proposed in our SR27 plan to drive the right focus and therefore we will continue to develop our People Strategy implementation plan as we move towards Final Business Plan submission. More specifically, we will work with the wider Scottish Water business to continue to identify specific skills and capability requirements that must be built into our strategic workforce plan.

Nevertheless, we have well established governance rhythms, reporting and communication mechanisms which we will nevertheless continue to utilise throughout SR27.

These include:

- **Regular Board meetings on reward and talent**

  Our Board focus on talent on an annual basis, ensuring that we are developing our talent towards our strategic goals, planning for leadership succession, and managing risk. Our Remuneration Committee plays a key role in setting compensation framework and executive pay.
- **An Executive Leadership Team (ELT) approved People Strategy, and People Business Partners supporting implementation**

  Our ELT take a close interest in setting people management practice, and act as sponsors for our key people initiatives. They also work with People Business Partners to ensure the people strategy is enabled in their directorate.
- **Strategic Resourcing and Talent Sessions**

  This allows our leadership to consider workforce planning, assessing current and future talent needs, the challenges in attracting and recruiting them, addressing skills gaps through analysis, and optimising how and where talent is deployed across the organisation.
- **Performance Management Practice**

  All leaders have regular My Story check ins to ensure our people have clear objectives, a personal learning plan, an opportunity to discuss how to remove blockers, and to describe pride with what has been achieved so far. These have 3 clear components – setting yearly objectives and leaning, a mid-year review, and an end of year assessment of performance. This is linked with each Directorate having a plan on a page so that My Story objectives can link into the overall vision of what is to be achieved.
- **A celebration of people's achievements through recognition events**

  It is critical for Scottish Water to set the standard of what good looks like and give our employees the opportunity to celebrate when we deliver. This includes team celebrations at the end of a big project, corporate awards which celebrate achievement of goals, and the people who made it happen, and other celebrations (such as long service awards). Internal customer service awards are also well embedded in our business. We want our people to have the opportunity for boosted morale, to feel their hard work is recognised, and to create memorable moments.
- **A people section in our annual report and accounts**

  Every year we outline progress against our People Strategy in our annual report and accounts and highlight anything significant which has been delivered through it.

- **Our people activities will be audited as required by the Audit Committee**

  We align with our Audit committee duties, with audits carried out at the intervals agreed with our Audit committees. This ensures compliance with legislation, fosters equality, and proactively addresses risks.

# 5 Conclusion

Scottish Water's success since 2003 has relied on our ability to deliver through our people. We have always invested significantly to ensure our people are engaged and equipped for the challenges ahead. The challenges in SR27 are some of the toughest we have faced, so more than ever we must secure the commitment of our people for the journey ahead. We feel confident in our ability to do this and have the capability to dial up and dial down as the world changes round us.

Our strategy for SR27 focuses on ensuring every individual is clear on their role, why it matters, what they deliver, how that is measured, and the difference that makes to Scottish Water customers. It ensures that our people are developed to be capable of everything they are asked to deliver with increased learning and development to meet the needs of future challenges. It empowers leaders to be inspiring to lead their people to make productivity improvements. It invests to ensure our people have everything around them they need to deliver. Lastly it respects our employees who are encouraged to bring their diversity of thinking and create an environment where they can feel included and give of their best.

We believe this People Strategy will be a critical enabler of the SR27 Business Plan and as we move towards Final Business Plan submission we will continue to iterate this strategy.

# Digital
# Technical Appendix 017

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# 1 Executive Summary

Digital technology is now core to the delivery of Scottish Water's long-term ambitions: *Service Excellence*, *Beyond Net Zero Emissions*, and *Great Value & Sustainability*. Digital technology, data and analytics now underpin nearly all critical business processes and customer interactions. In SR27, our digital strategy pivots from foundational cloud migration to becoming a direct enabler of business transformation, achieving better business outcomes at lower cost and carbon. This plan sets out the investments, capabilities, and governance we need to deliver that shift.

Our SR27 digital investment plan will modernise our platforms, improve operational resilience, protect against evolving cyber threats, and accelerate the intelligent use of data, analytics and artificial intelligence (AI) to support better decision-making and service delivery. This includes full migration from legacy data centres, enhancement of our cloud-native platforms, supporting secure convergence of Information Technology (IT) and Operational Technology (OT) systems, and the adoption of agile, DevOps-led delivery practices.

We are also preparing for the future, with targeted investment in artificial intelligence, secure digital platforms, and data-driven operations that will underpin greater efficiency, automation, and customer satisfaction. Our transition to a more adaptive operating model, supported by a new partner ecosystem from 2026, ensures we have the capability, capacity, and culture to deliver at scale and pace.

As our assets and networks become increasingly digitally enabled - through remote sensing, telemetry, and intelligent automation - our ability to design and operate them securely must keep pace. Security will be embedded by design, not bolted on after the fact. At the same time, we will empower our people through tools like Copilot and citizen development platforms, enabling innovation to happen at all levels of the organisation, safely, responsibly and at scale.

To deliver this, we are investing in:

- **Robust foundations**: completing our cloud transition, securing our systems, and managing technology obsolescence through a structured, risk-based approach.
- **Smarter operations**: enabling real-time, data-driven automation of infrastructure by securely integrating IT and OT and deploying edge computing technologies.
- **User-centred innovation**: enhancing customer experience, social inclusion and employee productivity through intuitive platforms, better data, and responsive digital services.
- **Agile and DevOps practices**: delivering value incrementally and securely, supported by strong governance, internal capability building, and adaptive delivery models.
- **Resilience and readiness**: staying ahead of evolving cyber threats through security investment and education. We recognise that this alone cannot remove the risk and therefore we will continue to bolster our cyber response and recovery capability. We are also preparing for future cryptographic standards, including the quantum era.

SR27 represents a decisive shift. We are moving from enabling digital capabilities to delivering business outcomes through them. This plan builds on the progress and lessons of SR21 and reflects a maturing digital function - one that is now integral to Scottish Water's operational and strategic success.

We will invest a total of £220.9m (2023/24 prices) over 6 years to deliver this plan. £103.6m of this is tier 2 with the remainder accounted for as 'Cloud arrangement costs'. The table 1 below summarises our key investments, alongside the projected benefits.

*Table 1: Our SR27 Digital Investments*

| Investment Summary (needs ref from copperleaf) | Projected Benefit |
|---|---|
| **Efficient Planning & Delivery 875** Maintain business critical system availability, access and performance; optimise and automate repeatable process to unlock business value wherever possible. | Sustain operational efficiency, support secure and integrated service delivery, and ensure core systems remain reliable, scalable, and aligned to Scottish Water's evolving digital and organisational needs. They will also future-proof key platforms by addressing contract, performance, and architectural risks. |
| **Customer Experience Management 877** Anticipate and fulfil customers' needs ensuring our customer engagement channels are always available. | Modernise our customer-facing and regulatory platforms, ensuring security, compliance, and integration with core systems. These investments will improve customer experience and social inclusion, maintain public trust, and support efficient service delivery. |
| **Intelligent Decision Making 1204** Exploit our data and leverage advanced analytics to deliver actionable insights and comply with Regulatory and Legislative drivers. | These investments will maintain core operational and data platforms, reduce technical debt, enable efficient data processing and support secure, integrated, automated and future-ready digital operations across telemetry, asset management, analytics and artificial intelligence. |
| **Ring-Fenced Commodities & Infrastructure 1205** Maintaining essential business continuity through end user devices, communication, productivity and collaboration solutions | These investments will enable secure, efficient management of our cloud estate, improve tooling for digital delivery, and ensure our end-user technology remains current, supported, and aligned with modern working practices. |
| **Risk & Security Management 1203** Always protect our customers, people and assets from Digital Cyber threats and process data in a legal, fair, transparent and ethical manner. | These initiatives will strengthen our data governance, security, and compliance posture, while modernising key business and technical platforms to adapt to future regulatory, operational, and risk management needs. |

*AR3: Asset Repair, Refurbishment, and Replacement

# 2 Background

**Key Points:**

- Our investment in cloud technology remains on track – and we have received strong external endorsement to our approach on cyber.
- However, we know that that digital landscape is evolving rapidly, driven by the pace of technological advancement and changing business needs within a more complex and sophisticated cyber threat landscape.
- To stay ahead, we are adopting a forward leaning, ambitious approach: using Digital as a driver of innovation, lower costs *and* a lower carbon footprint.

## 2.1 Context

Scottish Water has developed a new and bold digital strategy, demonstrating our commitment to leveraging technology, data and analytics to accelerate us towards service excellence, beyond net zero emissions and great value & financial sustainability. Our previous strategy of transitioning vulnerable legacy applications to secure cloud technology shifts to one which is an essential and integral part of delivering improved business outcomes - addressing the challenges of climate change adaptation and asset deterioration at affordable customer prices.

We rely on a broad array of technologies not only for achieving service excellence, environmental sustainability and great value, but also for maintaining resilience and security in a rapidly evolving digital landscape.

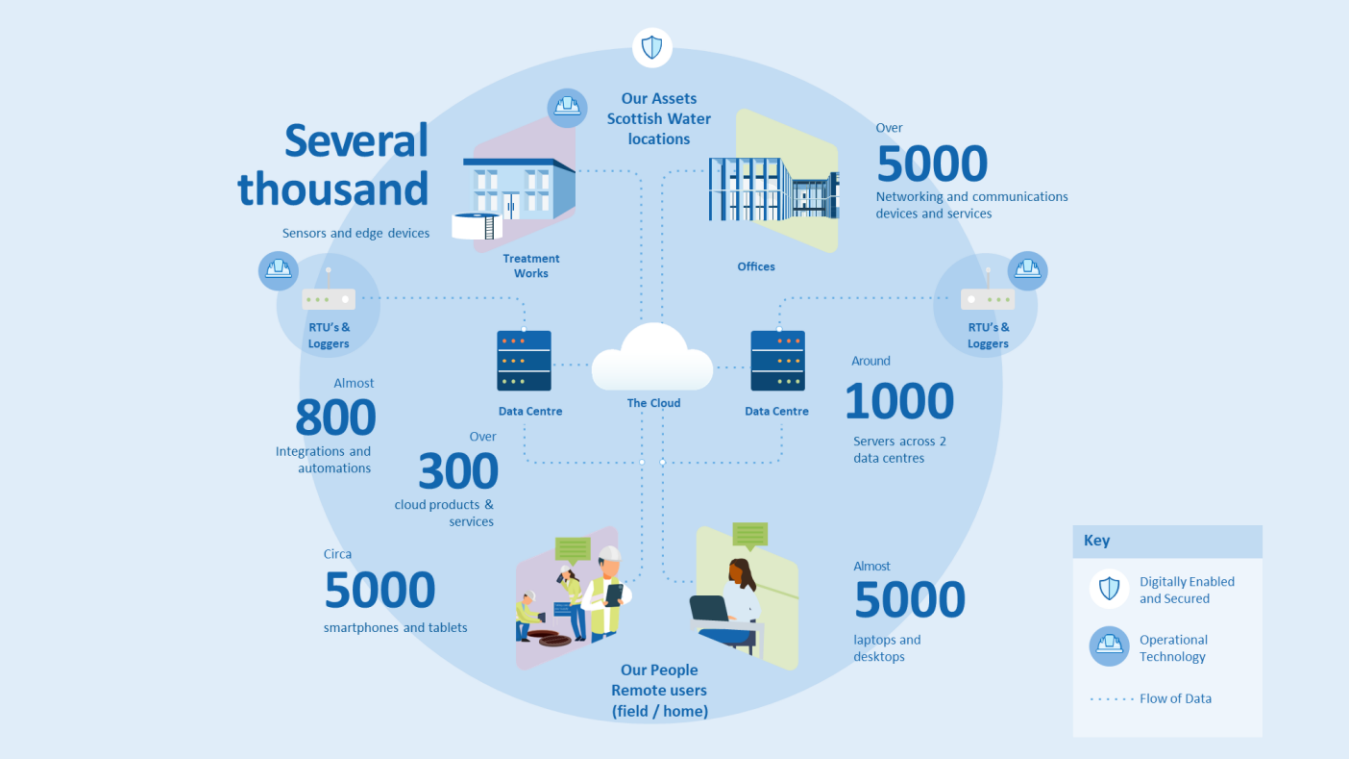


*Figure 1: Our Digital Assets*

Over recent years we have made considerable progress in addressing outdated and vulnerable technology as we move from largely on-premises, customised applications to those that exploit the scale, security and flexibility of cloud computing.

As this shift nears completion, it is time to adopt a more ambitious approach. Our new strategy therefore positions digital as a driver of innovation within our organisation, delivering business outcomes at significantly lower cost and carbon footprint. This transformation, spurred by rapid technological advancements, necessitates fresh thinking and the development of new capabilities to not just adapt, but to lead and disrupt positively and responsibly.

## 2.2 Our Digital Progress

Our cloud migration journey is in its final stages, aiming for full transition by April 2027. This includes the migration of remaining critical applications such as our Asset Management system, Telemetry platform, and Laboratory Information Management System. These foundational shifts not only modernise our estate but also unlock greater agility, resilience, and scalability.

We are also progressing well with our Public Switched Telephone Network (PSTN) Migration programme, replacing over 4500 legacy telephony connections to operational assets with more reliable and modern communication solutions. This is necessitated by BT's planned withdrawal of PSTN services by January 2027, with our own project targeted for completion in late 2025 (BT's original deadline). Importantly, it also acts as an enabler for more intelligent, responsive operations across our asset base.

Across the board, our technology investments remain on track and within the agreed investment envelope, enabling us to meet critical infrastructure goals while freeing up capability and focus for wider digital transformation efforts. Our SR21 digital portfolio is illustrated below:

| | | |
|---|---|---|
| **Asset Management**<br>Modernising and transforming how we manage our assets across the business. | **Digital Workplace**<br>Modernising how we work and collaborate across the business from any location. | **Operational Technology**<br>Addressing obsolescence and improving visibility of our assets to predict, prevent and minimise risk. |
| **Infrastructure**<br>Refreshing and extending our infrastructure, increasing resilience and strengthening operations. | **Cyber & Security**<br>Ensuring our business is secure, continually adapting to increasing cyber risks. | **Data Regulation**<br>Ensuring our data is secure and access to our corporate applications is controlled. |
| **Stand Alone Projects**<br>Discrete projects with benefits not aligned to larger programmes shown here. | **Cloud Evergreen**<br>Ensuring our cloud systems are kept up to date and in support. | Projected out-turn of SR21 digital investment is £277m in 2023/24 prices. |

Service performance remains strong, with device experience trending above industry standards and a continued reduction in customer-impacting service interruptions. This reflects progress in our drive toward zero preventable incidents, supported by more effective self-service and automation. A decline in critical Priority 1 incidents further demonstrates the growing resilience of our business systems and telemetry infrastructure.

Employee satisfaction also remains high. Digital improvements shaped through colleague feedback have made tools and services more intuitive, connected, and responsive - transforming day-to-day experiences for our people.

In cybersecurity, our investment and education programmes has led to zero impactful incidents to date, and our move toward full cloud integration has contributed significantly to that. With 80% of IT systems already cloud-based, we are leveraging the advanced, embedded security controls offered by our cloud providers to secure our estate more effectively than was possible with traditional on-premises infrastructure.

To sustain and build on this, we continue to test and evolve our approach. Scottish Water has been proactive in conducting regular internal and external cyber audit and assurance activity to verify compliance, assess maturity, and identify areas for improvement. This includes independent assessments aligned with national guidance and industry standards. We also recognise that technology and education alone cannot eliminate the risk of cyber-attack and so we will continue to strengthen our response and recovery playbooks and business continuity plans.

We've recently received strong external endorsement of our cyber posture:

- In February 2025, the National Cyber Security Centre (NCSC) described our structured Cyber Resilience Plan update as the best they've seen to date in the UK water sector and confirmed they had no concerns with our maturity or approach.
- In January 2024, an external Drinking Water Quality Regulator (DWQR) audit of our Network and Information Systems (NIS) compliance praised our security culture, open engagement, layered defence approach, awareness of emerging threats, and our progress on asset management and risk understanding.

This positive feedback from both the NCSC and DWQR reflects not only the strength of our current controls but also our cultural maturity - a willingness to be transparent, to listen, and to continually improve.

## 2.3 Drivers for Change

Our strategic projections have highlighted climate change, asset deterioration and affordability as our greatest challenges. We recognise that overarching solutions to these will span a 25-year horizon as part of our Long-Term Strategy, with technological transformation being a key driver. Our digital strategy will start to deliver improvements within a shorter timeframe, aligned with what is reasonable for a technology horizon and in conjunction with detailed planning for SR27, enabling us to make impactful changes and drive progress more rapidly.

Our current operating model and partnerships, while effective, were primarily designed to address legacy needs, early large-scale cloud shifts, and the initial stages of our transformation. Instead, we can now put more emphasis on agile delivery methods that yield benefits and outcomes earlier and more frequently for our customers and colleagues. These practices are also better suited to our adoption of automation, advanced analytics and artificial intelligence (AI) that are setting new standards of efficiency and service excellence. Our new strategy will require further development of these capabilities and access to appropriate skills in the market.

Historically, Operational Technology (OT) and Information Technology (IT) were separate, ensuring our water and waste water assets were protected from cyber threats. The convergence

of IT and OT has accelerated as assets become increasingly connected to the internet using a growing array of sensors and driven by opportunities to enhance service, reduce cost and carbon emissions via an intelligent asset base. In doing so, solutions must comply with NIS regulations, but all too often these interventions are reactive or retro-fitted. New strategic partnerships that seamlessly integrate these complex and high-scale digital innovations with engineering practices across capital investment are essential and these partnerships should align with the 'enterprise' model within our SR27 supply chain design.

As a measure of the scale of potential change here, Gartner, a leading global research and advisory firm, predicts that by 2026, 40% of digital strategies in utilities will be framed by intelligent operations, and over 70% of investments in new industrial assets will incorporate intelligent asset design features, e.g. remote-control capability.

## 2.4 An Evolving Digital Landscape

Cutting-edge technologies and emerging threats, together with a constantly evolving technical landscape, present both challenges and opportunities for Digital services and products. Alongside changing business needs, financial pressures, and sustainability goals, this creates a dynamic environment in which our strategy must remain adaptable. Our current SR27 projections reflect what we know today, including a mix of initiatives that are funded and others that are not yet funded but may become necessary as the period progresses (eg post-quantum encryption). It is therefore Digital's intention to review and refine our strategy at regular intervals, including throughout SR27, to ensure it continues to reflect the organisation's needs and external developments.

In the technology arena, cutting-edge developments like Machine learning (ML)/AI, Edge Computing, IT/OT convergence, Digital Twinning, and Quantum Computing can empower our people and partners:

- **Artificial Intelligence, ML & Advanced Analytics** will revolutionise how we work. It has the potential to help us work smarter by automating decisions without losing accuracy and reliability, freeing up our teams to focus on other important tasks. AI can completely transform our processes and data journeys, helping us to make decisions with unparalleled precision. Harnessing the power of AI can make us all more effective and efficient and we want to maximise the value that AI can deliver, but we must do so in a way that is safe, transparent, ethical and fair, whilst abiding by current and emerging legislation. We also recognise that effective engagement with our colleagues and Trade Unions is vital to securing enthusiastic commitment to more efficient ways of working.
- **Edge Computing** Edge computing lets us handle data right where it's created instead of sending it far away to be processed. This can help us work more swiftly and smartly, letting us analyse information on-site at places like treatment works, which saves time and makes our processes more efficient. This growing number of devices will require secure management and maintenance to ensure they remain up-to-date and fit for purpose throughout their lifespan.
- **IT/OT Convergence** To help us better understand the health and performance of our assets, we need smooth and immediate data transfer between our operational assets and IT systems. To tackle this, we must bring in new technology that will let our assets and systems communicate seamlessly and securely. This means faster and more reliable sharing of information and new capabilities like remote control making us more efficient and helping us deliver better more resilient services to our customers and communities
- **Digital Twinning** The joining-up of technology, data and analytics through digital twinning can assist us in digitally rehearsing construction and commissioning, enhancing operational

efficiency, reducing our carbon and foreseeing potential issues through scenario planning before they become real problems that impact our customers and communities. To do this, we need trusted and accurate data with which to create digital twins. We also need to make sure these are kept secure, as they'll be virtual representations of our most important assets.

- **Quantum Computing** Quantum computing is an advanced type of computing that can solve large, complex problems in the blink of an eye, at speeds completely unachievable by conventional computers. Potential applications include helping us get better at treating water, understanding the effects of climate change, or finding leaks faster. Quantum computing promises to supercharge our operations, not only making them smarter, but also more secure in an ever evolving and volatile digital landscape. Whilst it's not mainstream just yet, it will become increasingly important to follow best-practice cyber security techniques to continue to safeguard our customers, people and assets from digital threats.

# 3 Our Digital Strategy

**Key Points:**

- We developed an internal 5-year Digital Strategy in 2024 which has continued to evolve in line with our development of our Long-Term Strategy and SR27 objectives.
- Our Digital Strategy in an integral part of achieving Scottish Water's strategic ambitions. It will deliver better business outcomes for customers at lower cost and carbon by empowering our employees and partners, enhancing decision making through data, driving efficiency through innovation, and effectively mitigating the growing threat of cyber-attacks.
- This Digital SR27 Plan is informed by and fully aligned to our SR27 business outcomes.

## 3.1 Overview

Our strategy is to digitally lead Scottish Water, delivering better business outcomes through solutions and innovation that add value, are secure, easy to use and always on. This represents a significant transition from primarily de-risking our estate and digitally enabling our workforce, to being an integral part of business strategy in pursuit of supporting a flourishing Scotland. This new direction leverages agile execution and the responsible disruption of our business practices. It will enhance service delivery, drive smarter investment decisions, and help tackle affordability and environmental sustainability challenges.

*Figure 2: A snapshot of our Digital Strategy*

To do this, our digital strategy pivots on four foundational pillars / strategic objectives designed to redefine how we operate and deliver value:

1 **Empowerment and Effectiveness:** We are committed to empowering our employees and partners by equipping them with the right skills, along with cutting-edge tools and technologies, using digital to enhance job satisfaction and effective collaboration. For instance, our successful trial of Copilot for Microsoft 365 has led to improved productivity,

allowing staff to automate routine tasks like email management and document creation, thus focusing more on strategic initiatives.

2 **Data-Driven Insights:** Enhancing decision-making through data-driven insights and advanced analytics is key to our strategy. This emphasises the importance of data quality, management, design, advanced analytics capability and literacy. For instance, by implementing real-time analytics and control systems on wastewater treatment works and pumping stations, we have maximised the value of our data and improved the energy efficiency of our assets.

3 **Innovation and Efficiency:** Our focus on innovation and automation is geared towards streamlining processes and boosting productivity, e.g. by using AI to read meters and automate recording, we've enhanced operational efficiency. This application has not only accelerated data collection and analysis but also ensured accuracy and better customer satisfaction; and could be scaled into many other areas where we collect data.

4 **Security and Protection:** Recognising the growing threat of digital intrusions, such as AI-generated deep fakes, a major focus of our strategy has been to safeguard our business, customer data, and operational assets through robust cybersecurity measures. Our ethical hacking initiatives have proactively identified and addressed vulnerabilities, helping to educate our people and fortifying our defences before threats could materialise, thereby maintaining the integrity and reliability of our operations and securing customer trust.

## 3.2 Strategy in Action

Key elements of our new digital strategy have already been put into practice. For example, since September 2023, Scottish Water has been using Copilot for Microsoft 365, a generative AI-powered assistant aimed at enhancing productivity within Microsoft applications like Outlook, Word, PowerPoint, Excel, and Teams. Now in use across circa 1,500 employees, we have exploited the tool's potential to streamline tasks, reduce time spent on repetitive activities, and improve work quality. Significant time savings have been realised across all directorates, averaging a 4.7% to 6% reduction in time spent per user per week.

Unlike previous AI technologies that required expert knowledge to implement and deliver value with, generative AI is more accessible. Tools like Copilot, ChatGPT and many more can be used with natural language, making powerful features available to a broader audience, including those without specialist skills.

As early adopters, we've also taken a leading role in implementing responsible AI. We have pioneered the development of internal AI guardrails and data ethics frameworks, ensuring that AI is deployed safely, transparently, and in alignment with our values. This includes controls on how AI interacts with sensitive data, alignment with our cyber and privacy standards, and rigorous review of potential use cases to assess risk and fairness. Crucially, we are also factoring in the carbon impact of large-scale AI investments, recognising that advanced AI workloads can be energy intensive. Our aim is to ensure that any expansion of AI capability is not only productive - but sustainable and ethically grounded.

In a recent study, McKinsey projects that by 2030, approximately 27 percent of current working hours in Europe could be automated, driven by advancements in generative AI. If achieved, this could lead to significant value for Scottish Water.

Our digital strategy is also becoming an integral part of delivering better business outcomes against some of our biggest challenges, as the following examples demonstrate:

- **Transforming Waste Water Services:** Advanced sensors in our wastewater network have enabled us to detect blockages or issues and prevent impact to customers or the environment. We are seeing a circa 25% reduction in pilot areas. We are now maturing this capability and scaling up to cover 16 drainage areas, over 20% of Scotland's population, with the aim of progressively eliminating pollution and flooding due to 'other causes'.
- **Empowering Customers and Communities:** Digital capabilities can help inform, educate and aid changing consumer behaviour to lower water consumption through smart metering and data, while digital platforms offer customers real-time information during service interruptions, improving their experience and satisfaction with Scottish Water.
- **Transforming Our Emissions:** We are expanding our use of digital portals and artificial intelligence to optimise energy use at our exemplar pumping stations and wastewater treatment works while fostering proactive maintenance, reducing spills and downtime.
- **Consistently Excellent Water Supply:** Through expanding our intelligent asset base, such as the advanced water monitoring systems in Inverness, we have reduced water leakage and demand sufficiently to defer the need for significant planned investment. These intelligent network solutions will become the viable alternative or primary mitigation to expensive conventional supply-side solutions.

## 3.3 Development of Our Digital Strategy

We engaged with stakeholders across Scottish Water to develop a rich understanding of the challenges faced by teams across our organisation. We identified 4 key groups of users: our customers, our people, our partners and our regulators. A summary of our findings is shown below:

*Figure 3: Stakeholder Engagement Summary*

We also engaged with other water companies and many organisations both inside and outside of our sector. We took counsel from industry analysts such as Gartner and applied our own deep understanding of the technology sector to ensure that our Digital Strategy is aligned with technology evolution as much as is possible in a fast-paced environment.

Finally, we ensured alignment with our Digital Management Approach, the policy by which we draw down investment to ensure our digital products and services continue to provide the critical functions needed by our customers and our people. This policy defines replacement and refresh triggers based on service and support obsolescence, and is defined by multiple technology, service and product categories.

## 3.4 Challenges, Risks, Mitigations and Opportunities

Our technological advancement brings with it risks and challenges that we must acknowledge and address:

- **Data & Technological Threats:** Rapid AI progression and misinformation may outpace our response capabilities. By committing to ethical practices and robust safeguards, e.g. through AI guardrails and a data ethics policy, we can manage these risks while leveraging AI's value. We remain vigilant against advanced cyber threats like deepfakes and AI-generated phishing, necessitating ongoing investment in detection, education and defensive strategies. AI also offers new avenues for proactive protection and rapid response.
- **External Environment Adaptation:** Scottish Water works with a global supply chain, sourcing digital components and specialist resource from around the world. Emphasising ethical supply chains, especially in cybersecurity procurement, is crucial. Future partnerships must incorporate adaptability and flexibility to navigate external changes effectively.

- **Digital Skills Gap:** Enhancing our digital capabilities and deriving insights from data requires new skills. Initiatives like our Digital Academy, Data Citizenship and Data Fluency are preparing our workforce for future challenges. We also plan to grow skills in AI Literacy. The scarcity of digital expertise presents both a challenge and an opportunity to innovate in talent development. For example, by forming dynamic partnerships with open talent marketplaces, we can quickly close skill gaps and promote inclusion among overlooked communities.
- **Resistance to Change:** Positively disrupting our business will likely introduce new resistances to our digital advancement, necessitating clear alignment to benefits and ever greater engagement with users. A clear focus on providing an excellent digital experience and growing skills will go some way to averting this risk.

We are committed to making our digital services user-friendly, responsive and simple. By automating processes and focusing on collecting only the most essential information, we can prevent app fatigue and increase efficiency amongst our teams, all whilst considering the environmental impact of our digital activities, moving us towards our net-zero target.

To maximise the value from digital solutions, we need to move faster, at lower cost and with higher quality and security and privacy by design. Cloud products are ideal for employing DevOps (rapid development of new capability and value into operation) and this is where we, and our future partners, need to go. Our goal is also to become a more intelligent client too, taking ownership of key digital capabilities that will drive us forward in reaching our strategic ambitions.

Industry-wide trends in Digital offerings reflect these common needs, and the cloud platforms and services we have and are building provide a stable and secure base to develop products at pace, while keeping major line-of-business applications up to date and in line with shifting regulatory and statutory demands. Regular engagement with other water and utility companies to share challenges and solutions has provided continued assurance that Scottish Water is approaching its Digital needs in a cost effective and sound fashion, and frequent consultations with Gartner inform technology strategy, ways of working, delivery methodology, sourcing and project-specific choices.

As we look ahead to SR27, our strategy will shift from laying digital foundations to actively driving transformation across the business. We will build on the momentum from SR21 to complete our cloud migration, scale intelligent asset capabilities, deepen IT/OT convergence securely, and embed agile delivery as the norm. Investment will focus on maintaining secure, evergreen platforms; unlocking the full value of our data; and enabling smarter, faster decisions across Scottish Water. We will modernise legacy systems, enhance field and customer-facing services, and strengthen our cyber resilience in line with emerging threats and regulatory expectations. This next chapter represents a strategic pivot - from enabling digital capabilities to delivering measurable business outcomes through them. Section 3 sets out our detailed plan to achieve this.

# 4 SR27 Digital Plan

**Key Points:**

- We are proposing to invest **£103.6m** (tier 2) in Digital within the SR27 period. Our investment planning is informed by the digital Management Approach, which sets out our detailed investment policy. This is in addition to the funding of our Cloud Computing Arrangement (CCA).
- For all our digital areas, our approach is to replace assets when they are obsolescent but still functioning. The exception to this is the Digital Workplace, where we replace assets when they are obsolete and functioning.

## 4.1 Management Approach

Our SR27 digital plan is built upon the foundation of our digital strategy, which informs technology choices and direction. The accompanying management approach sets out our investment policy for existing digital assets.

The aim is to manage the obsolescence of digital products and services in line with our risk appetite, ensuring that systems and data remain accessible, secure and effective. When technology-driven replacement enables the adoption of a better modern equivalent, we will pursue this - seeking to reduce our carbon footprint, enhance usability and productivity, strengthen security, and improve resilience.

Unlike physical assets, digital assets are seldom refreshed or replaced in isolation. Interdependencies must be considered, and risk must be assessed across four dimensions: business fit, vendor support, future development plans, and underlying technical structure. An emerging issue in one area may necessitate investment in another. Consequently, assessments are based on a combination of business needs dates (e.g. policy or service expiry), vendor dates (e.g. end-of-support), and technology dates (e.g. end-of-life).

Each digital asset category is assigned a risk profile based on criticality, vulnerability, vendor reliance, and interdependence with other components in the estate. This classification helps prioritise investment and informs refresh decisions. Categories labelled as High demand require close monitoring and earlier intervention due to their operational importance or security sensitivity. A Low rating indicates a more tolerant posture toward obsolescence, often due to lower criticality or reduced exposure. Where risk is context-dependent, a Sliding scale is used to denote that investment timing should be based on localised business conditions, deployment scope, or evolving dependencies.

For investment planning, we classify our digital estate into ten interconnected areas. Each plays a key role in supporting Scottish Water's operational and strategic ambitions. Table 2 below sets these areas out.

*Table 2: Digital Investment Planning Categories*

| Area | Description | Risk Profile |
|---|---|---|
| **Data Centre Systems** | A diminishing on-premises footprint used to host legacy applications and infrastructure, comprising compute, storage, databases, hardware, network and telecoms. | High |

| Area | Description | Risk Profile |
|---|---|---|
| **Digital Workplace** | End-user devices, productivity/collaboration solutions for staff and partners (e.g. laptops, desktops, tablets, mobiles, audio-visual). | Low |
| **Cloud Business Systems** | Line of business, or systems of record with a slow rate of change, typically used for transactional purposes. | Sliding scale |
| **Digital Channels** | Applications, services, and Application Programming Interfaces (APIs) used to communicate and engage with customers, partners and external stakeholders. | Sliding scale |
| **Integration & Automation** | Services and APIs used to connect systems and improve business processes. | Low |
| **Cloud Platform** | Used to build, maintain, and enhance modern applications on Azure, including compute, storage, databases, app services, and networking. | Sliding scale |
| **Cloud Products** | Internally developed solutions using Azure components to enable agility and data-driven decision-making. | Sliding scale |
| **Edge Compute & Sensing** | Assets providing sensing, logging, secure remote control, and analytics for operational equipment, spanning apps, networking, and telecoms. | High |
| **Cyber Security** | Technologies and controls that safeguard the confidentiality, integrity, and availability of systems and information. | High |
| **Networks & Communications** | Core connectivity infrastructure enabling seamless data flow across the estate. | High |

The preferred investment policy for most digital areas is to replace assets when they are obsolescent but still functioning. This strikes a balance between cost-efficiency, risk mitigation, and operational continuity. By replacing before critical failure occurs, we maintain strategic alignment and operational integrity.

An exception is made for the Digital Workplace category, where assets are replaced when they are obsolete and functioning, as earlier refreshes tend not to deliver significant additional benefit. This approach continues to meet productivity and security needs without incurring avoidable cost.

Where delays in asset replacement are necessary - due to upstream project dependencies or pending architectural upgrades - mitigating actions such as increased monitoring or annual condition reviews will be implemented to manage risk and maintain readiness for timely intervention.

## 4.2 SR27 Planned Investment

We have set out, below, our planned SR27 investments (in line with the management approach described above) across:

- Data Centre Systems;
- Digital Workplace;

- Cloud Business Systems;
- Digital Channels;
- Integration & Automation;
- Cloud Platform;
- Edge Compute & Sensing;
- Cyber Security; and
- Networks & Communications.

These investments draw on the £103.6m investment set out in our Reference Scenario in the Executive Summary, plus the Tier 1 accounting treatment of Cloud Computing Arrangement (CCA) cost.

### *4.2.1 Data Centre Systems (Telemetry Consolidation)*

As part of current plans, our objective is clear: to ensure a full and final exit from our legacy data centres by the end of SR21, aligned with our strategic commitment to cloud-first architecture and modern infrastructure practices. This includes the physical and digital decommissioning of residual services, alongside the clearance of physical plant - such as power supplies, Uninterruptible Power Supply (UPS) units, racks, cabling, and cooling systems - which cannot be removed until the final workloads have been transitioned.

A critical aspect of this programme will be the consolidation and retirement of legacy telemetry applications that remain in use, such as legacy instances of our Water Management System, Lomond Scheme SCADA (Supervisory Control and Data Acquisition), and Open Enterprise. These systems, while functionally valuable in their time must be replaced or migrated in a manner that preserves operational continuity while eliminating technical debt.

It is important to note that if this work is not commenced in line with our current plan, there is a significant risk of cost escalation. Deferring investment or failing to vacate our data centres by the end of SR21 will not only incur additional operational costs (e.g. for facilities management, power, and vendor support), but may also introduce risks of regulatory non-compliance, security vulnerabilities, and unscheduled system failures.

The amount shown for this area of investment is specifically intended to cover telemetry consolidation activities following successful data centre exit of all other IT systems, in line with our plan. It does not include any provision for extended operations, rework, or additional remediation that would become necessary if the data centres are not exited on schedule. Should deferral of current plans occur, substantially greater investment would be required.

### *4.2.2 Digital Workplace*

The Digital Workplace programme for SR27 encompasses a series of targeted initiatives to ensure our workforce remains well-equipped, connected, and productive in a hybrid working environment. The focus is on providing modern, secure, and reliable tools that meet evolving user needs while supporting operational resilience, flexibility, and service improvement.

A core element of the programme is a structured refresh cycle for our end-user devices, including laptops, mobile phones, desktops, tablets, and rugged toughbooks. This includes both planned lifecycle refreshes and a reactive budget line to cover ad-hoc replacements driven by unexpected failures or business growth. With a likely shift to Windows 12 and next-generation

hardware - potentially including ARM or AI-based architectures - this investment will position us for a more modern, secure, and high-performance desktop estate.

Our mobile and tablet strategy will evolve in response to usage patterns. With a current estate of around 1,400 Android tablets (as of Jan 2025), we anticipate a gradual reduction in favour of laptops where feasible. Toughbooks (approx. 392 Windows rugged devices) will continue to be refreshed with an efficient factory pre-configuration and Intune-based deployment model.

Beyond end-user hardware, we will review and rationalise our voice platforms. Both our customer experience centre and intelligent control centre have raised concerns about existing solutions (Puzzel and Teams Voice) and have indicated interest in alternatives like Dynamics Voice and enhanced analytics capabilities. A key objective will be to consolidate down to no more than two strategic platforms, supported by a refresh of disaster recovery arrangements.

To further support hybrid working, investment will be made in agile working tools, including refreshed hybrid meeting room technology and enhancements to the Matrix Booking System. These are tightly coupled with planned office changes and dependencies on building shutdowns. Similarly, the transition of our door entry system to a cloud-based solution is aligned with both the data centre exit strategy and new office timelines.

Lastly, our print service - delivered during SR21 - will be reviewed for refresh or replacement, dependent on the outcomes of sourcing activities, reduced printing needs and contract lengths. Together, these initiatives ensure the Digital Workplace remains fit for purpose, secure, efficient, and aligned to the way our people work - now and into the future.

### *4.2.3 Cloud Business Systems*

Our Cloud Business Systems programme for SR27 brings together a wide range of strategic system refreshes, platform transitions, and targeted upgrades designed to modernise, streamline, and future-proof our core business platforms. This investment supports our transition toward true cloud-native architecture, ensuring systems are evergreen, agile, and better integrated across the enterprise.

Many of our core systems, such as Enablon (Quality Management), Maximo (Asset Management), and our Enterprise GIS (Geographic Information System), require further work to move beyond initial data centre shifts into sustainable cloud-based, evergreen models. In several cases - like GIS and Copperleaf (Asset Investment Planning) - current solutions are not cloud-native and will need substantial effort to migrate or re-platform over time in line with vendor roadmaps, especially around contract renewals.

Similarly, Dynamics (customer contact and case management) presents a significant area of transformation. While low-end investment may involve keeping current instances evergreen, a more realistic scenario is the re-architecting or replacement of multiple Dynamics-based solutions across different customer segments. There is a parallel need to assess options such as Salesforce or ServiceNow, particularly where integrations or platform consolidation would bring value.

Several other domains are facing similar decision points. For example, Work Scheduling & Field Services may need a Salesforce platform re-evaluation due to licensing costs and integration complexity. Likewise, our Finance Systems (Oracle Fusion), Human Capital Management (Workday), Portfolio, Programme & Project Management (P3M), and Learning Management

(Cornerstone) systems may require platform change if contractual or performance issues emerge. The costing tools platform (BES) remains a likely candidate for replacement, with limitations in performance and carbon accounting capabilities continuing to constrain its effectiveness.

Complementing these major platforms are a series of targeted initiatives: transitioning end-of-life Telemetry and Situational Awareness systems to Software as a Service (SaaS) or Platform as a Service (PaaS) models, integrating ServiceNow more deeply into DevOps pipelines, modernising our Testing & Environment Management tooling, and refreshing Information Management platforms such as SharePoint, Data Tooling, and Information Regulation systems delivered in SR21. The ServiceNow roadmap also includes options for enhanced automation, AI-driven assistance, and expansion into risk and compliance modules.

In addition, we must plan for regulatory-driven requirements, such as the SR27 Central Market Agency (CMA) release, which will necessitate bi-annual system and process changes. Laboratory Information Management System (LIMS) replacement, Waste Management upgrades, and Hydraulic Modelling cloud transitions are also key elements, supporting efficiency, automation, and audit compliance across operations.

Taken together, these initiatives form a cohesive strategy to ensure our business systems are not only fit for purpose but are also agile, scalable, and positioned to meet the challenges of a digital-first future.

### *4.2.4 Digital Channels*

The Digital Channels programme for SR27 focuses on modernising and sustaining our external-facing digital presence, with particular emphasis on public engagement, customer experience, and data transparency. Central to this is the refresh of our External Media Engagement platforms, including the corporate website, customer portals, web channels, and associated digital services that support customer communications and service visibility.

These platforms form the public face of our organisation and are critical to maintaining customer trust, ensuring service transparency, and enabling responsive engagement. They also support our obligations around Open Data and integration with key business systems such as Maximo, SharePoint, and Azure.

Given the rapid pace of change in web technologies, accessibility standards, and digital security threats, these systems must not be allowed to stagnate. A regular refresh cycle is essential - not only to ensure modern user experience and accessibility compliance, but also to safeguard against vulnerabilities and maintain integration integrity with our back-end systems.

This investment will ensure that our digital channels remain secure, modern, and capable of supporting future business needs while continuing to offer a high-quality experience for customers, stakeholders, and the wider public.

### *4.2.5 Integration & Automation*

This programme is focused on strengthening the foundations of our digital ecosystem by ensuring robust, scalable, and future-ready connectivity between systems. Central to this is the refresh of our Data & Application Integrations, which will complete the transition from legacy Boomi implementations to a strategic, Azure-native integration model aligned with our broader cloud and automation ambitions.

This work is vital to maintain system interoperability as we modernise key platforms such as Enterprise Asset Management (EAM), Geographic Information Systems (GIS), and Programme & Project Management (P3M). As these systems evolve, so too must the integrations that connect them - especially given the increasing reliance on SaaS platforms, where ongoing vendor-driven changes can rapidly render outdated integrations fragile or non-functional.

Additionally, regulatory requirements continue to drive change, including the refresh of our Annual Return system. This ensures that we remain compliant with reporting obligations while improving efficiency and accuracy in data collection and submission processes.

Together, these initiatives will improve data flow, reduce manual interventions, and support more responsive, automated business operations - laying the groundwork for a fully integrated, adaptive digital environment in SR27 and beyond.

### *4.2.6 Cloud Platform*

The Cloud Platform programme for SR27 is focused on ensuring that our cloud foundation remains secure, scalable, and fit for purpose as our digital estate continues to grow in complexity and importance. This includes refreshing core platforms, modernising tooling, and addressing key technical debt and sustainability risks introduced during earlier transformation phases.

One of the primary initiatives is the refresh of the Power Platform and associated Azure applications. With a growing backlog of developed apps and concerns over "app sprawl" and limited post-deployment support, there is a clear need to rationalise, simplify and modernise the estate. This will include re-platforming or refactoring existing apps, particularly where Microsoft make platform changes that break compatibility or introduce new security requirements.

The Data Lakehouse, which includes technologies such as Delta Lake, is also a priority. While a significant upgrade may be fully delivered in SR21, further refactoring or enhancements are expected in SR27 to ensure full alignment with our enterprise data strategy. This includes improved performance, integration, and data lifecycle management to support analytical and operational needs.

A critical enabler across all cloud activity is Cloud Tooling. This initiative represents a foundational investment in the technologies required to manage a modern, all-cloud environment - tools that were either unnecessary in an on-prem world or previously provided by partners. The work involves defining and delivering tooling across three key domains: Service Management, Security, and Application Development. Some tooling (e.g. Microsoft Sentinel, Defender, and Purview) is already in place but is underutilised. Future tooling will include AI-assisted development environments like CoPilot Studio, as well as enhanced application security testing capabilities such as SonarQube for SAST (Static Application Security Testing). Integration with OT environments must also be considered, with thoughtful planning for shared use and necessary segregation.

Ultimately, the Cloud Platform programme is about maintaining pace with the rapid evolution of cloud technologies, while ensuring our platforms remain robust, well-managed, and able to support secure innovation at scale.

### 4.2.7 Cloud Products

This programme is focused on the maintenance and sustainment of core digital and data systems that have become critical to business operations. These initiatives are not intended to introduce major new functionality but instead to ensure that existing cloud-based products remain secure, reliable, and compliant as the wider technology and regulatory environment evolves.

The programme includes activities to support the continued operation of business analytics tools, including essential technical rework of reporting applications where needed. This is to manage compatibility with changing data sources, resolve technical debt, and maintain the usability of tools relied upon for day-to-day insight and operational reporting.

Work will also continue to support enterprise data compliance. This includes maintaining systems for records management, retention and archiving, data loss prevention (DLP), and sensitivity labelling across existing platforms such as Power BI and Power Platform. Some ongoing activity will be required to manage regulatory compliance, sustain data quality controls, and support digital rationalisation - ensuring the current estate remains manageable and coherent, rather than expanding or adding further complexity.

Support for tools used in synthetic data creation, data collection, and metadata management will also continue where existing capabilities have been established during SR21. These tools require updates to remain functional as wider systems change or as regulatory expectations shift.

In addition, the programme includes the introduction and sustainment of a digital requirements management tool to replace outdated spreadsheet-based tracking. This will support more reliable coordination of digital delivery across teams, without significantly altering existing processes or introducing new capabilities.

Overall, this programme ensures that our cloud-based products remain fit for purpose, manageable, and secure - preserving the value of prior investment and aligning with a responsible digital asset management approach.

### 4.2.8 Edge Compute & Sensing

The Edge Compute & Sensing programme for SR27 is focused on the ongoing maintenance and sustainment of critical operational systems at the boundary between the physical and digital environments. The emphasis is on ensuring reliability, continued performance, and alignment with longer-term strategic outcomes, rather than introducing new capabilities.

A key initiative is the refresh of metering systems, which covers the maintenance and update of front-end interfaces and supporting databases. While some foundational work is expected to be completed under SR21, a fully sustainable solution - particularly one built on modern utility network models - will require ongoing investment. This will ensure metering systems remain secure, accurate, and fit for purpose as operational demands and integration requirements evolve. This initiative provides a foundation for a more resilient, manageable, and future-ready operational technology environment, with a focus on keeping critical edge systems dependable and properly aligned with business strategy.

### *4.2.9 Cyber Security*

The Cyber Security programme for SR27 focuses on maintaining and evolving core security capabilities in response to a rapidly changing digital, regulatory, and threat landscape. As Scottish Water becomes an almost exclusively cloud-based organisation with increasing IT/OT convergence, the cyber security function must adapt to ensure continued resilience, compliance, and operational protection.

A key initiative is the refresh of existing security systems, currently delivered under managed service arrangements. This includes reassessment and renewal of the full toolset - such as threat detection, monitoring, and endpoint protection - against an updated Cyber Security Mesh Architecture (CSMA) or equivalent model. The aim is to ensure the refreshed toolset is appropriate for today's risks, which now include AI-powered threats, supply chain vulnerabilities, and the need for resilience against future cryptographic risks such as those posed by quantum computing.

We will continue to educate our people who are also a critical line of defence. More frequent enhanced training in the ability to spot more sophisticated social engineering attacks, such as deepfake phishing emails, are essential and, recognising that technology and education alone cannot eliminate the risk of a cyber breach, we need to continue to bolster our ability to respond and recover, and test these playbooks regularly through effective scenarios and simulations.

To support secure development and deployment of operational technologies, a Cyber Lab will provide a test environment for validating OT-related solutions. This includes bench testing of devices like Westermo routers and SD-WAN (Software-Defined Wide Area Network) configurations for OT use cases. It will also support proof-of-concept work and integration testing where IT and OT boundaries continue to blur, particularly as legacy telecoms services are retired and replaced.

The programme also includes funding for compliance with future phases of NIS regulations. As seen with NIS2 - which will expand obligations to areas like wastewater once passed - further regulatory evolution in SR27 is likely.

The Quantum Cryptography Discovery initiative ensures we remain ahead of the curve in understanding and preparing for the impact of quantum-resilient encryption. As new cryptographic standards such as CRYSTALS-Kyber and Dilithium are adopted, we will need to assess where and how to update our systems to mitigate long-term cryptographic risk. The rapid development of Quantum poses a risk to the security of our communications and while we have included the cost of assessment and preparation in this plan by 2028, as per guidance to Critical National Infrastructure providers from NCSC, the cost of implementation prior to 2033 is not included in this plan and represents a risk.

In support of secure communications across IT and OT systems, a broader rollout of Public Key Infrastructure (PKI) will also be required. This will provide secure identity and authentication for systems including SD-WAN, control networks, third-party integrations and end-user devices.

Finally, the Privacy Management Tools initiative addresses the need to operationalise and automate data privacy governance. Current manual processes are unlikely to be sustainable as our data landscape grows in complexity and risk, particularly with the rise of AI and the increasing volume of personal and sensitive data. Tools such as OneTrust - or equivalent - will support enterprise-wide privacy compliance, further embedding privacy by design across all systems and services.

Together, these initiatives ensure that our cyber security capabilities remain robust, adaptive, and aligned to both operational needs and regulatory expectations - while continuing to manage emerging risks at the speed of digital change.

### *4.2.10 Networks & Communications*

The Networks & Communications programme for SR27 focuses on maintaining and evolving the connectivity infrastructure that underpins both field and fixed operations across the estate. The programme continues the transition away from legacy network technologies and supports the shift to cloud-first, secure, and flexible communications, while ensuring ongoing operational reliability and value for money.

The Field Connectivity Refresh initiative provides for the continued operation and lifecycle management of over 500 deployed devices (including 164 vehicles) that were connected during SR21 using 4G-based Blackspot routers. These routers, often deployed in harsh environments and subject to frequent movement, require structured maintenance to ensure they remain fit for purpose. In parallel, we will support connectivity for new sites and vehicles not upgraded in SR21. Each site will be evaluated to determine the most cost-effective and supportable solution - ranging from basic 4G routers to more advanced SD-WAN deployments, with or without Juniper Mist WiFi Access Points (APs), depending on operational needs.

The SD-WAN for OT initiative extends secure, resilient software-defined networking to operational technology environments. While initial deployments in SR21 focused on IT and lower-tier OT traffic, this phase includes the design, testing, and standardisation required for broader OT adoption. It supports future replacement of legacy communications technologies such as TSAT Mesh, M2M, radio, and microwave links, in line with the IT/OT strategy.

For cases where SD-WAN is not a viable solution, this programme provides for the replacement of remaining MPLS (Multiprotocol Label Switching) and internet connections - especially in specialist or private wire scenarios - ensuring that all communications infrastructure remains reliable and supportable.

The Local Area Network (LAN) Refresh initiative will ensure continued performance and manageability of wired and wireless network infrastructure across both office and operational sites. This includes refreshing legacy devices deployed under earlier projects (such as Network Strategy Execution - bringing local area, wide area And WiFi networks to a consistent standard; and Enterprise Connect - replacement of a service withdraw by BT for multiple small sites) with modern equivalents. The future state aims for consistent deployment of SD-WAN and Juniper Mist WiFi, phasing out obsolete wireless technologies and ensuring network services align with our standard architecture.

Together, these initiatives support a robust, adaptable, and secure network environment - one capable of supporting the full breadth of operational and enterprise requirements across our evolving digital estate.

## 4.3 Exclusions

While our SR27 digital plan is comprehensive and forward-looking, there are several areas that remain outside the immediate investment scope. These exclusions are shaped by the current

maturity of emerging technologies, affordability constraints, dependencies on broader organisational decisions, and the evolving external landscape e.g. quantum computing risk to communications and network security.

Our approach to digital investment is pragmatic: we will continue to pursue efficiencies through continuous improvement and targeted innovation. However, not every opportunity or risk can be fully quantified or addressed at this stage. We expect new challenges and opportunities to emerge over the SR27 period, some with uncertain financial implications. Our strategy has been designed with enough agility to respond and adapt as needed.

### *4.3.1 Post-Quantum Cryptography*

The emergence of quantum computing presents a long-term threat to current encryption standards, particularly public key cryptography, which underpins much of our digital estate. In response, the National Cyber Security Centre (NCSC) has issued a phased migration plan advising organisations to begin preparing now for a transition to post-quantum cryptographic algorithms.

NCSC's guidance outlines the following target milestones:

- By 2028: Identify and prioritise systems requiring cryptographic upgrades.
- By 2031: Implement upgrades for the most critical systems.
- By 2035: Complete transition to quantum-safe encryption across all systems.

In line with this roadmap, we have included provision in our SR27 plan to meet the 2028 target - specifically, the identification, assessment and prioritisation of systems that rely on vulnerable cryptographic methods. This includes planning activities, initial risk assessments, and architectural design for future migration.

However, the cost and complexity of achieving the 2031 and 2035 milestones are still being scoped. These are likely to be significant, as they may involve wide-ranging updates across infrastructure, software, and vendor ecosystems. The scale and timing of required remediation will depend on both the maturity of post-quantum standards (such as NIST's finalisation of the CRYSTALS-Kyber and Dilithium algorithms) and the extent of embedded cryptographic dependencies in our estate.

At this stage, cost estimates for 2031 and 2035 are still in development. We expect the associated investment to be distributed across both SR27 and SR33, with final allocations refined as our understanding improves. The SR27 plan will be updated at a future point once firmer estimates are available, and technology pathways are clearer.

This is a live area of strategic importance. We are actively monitoring developments and engaging with relevant standards bodies, vendors and utility peers to ensure that our cryptographic transition plan is robust, timely and proportionate to risk.

### *4.3.2 Emerging Technologies Not Yet Investment-Ready*

Several emerging technologies - such as quantum computing mentioned already, advanced synthetic data generation, large-scale digital twinning, and regenerative AI - are being actively monitored but have not yet reached the maturity, affordability, or regulatory clarity required for

mainstream adoption. While these technologies hold promise, our SR27 plan deliberately avoids speculative investment, focusing instead on tangible value and alignment with our operating context.

Where pilots, discovery work, or small-scale proofs of concept are justified, we will pursue these through innovation funding or partnerships. However, mainstream adoption of these technologies is excluded from the core SR27 investment scope.

### *4.3.3 Innovation and Continuous Improvement Funding*

The plan does not include a ring-fenced fund for continuous improvement or tactical innovation initiatives. In practice, we expect many small but high-impact improvements to arise organically as part of delivery e.g. maximising value from a modern equivalent replacement. To support this, we will rely on agile delivery practices, effective product ownership, and mechanisms such as innovation sprints or flexible change budgets within programme boundaries. Should the need arise for more structured or formalised innovation funding, this would require separate business case development and governance.

### *4.3.4 Potential Changes to Regulatory or Legislative Requirements*

Our SR27 digital plan is aligned to current regulatory and statutory expectations. However, material changes - such as a step change in NIS regulation, new data governance obligations, new cyber threats or expanded reporting requirements - may introduce new costs or capabilities that are not currently planned. Where such changes occur, we will engage with stakeholders to explore options for reprioritisation, re-scoping, or seeking additional investment through formal change mechanisms.

### *4.3.5 IT/OT Convergence*

Our SR27 digital plan does not include a specific initiative to validate the feasibility and value of IT/OT convergence, which would ensure any future investment is justified, technically sound, and aligned with business priorities. It is expected that this activity will be driven and funded from the Operational area of the business with full co-operation and co-ordination from Digital, once the Digital Sourcing and Target Operating Model changes are agreed.

# 5 Implementation

**Key Points:**

- We use a range of delivery frameworks (Waterfall, Hybrid, Agile) to successfully execute our digital initiatives, chosen based on the specific needs of projects. This is underpinned by a robust governance framework that spans investment decisions, oversight bodies and risk management processes.
- We have updated our operating model to enhance the speed and efficiency of our IT delivery, foster closer collaboration between our business, digital partners and vendors, and support continuous development and automation.
- We are committed to building our internal capability (including the future skills that will be crucial for our long-term success), whilst bringing in niche expertise to meet our evolving needs.
- We have taken a proactive approach to delivery lessons learned from SR21, whilst building on successes to deliver our SR27 digital plan.

## 5.1 Delivery Frameworks and Governance

### *5.1.1 Delivery Frameworks*

At Scottish Water, we employ a variety of delivery frameworks to ensure the successful execution of our digital initiatives. These include waterfall, hybrid, and agile methodologies, each chosen based on the specific needs and complexities of the project or product at hand.

- Waterfall: This traditional approach is used for projects with well-defined requirements and a clear sequence of stages. It allows for meticulous planning and documentation, ensuring that each phase is completed before the next begins.
- Hybrid: Combining elements of both waterfall and agile, the hybrid approach offers flexibility while maintaining a structured framework. This is particularly useful for projects that require a balance between predictability and adaptability, or where iterative cycles are needed.
- Agile: Agile methodologies, including Scrum and Kanban in our Azure DevOps environment, are employed for projects that demand rapid iteration and continuous feedback. This approach enhances our ability to respond to changing requirements and fosters collaboration.

Our governance processes have consistently led to successful outcomes, ensuring that projects are delivered on time, within budget, and to the desired quality standards.

As we near completion of our shift to cloud-based infrastructure, our delivery approach will increasingly emphasise agile methods and DevOps practices. This evolution enables us to deploy new capabilities faster, iterate based on user feedback, and embed continuous improvement across our digital estate.

### *5.1.2 Governance Structure*

Digital delivery at Scottish Water is governed through a robust framework that encompasses investment decision-making, oversight bodies, and risk management processes.

- **Investment Decision-Making**: Investment decisions are guided by a comprehensive appraisal process, ensuring that all projects align with our strategic ambitions, comply with our digital management approach, and deliver value for money.

- **Oversight Bodies**: The Digital Value Management Board, Investment Group Design Approval Board, Change Acceptance Board and other oversight bodies provide continuous monitoring and governance, ensuring that projects adhere to agreed policies and architecture, privacy, security and design standards and deliver expected benefits.
- **Risk Management**: Our risk management processes are designed to identify, assess, and mitigate risks throughout the project lifecycle. This proactive approach helps us manage uncertainties and ensure successful project outcomes.

## 5.2 Sourcing, Resourcing and Skills

### *5.2.1 Operating Model Shift*

Scottish Water is undergoing a significant shift in its operating model to better align with our strategic ambitions and the evolving digital landscape. This transformation will see the introduction of a new partner ecosystem from September 2026, alongside bringing some services in-house where better aligned to internal capabilities, clarify accountability and reduce overall cost.

Our new, adaptive operating model is designed to enhance the speed and efficiency of IT delivery, foster closer collaboration between Scottish Water, Digital Partners and Vendors, and support continuous development and automation. Here are the key attributes of this model:

1. **Focus on Agility**: The adaptive model shifts focus to models and practices that deliver value incrementally and continually through agile and DevOps practices.
2. **Business Value Alignment**: There is a clear alignment to business value, with applications and teams aligned to our strategic outcomes.
3. **Customer and Colleague Experience**: The model introduces capabilities for better customer experience (CX) and user experience (UX), ensuring that the solutions developed are secure, inclusive and meet the needs of our customers.
4. **Continuous Development and Automation**: The adaptive model supports the continuous development of new functionalities and highly automates underpinning processes and infrastructure. This reduces manual effort, reduces risk and increases efficiency.
5. **Collaboration and Culture Change**: The model fosters closer collaboration between Scottish Water, Partners and Vendors, requiring a change in culture to support this new way of working. We have been moving towards this way of working for several years now and the redesign better aligns to our aspirations for a more integrated approach.
6. **Agility and Flexibility**: The adaptive model is structured to be agile and flexible, allowing Scottish Water to quickly respond to changing business needs and technological advancements.
7. **Enhanced Governance and Risk Management**: The model includes robust governance structures and risk management processes to ensure that digital initiatives are delivered successfully, securely and align with the organisation's strategic ambitions.
8. **Integration with Digital and Organisational Strategies**: The adaptive operating model is closely aligned with the wider organisational change agenda, including the supply chain strategy and 'enterprise model'.

These attributes collectively enable Scottish Water to drive digital transformation more effectively delivering SR27 business outcomes at lower cost and carbon.

### 5.2.2 Internal Capability

Building internal capability is a cornerstone of our strategy. We are committed to developing a robust internal skill set through various initiatives:

- **Digital Academy**: Our Digital Academy is designed to upskill our workforce, providing training in the latest digital technologies and methodologies. This initiative ensures that our employees are equipped with the necessary skills to drive digital transformation within the organisation. This includes data citizenship – growing data fluency skills and AI literacy to improve the health, quality and completeness of data, essential to delivering our SR27 objectives
- **Citizen Developers**: We are empowering our employees to become citizen developers, enabling them to create secure digital solutions on a safe, scalable platform to common standards. This approach fosters innovation and allows for rapid development and deployment of digital tools at low cost.
- **Professional Upskilling**: Continuous professional development is facilitated through targeted training programmes and workshops. These initiatives focus on enhancing skills in areas such as data, analytics, AI, MLOps (Machine Learning Operations) and DevSecOps (Development, Security and Operations), ensuring our workforce remains at the forefront of technological advancements.
- **Cyber Security**: our employees and supply chain are an important line of defence. We will develop more comprehensive training programmes and awareness to mitigate the threat of ever more sophisticated, AI-generated deepfake social engineering techniques. Regular ethical penetration testing will confirm the effectiveness of training and provide more immediate learning reinforcement. We will also continually improve our ability to respond and recover, regularly testing these playbooks through incident scenarios, recognising that we cannot eliminate the risk of cyber-attack completely.

### 5.2.3 Partner Strategy

Our sourcing strategy for SR27 is designed to bring in both niche expertise and Partners that can scale flexibly to meet our evolving needs:

- **Niche Expertise**: We will engage with partners who specialise in areas such as AI, cyber security, and DevSecOps. These partnerships will provide us with the specialised knowledge and skills required to tackle complex challenges and drive innovation.
- **Flexible Scaling**: Our partner ecosystem will be structured to allow for flexible scaling of resources. This approach ensures that we can quickly adapt to changing demands and leverage external expertise when needed, while maintaining control over critical aspects of delivery.

### 5.2.4 Future Skills Planning

Understanding and addressing skills gaps is crucial for our long-term success. Our future skills planning involves a multi-faceted approach:

- **Recruitment**: We are actively recruiting talent with specialised skills to fill identified gaps. This includes roles in AI, cyber security, and other emerging technologies.
- **Partnerships**: Collaborating with educational institutions and industry partners to develop tailored training programmes and internships. These partnerships help us build a pipeline of skilled professionals ready to contribute to our digital initiatives.
- **Training**: Ongoing training and development programmes are in place to ensure our existing workforce continues to grow and adapt. This includes leadership development, technical training, and workshops focused on emerging technologies.

By aligning our sourcing, resourcing, and skills development strategies with our new adaptive operating model, we are well-positioned to achieve our digital strategic objectives and drive digital transformation across Scottish Water.

## 5.3 Learning from SR21

### *5.3.1 What Worked*

The SR21 period saw several notable successes that have laid a strong foundation for our future initiatives:

- **Cloud Transition Progress**: We made significant strides in transitioning to cloud-based infrastructure, which has enhanced our operational efficiency and scalability.
- **Improved Resilience**: Our efforts in de-risking the IT estate and enhancing our infrastructure have resulted in improved resilience and security and reduced incidents.
- **Incident Reduction**: Through the implementation of modern platforms and technologies, we have successfully reduced the number of incidents, leading to more stable and reliable services.
- **Agile Trials**: The introduction of agile methodologies has shown promising results, enabling faster delivery and better adaptability to changing requirements.

### *5.3.2 Challenges*

Despite these successes, SR21 also presented several challenges that we have learned from:

- **Underestimating Delivery Timescales**: One of the key issues was underestimating the time required to deliver certain projects. This led to delays and impacted our ability to meet some of our targets.
- **Legacy System Complexity**: The complexity of our legacy systems posed significant challenges, particularly in terms of integration and maintenance. This complexity often resulted in higher costs and longer delivery times.
- **Skills Shortages**: We faced shortages in critical skills, which affected our ability to deliver projects efficiently. This highlighted the need for a more robust strategy for skills development and recruitment.

### *5.3.3 SR27 Improvements*

The lessons learned from SR21 are being actively incorporated into the design and delivery practices for SR27 to ensure better outcomes:

- **Enhanced Planning and Estimation**: We have improved our planning and estimation processes to provide more accurate delivery timescales. This includes more rigorous project scoping, new agile approaches and better risk management practices.
- **Modernising Legacy Systems**: To address the challenges posed by legacy systems, we are investing in modernising our IT infrastructure. This includes the adoption of new technologies and platforms that are more flexible and easier to integrate.
- **Building Internal Capability**: Recognising the importance of having the right skills, we are focusing on building internal capability through initiatives such as the Digital Academy, Data Citizenship, professional upskilling, and the development of citizen developers.
- **Agile and DevOps Practices**: We are expanding the use of agile and DevOps practices across more projects to enhance our delivery speed and adaptability. This approach will help us respond more effectively to changing requirements and improve overall project outcomes.
- **Robust Governance and Oversight**: Strengthening our governance structures and oversight mechanisms is a key focus for SR27. This includes better investment decision-making processes, continuous monitoring, and proactive risk management.

By integrating these enhancements into our SR27 planning, we aim to build on the successes of SR21 while addressing its shortcomings. This approach will enable us to deliver more efficient, resilient, and innovative digital solutions that align with our strategic ambitions.

# 6 Conclusion

This technical appendix sets out a bold and forward-looking digital plan for SR27, one that is integral to achieving Scottish Water's SR27 objectives and Long-Term Strategy. We are investing in the capabilities that will allow Scottish Water to operate more intelligently, more securely, and more efficiently - directly enabling our strategic ambitions.

We will invest £220.9m across ten key digital domains to modernise legacy infrastructure, harness cloud capabilities, converge IT and OT securely, and unlock greater value from our data. This plan is structured, risk-based, and guided by our Digital Management Approach, ensuring we maintain operational continuity while building the digital capabilities of the future.

We are confident in our ability to deliver this plan. We have strengthened our internal capability, established clear governance, and aligned our sourcing and delivery models to our digital ambitions. Agile and DevOps practices are now embedded into our ways of working, supported by strong product ownership and a culture of continuous improvement.

The SR27 plan reflects the reality of a dynamic and uncertain environment. Our strategy is not fixed - it is adaptable. We have built in the mechanisms to respond to change, whether through technology evolution, shifting regulatory requirements, or emerging customer needs.

Scottish Water's digital function has become a driver of responsible disruption. This plan demonstrates how we will continue to lead the way - modernising our estate, securing our operations, and empowering our people to deliver an even better future for our customers and communities.

# Transformation & Innovation

## Technical Appendix 018

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# 1 Executive summary

As Scotland's publicly owned water company, we continually seek ways to improve or protect the service we provide to our customers. We must also find ways to make these improvements whilst making our operations and investments more efficient and effective. Every improvement that we make in this way leads to better outcomes for customers, lower bills or reinvestment back into our assets.

We face significant challenges moving into SR27, including extreme weather, population growth, and stricter regulations. Our aging water and wastewater assets will need more investment to maintain current service levels and prevent unfair burdens on future generations. Therefore, the need for investment in SR27 is greater than ever.

However, we have developed our investment plan within a series of constraints i.e. within an affordable cost envelope, to a scale that is deliverable, whilst overcoming challenges and seizing opportunities as they emerge. Through targeted research and innovation and transformation programmes we can develop the knowledge and capability to adapt the way we work and to make the sustainable change necessary to drive better customer outcomes.

Through our transformation programme we improve and adapt our business processes, adopt new technology and deploy digital advancements to deliver our services more efficiently in the near term. Through our research and innovation programme we seek to enhance our knowledge and capability to ensure that our assets and therefore our service adapts over time to ensure long term service excellence and go beyond net zero emissions.

During SR21, our Transformation Programme is forecast to deliver £433 million in gross financial benefits, generating £174 million in net benefits. In SR21 our Research & Innovation programme has 185 projects (to date) across the water (41), wastewater (55), net zero (37) and circular economy (52) focus areas. The programme is a balance between site trials of technology and approaches, sponsored PhDs, and collaborative projects through academia, supply chain partners and other water companies through the Ofwat innovation fund. The Research & Innovation programme is on track to leverage Scottish Water's investment in these areas with up to £100m of additional funding for research from external sources over the SR21 period.

## 1.1 Lessons learned from SR21

Lessons learned from SR21 have guided us to prioritise the key themes of our SR27 Transformation programme to drive the largest impacts, whilst balancing the capacity of the organisation for major change. Although these themes represent the balance we aim to strike, future opportunities will be assessed on their benefits potential and impact on organisational capacity. To ensure our Research & Innovation investments deliver best value to customers, in developing our SR27 portfolio we have followed a staged approach to Research & Innovation, increasing knowledge and learning, applying this through pilot trials and ultimately scaling through demonstrator projects. In the delivery of Transformation and Research & Innovation programmes in SR27 we have also continued to build on the success of our partnership working approaches.

Table 1 below describes a summary of our SR27 Transformation and Research & Innovation programmes.

*Table 1: A summary of our key Transformation, Research and Innovation Investments*

| Investment Category | Investment Summary | Proposed investment (£m, 23/24) |
|---|---|---|
| **Transformation** | Capital and Digital Procurement | 29 |
| | Standardisation and Lean | 18 |
| | Digitisation, AI and Automation | 18 |
| | System Based Approach | 9 |
| | Asset Risk and Optimisation | 30 |
| | Partnership Ecosystems (Team Scotland) | 6 |
| **Research & Innovation** | Hydro Nation Chair programme | 4 |
| | UK Water Industry Research – collaborative research programme | 2 |
| | Research and Innovation Programme | 23 |
| | Lighthouse Fund | 15 |

The SR27 Transformation programme is expected to deliver £405 million in gross benefits — comprising £41 million in operational savings and £364 million in capital savings.

Although the key themes of Transformation and Research & Innovation have been identified, detailed bottom-up financial planning and detailed programming will take places as programmes of work are developed. On that basis, all of the figures shown in Data Table 6 are estimates. They highlight the up-front investment required to support the themes in the first years of the regulatory period, and the expected benefits based on top-down assumptions and the experience gained from running similar projects during the SR21 period.

As we enter SR27, the Transformation themes will be subject to the current (SR21) governance process before each investment is approved. One element of this governance process that we have more recently developed and implemented is that individual investment cases must exceed a financial hurdle rate which is subject to periodic review as well as having implementation plans in place and a benefits realisation plan to demonstrate the savings, before the delivery phase commences.

As the SR27 portfolio matures, additional opportunities within and beyond the key themes will emerge and be actively explored. those that support our strategy and meet the defined approval criteria will be considered for investment, on a spend to save basis, and will follow the governance process described above.

# 2 Background

## 2.1 Using Transformation and Research & Innovation as levers for improvement

As Scotland's publicly owned water company, we continually seek ways to improve or protect the service we provide to our customers. We must also find ways to make these improvements whilst making our operations and investments more efficient and effective. Every improvement that we make in this way leads to better outcomes for customers, lower bills or reinvestment back into our assets.

In addition, as we have developed of our Long-Term Strategy, and subsequently in the development of our SR27 plan, we have identified several key challenges we must overcome and near-term opportunities that we must seize if we are to deliver our ambitions regulatory and statutory commitments.

### *2.1.1 Challenges we are facing and opportunities we must seize in SR27*

We are facing an unprecedented scale and variety of challenges (some of which are new to our organisation) to the services that we provide with the assets we own as we move into SR27:

- More extreme weather – for example warmer, drier summers that can lead to drought and deteriorating raw water quality, wetter winters that cause flooding, more frequent storms that disrupt our assets and services etc.
- Population growth and change – the predicted increase in population, along with the changes to where people live, will mean that we need to provide more water if we keep using it at the same rate we do today. The increase in housing will also put more pressure on our waste water network and result in a need for new assets to treat the additional volume of waste water. In addition, there will be an increase in non-permeable surfaces, such as driveways, paths and roads that will further reduce green space for natural drainage.
- Tightening regulatory requirements – for example the recast Urban Waste Water Treatment Directive (rUWWTD) could new drive standards of service that our assets must deliver.

Against this backdrop, our water and wastewater assets continue to age in aggregate and will require additional investment just to maintain services at the level they are today and to avoid placing increasing and unfair burdens on future generations of customers. Combining these factors - the need for investment in SR27 is greater than ever before.

However, we must develop our investment plan within a series of constraints:

- Within an affordable cost envelope, and
- To a scale that is deliverable

It is these constraints to which we have the opportunity to influence with Transformation and Research & Innovation projects and programmes.

### *2.1.2 We must change parts of our business, our assets and the way in which we deliver services in order to deliver our SR27 plan*

To deliver against this significantly increased need within these constraints, we cannot simply continue to undertake business in the same manner and at the same rate as we currently do/historically have done.

Therefore, we deploy two levers of change:

1. **Transformation** – deploying, system-wide changes in the way we operate as a business in order to achieve step-changes in either capabilities or costs. Improvements of this scale often requires upfront investment in order to be able to drive change and capture long-term benefits for our customers and stakeholders.
2. **Research and Innovation** – developing and deploying new knowledge; new technologies and process improvements to specific areas of our business. This includes advances in physical and social science, digital, and engineering technology and how can it be employed now and, in the future to develop the science and assets we need to deliver our ambitions ensure we deliver on our ambitions. This requires a portfolio across continuous improvement (incremental innovation), research and development and breakthrough innovation to discover, define, develop and deploy new knowledge and capabilities that deliver value for our customers.

In deploying the above levers we are able to:

- Deliver our plans (both our SR27 plan and our wider, long-term strategy ambitions) more efficiently i.e. deliver more or the same for less money;
- Exceed service performance ambitions i.e. achieve improved regulatory outcomes; and
- Tackle problems that historically we have been unable to solve economically with existing products or approaches.

# 3 We have a strong track record of Transformation and Research & Innovation delivering customer benefit

In this section, we set out how Scottish Water performed during the SR21 period, with a particular focus on how we have delivered our planned transformation and research & innovation initiatives. This includes delivering transformation activities against the Tier 1 efficiency challenge (of 1% per year) set out in WICS' Final Determination, our capital costs via our Transformation programme and against the technical challenges in each of our key investment areas.

*Unless otherwise stated, all benefit values are reported as net (i.e., after accounting for delivery costs). Gross figures are included where relevant to illustrate total value.*

## 3.1 Transformation

In summary, our transformation activities have contributed to our Tier 1 efficiency challenge to date, and we currently estimate that we will broadly meet our SR21 efficiency commitment of 1% p.a. by the end of the regulatory period.[1]

The Transformation programme is expected to deliver £433 million in gross savings during SR21, against total delivery costs of £259 million (including £23 million in ongoing costs). This equates to £174 million in net benefits, which have supported wider investment across the capital program. By the final year of SR21, the annualised benefit run rate is expected to reach £72m. Based on current analysis, capital costs are forecast to be ~6% lower at the start of SR27 than they were at the start of SR21.

### *3.1.1 Delivering our SR21 efficiency challenge*

Transformation initiatives are forecast to contribute £30 million in net Tier 1 benefits, derived from £49 million in gross savings.. The top five initiatives contribute over 60% of the total Tier 1 benefits:

- **SR21 Procurement** – although predominantly delivering Tier 2 savings (as planned), this initiative is also forecast to deliver Tier 1 savings.
- **Wholesale Transformation** – the Wholesale Service processes were streamlined to better respond to the customer's concerns, improve right first time and reduce waste.
- **Project SWIFT** – SWIFT has improved the efficiency of field work, whilst reducing carbon emissions and improving service.
- **Co-pilot Upscale** – the introduction of Co-pilot increased the productivity of the pilot groups to such an extent that its deployment has been upscaled.
- **Functional Hub** - the Functional Hub is deploying the capabilities and culture to enable the business to continuously improve its processes.

In addition to delivering the Tier 1 benefits above, Transformation initiatives are forecast to deliver up to £384 million in gross Tier 2 and Tier 1A benefits during SR21. The largest contributing initiatives are shown below:

[1] This is calculated on the basis that at the start of SR21 Scottish Water's Tier 1 costs were £899.1m, as reported in AR22. In 24/25 prices this equates to £1,112.9m. Our current forecast for 26/26 Tier 1 costs is £1109.1m, which would be £1,051.6m in 24/25 prices. This estimate would equate to c5.5% cumulative efficiency savings over the SR21 period, marginally lower than the 5.8% set out in the SR21 Final Determination. We continue to look for additional efficiencies that can be captured during the remainder of SR21, such that we can fully meet our commitment over the period.

- **SR21 Capital Procurement -** application of new partnerships for DV1 and DV2.
- **SIDM Programme -** making smarter investment decisions.
- **DV1 Execution Plans and Mobilisation -** streamlining of the Plan and Prepare stages of capital investment projects.
- **Waste Water Intelligent Networks and Improved Urban Water Routemap -** improved asset and network condition and performance management through the application of sensors.
- **Standardisation -** simplification and standardisation of designs to reduce time, cost and carbon within capital procurement projects.
- **Project Swift -** streamlining of field work processes to improve planning, scheduling and delivery of work.
- **Intelligent Water Networks – Source to Tap -** proactive water network management enabled by improved asset and network condition intelligence.

Further details on our approach to transformation and the initiatives delivering the largest benefits contributions, can be found in Annex A.

## 3.2 Research & Innovation (R&I)

We have made some significant improvements to technologies, products and processes through research and innovation that are integrated into current and future activities. The R&I programme has 185 projects across the water (41), wastewater (55), net zero (37) and circular economy (52) focus areas. The programme is a balance between site trials of technology and approaches, sponsored PhDs, and collaborative projects through academia, supply chain partners and other water companies through the Ofwat innovation fund. The R&I programme is on track to leverage up to £100m of additional funding from external sources over the SR21 period.

Outputs from the programme include:

**Resource Recovery** - Achievement of end of waste categorisation for grit recovered from wastewater treatment. This can be utilised in recycled aggregate reducing carbon emissions and diverting waste from landfill.

**New wastewater treatment technologies** – Adoption of new wastewater treatment technologies (Nereda) – which can help to reduce the required size of treatment works by 50% and provides treatment at lower costs compared to legacy processes.

**New water treatment technologies** – Evaluation and adoption of ceramic membrane water treatment system - with the first installation in a facility at Bonnyrigg water treatment works, Peebles. The work has identified the operating envelope for membrane treatment which informs £500m of future investment where this technology will be utilised. The modular design and offside delivery model developed by Ross-shire Engineering (RSE) using this technology enables faster project delivery from initiation to commissioning. This has generated a significant new order book for RSE across the UK water sector – supporting a Flourishing Scotland.

**Minimisation of water quality incidents in distribution** – Building on research from University of Sheffield, we have adopted a water mains management approach that reduces the discoloration at customers taps and reduces the need for mains rehabilitation saving £40m in

SR21. Applying this approach has an enduring benefit – reducing the need for investment into future investment periods.

**Systemisation of final effluent monitoring at wastewater treatment works** – installation of near real-time monitors on wastewater treatment works in SR21 has provided greater insight on treatment performance. This replaces long lead-time laboratory analysis and enables proactive interventions to manage compliance at lower cost due to reductions in energy and chemicals.

**Design and implementation of resource recovery at demonstrator wastewater treatment works** – We are in the final stages of design to install cellulose recovery and algal bioreactors for phosphorus removal and recovery at an existing wastewater treatment works. This will enable evaluation of process benefits of resource recovery and allow for testing and development of markets for recovered resources.

**Nature Based Solutions** – Developed and designed a nature-based treatment system for installation at a wastewater treatment works for environmental improvement and to support growth. This will inform our future investment strategy and increase understanding of the capability of nature-based solutions. Deployment of this technology is enabling us to meet increased demand and will enable us to assess the potential for wider application at smaller wastewater treatment sites.

**Process Emissions** – increased the understanding of process emissions from wastewater treatment through identifying and deploying new measurement technologies and determining process conditions that drive emissions. This allows us to identify ways to control our processes to mitigate these emissions to support our Net Zero ambition. This will be an essential part of our Net Zero Route Map in SR27 and inform the level of carbon capture that is required to offset the emissions.

**Embracing Circular Economy Principles** – We have worked with our supply chain partners to develop a refurbishment and remanufacturing approach for wastewater pumps to reduce cost, carbon and time to replace pumps. This approach is being integrated into our wastewater pump management approach to drive more efficient service delivery.

## 3.3 What have we learned from the SR21 Transformation and Research & Innovation initiatives

### *3.3.1 Transformation*

**Dedicated resources** - the Transformation benefited from having a dedicated team, specifically focused on managing key initiatives and the application of recognised improvement tools and techniques. Return on investment can be improved further in SR27 by reducing the overall size of the Transformation team and upskilling it, to provide a leaner, higher value service.

**Funding** - availability of dedicated Transformation funding streamlined initiative mobilisation. The governance framework ensured that funding was allocated appropriately, whilst establishing a payback period within each regulatory period ensured inter-generational equity.

**Capacity** – In SR21 we have recognised that it is important to balance the capacity of the organisation with the number, scale and complexity of in-flight initiatives. From SR21 we have

learnt that Scottish Water has the capacity to support 5 – 6 complex Transformation themes simultaneously. Therefore, the areas of greatest opportunity will influence the key themes for SR27.

### *3.3.2 Research & Innovation*

**Dedicated resources** – the Research & Innovation programme has been delivered by a dedicated team within the business, aligned to water, wastewater and net zero strategies. Working with integrated sponsor teams across these areas ensured that research and innovation projects are prioritised and aligned to strategic and operational needs which in turn makes the process of implementation smoother and yield greater customer benefits.

**Funding** – Having a dedicated investment allocation allows for greater agility to respond to co-funding opportunities. As an example, Scottish Water has leveraged (currently £70m) from the Ofwat Innovation Fund which was put in place to drive greater collaborative innovation across the England and Wales water industry. This £200m fund (rising to £400m in PR24) is driving advances in cross-sector needs including, net zero wastewater treatment, advanced thermal processing of biosolids, 3D printing of concrete structures and open data initiatives. We also collaborate on technical research through UK Water Industry Research who deliver a £4m per annum research programme that underpins water and wastewater services and advances approaches to asset management, leakage and wider system operation. This will continue to be a focus area for Scottish Water to maximise the value of our research and innovation funding.

**Internal Collaborative working** – in delivering the research and innovation programme in SR21, internal collaboration was a key success factor. We established innovation groups covering water, wastewater and net zero with senior level representatives from across the business to sponsor the R&I programme and acts as the governance groups. This ensured that R&I activity and projects was focused on business need and that consideration for implementation and utilisation of the project outputs was built in. This created a business pull for the outputs and a buy in to the innovation. As we have developed the SR27 Investment Needs, gaps in knowledge and capability have been identified and captured and are built into the rolling Research and Innovation programme. This will enable a smoother transition from SR21 to SR27 and earlier realisation of benefits.

**External collaborative working** – our ability to unlock opportunities and manage risks associated with our services is increasingly dependent on support from stakeholders and customers. For example, the Research and Innovation programme has benefitted from collaboration with academia in Scotland through the Hydro Nation Chair programme hosted by University of Stirling. This novel approach, funded by Scottish Water through the Scottish Funding Council, created a dedicated resource across multiple universities focused on key missions aligned to our net zero ambition. This programme has leveraged additional funding through UK Research and Innovation (UKRI) and other sources (c.£18m to date) and pulled on the expertise across Scotland's water research community accelerating knowledge transfer, increasing understanding of impacts on the water environment and developing new evaluation techniques for peatland restoration work and monitoring of woodland expansion to mitigate our emissions.

# 4 Transformation and Research & Innovation in SR27

## 4.1 SR27 approach

### *4.1.1 SR27 Transformation overview*

The purpose of Transformation is to support the Scottish Water Strategic Ambitions.

In SR27, Transformation will deliver six key themes, which together will improve how we plan, invest and serve our customers, and help achieve our Great Value and Financial Sustainability and Service Excellence ambitions. Not only do the themes represent those areas necessary for delivering our technology roadmap, but they also represent our largest benefits opportunities.

1. **Capital and Digital Procurement** we are introducing a new execution model to leverage partnership opportunities throughout the supply chain to reduce costs and improve outcomes

2. **Standardisation and Lean** will support capital and digital procurement to increase repeatability and remove waste from our business processes, reducing time and costs associated with investments

3. **Digitisation, Artificial Intelligence and Automation** will be explored, trialled and rolled out to support the efficient delivery of the SR27 plan predominantly by reducing capital expenditure.

4. **System Based Approach** will utilise improved asset health data to improve investment decisions

5. **Asset Risk and Optimisation (Compass)** will utilise technology to increase operational awareness of our assets' health and performance, increasing timely preventative interventions and therefore reducing costs

6. **Partnership Ecosystems (Team Scotland**) will engage customers to reduce the demand for water and waste-water services.

Lessons learned from SR21 have guided us to prioritise the key areas driving the largest impacts, whilst balancing the capacity of the organisation for major change. Although these themes represent the balance we aim to strike, future opportunities will be assessed on their benefits potential and impact on organisational capacity. Since another lesson learned was the value of providing allocated funding to accelerate mobilisation, an allocation investment of ~£110 million will be included within SR27.

Although the key themes have been identified, granular planning is still ongoing. On that basis, all of the figures shown in the SR27 Data Table 6 (part of the SR27 Data Tables and Commentary submission) are estimates. They highlight the up-front investment required to support the themes in the first years of the regulatory period, and the expected benefits based on top-down assumptions and previous experience.

As we enter SR27, the themes will be subject to the current (SR21) governance process before each investment is approved. This will ensure that individual investment cases meet a defined set of approval criteria, which will be subject to periodic review and refinement, have implementation

plans in place and a benefits realisation plan to demonstrate the savings, before the delivery phase commences.

As the SR27 portfolio matures, additional opportunities within and beyond the key themes will emerge and be actively explored. those that support our strategy and align with the agreed approval criteria will be considered for investment, on a spend to save basis

Benefits will be measured against the SR27 Reference Scenario baseline. Capital benefits will be realised by capital investment costs being reduced in relation to the baseline, therefore allowing further investment in projects that were not included within the SR27 baseline. Operational savings will be realised by the tapering of operational budgets through the SR27 regulatory period. As the SR27 regulatory period progresses, Table 6 will be updated to track the actual and forecast costs and benefits, and those costs and benefits will be demonstrable within the IPS updates.

The total investment cost of the six Transformation themes during the SR27 regulatory period will be £110 million. The resultant net benefits of £295 million will materially support Scottish Water's ability to meet the cost efficiency TOTEX challenge of 0.8% per year (or ~£300 million over six years).

We are confident that our Transformation programme will deliver against our ambitions. Our key Transformation themes, although new, are a continuation of similar initiatives conducted throughout SR21. With over 100 initiatives delivered in SR21, we have increased confidence in the planning, governance and execution processes we have developed.

The section below describes the key Transformation themes, and the associated investment and benefits figures presented in SR27 Data Table 6. As noted above, all figures presented here represent early estimates of costs and benefits. These may be revised materially ahead of Final Business Plan submission, and our understanding and confidence in both costs and benefits will continue to improve as we approach the start of SR27.

### *4.1.2 SR27 Key Transformation Initiatives*

**Capital and Digital Procurement**

For the SR27 regulatory period, Scottish Water is transforming parts of its supply chain from an alliance-based approach to an enterprise model. This will bring Scottish Water closer to its supply chain partners, aligning incentives, unlocking opportunities for innovation and improving collaboration. The improvements will be made in the following areas:

***Incentivisation*** – by aligning partner incentives to Scottish Water Ambitions and Long-Term Outcomes, so these become increasingly supported at the programme level.

***Commercials*** – moving to a defined cost model, removes layers of risk aversion and stacked risk costing. Partner costs will be reimbursable, but profit will be dependent on outperformance, encouraging collaboration and innovation.

***Design*** – by ensuring the same partners are engaged, end to end, from design to programme completion, hand-offs are removed, and outperformance opportunities are brought forward into the design process. This will unlock many opportunities, including greater use of standardisation, simplification and lean.

***Digital*** – by moving to a common digital environment, everyone involved in a programme will work on the same platforms using the same models. This will streamline information exchange.

***Delivery*** – by moving to end to end programme teams, partners and Scottish Water resources can align around common goals, systems and processes to unlock efficiencies and time savings.

To transition to the new enterprise model, Scottish Water will employ different ways of working. The main changes, which are being implemented prior to the commencement of the SR27 regulatory period, will be developed around a transition plan to ensure that SW and its partners will be operationally ready for SR27. Scottish Water will begin to implement new ways of working and build the skills and capabilities it will require ahead of partners being appointed, however, the twelve months ahead of the SR27 period commencement will be essential to successfully build the processes, structures and relationships with the preferred bidders.

The total costs associated with implementing the Capital and Digital Investment theme are £29 million, tapering down from year one to year three (year 1: £13 million, year 2: £10 million and year 3: £6 million).

The total gross benefits associated with implementing the Capital and Digital Investment theme are £212 million, with a split of £6 million of operational savings and £206 million of capital savings, after applying a 60% Transformation risk adjustment. Capital benefits will be realised by capital investment costs being reduced in relation to the baseline, therefore allowing further investment in projects that were not included within the SR27 baseline. Operational savings will be realised by the tapering of operational budgets through the SR27 regulatory period.

### Standardisation and Lean

Standardisation is our approach to capturing best practice and embedding repeatability in the design, build, commissioning, maintenance, and operation of Scottish Water's assets, driving continuous improvement at every stage. This initiative is a key enabler to reducing time and costs in the capital programme, improving safety and quality, and reducing carbon emissions.

We will continue to remove waste from our products and processes by employing Lean and Agile ways of working, prioritising opportunities with the greatest benefits.

The total costs associated with implementing the Standardisation and Lean theme are £18 million.

The total gross benefits associated with the Standardisation and Lean theme are £55 million — £31 million operational and £24 million capital. These figures exclude benefits from the Total Productive Maintenance (TPM) initiative and reflect a 60% risk adjustment applied to account for delivery uncertainty, in line with our Transformation portfolio approach.

### Digitisation, AI and Automation

Digitisation, AI, and automation all present significant opportunities to improve the way we work. Our experience from SR21 shows that enhancing our digital estate will be required to enable the other themes and to drive additional financial benefits. With a portfolio of potential digital enhancement initiatives that will be promoted based on their ability to meet defined approval criteria and deliver strong value for money.

For the first three years of the regulatory period, an investment of £6 million per year has been allocated to support the other themes and deliver net benefits. As previously outlined, individual initiatives will be selected and promoted based on their ability to exceed the financial hurdle rate. Beyond the allocation, additional initiatives may be promoted on a spend to save basis and locally funded.

Digitisation benefits are expected to come predominantly from savings in capital expenditure. The projected savings assume the £18 million investment is allocated to projects expected to deliver high returns in line with our defined approval criteria. Gross benefits are currently projected to be £25 million of capital savings.

### System Based Approach

We recognise that we can and will need to continue to improve our asset management capabilities to support our three strategic ambitions and the efficiency challenge in SR27 whilst we continue our journey to asset management excellence. Due to the scale of change being delivered by the Sustainable Investment Decision Making (SIDM) programme, it will continue into the SR27 regulatory period. In SR27, SIDM will deliver investment prioritised across systems, through the application of our system planning capabilities, supported by Copperleaf. We will implement processes and capabilities for longer term system planning by SR27, applying cost-benefit analysis to manage our systems in the most economical way possible whilst meeting the service and risk positions. This has the potential for cost avoidance in SR27.

The investment costs associated with SIDM will reduce significantly by the end of the SR21 regulatory period as a sustained level of maturity is reached. The investment costs for the first three years of the SR27 regulatory period will be £3 million per year.

Benefits will come in the form of capex cost avoidance, delivered by making better investment decisions. Total gross savings are expected to be £71 million over six years, with a 60% Transformation risk adjustment applied. These will be one-time savings associated with specific investment appraisals. This will allow for re- investment into projects that were not included within the SR27 baseline.

### Asset Risk and Optimisation (ICC to ROC)

The Scottish Water Intelligent Control Centre transformation will deliver benefits through a combination of new ways of working, leveraging technologies, data analytics and insight, developing more proactive capabilities for early identification of service issues, whilst enabling water and wastewater system performance to be better understood and further optimised.

The programme is aligned to our strategic ambitions and will build state of the art capabilities in Scottish Water that will support the safety, well-being and development of our people to deliver world class water and waste-water services for our customers whilst taking care of our environment. It will also allow Scottish Water to demonstrate to stakeholders and regulators that we can reduce our cost base by delivering more effectively and efficiently whilst sustaining high levels of service.

Scottish Water will work with a partner to implement the roadmap for Asset Risk and Optimisation, accelerating implementation within the first three years of the regulatory period. The total cost for the period will be £29.5 million, with £14.5 million in year one and £7.5 million in years two and three. Partner costs of ~£5.5 million and internal support costs of ~£1.5 million will be incurred in year one. There will be £22.5 million of other costs (including sensor installations, remote access installations and data services) equally spread across years one to three at £7.5 million per year.

The estimated total gross benefits associated with the Asset Risk and Optimisation theme are currently £42 million, although this is expected to increase as the plans develop. The benefits split is estimated to be 10% operational and 90% capital based on current SR21 performance, delivering operational savings of £4 million and capital savings of £38 million.

**Partnership Ecosystems (Team Scotland)**

Scottish Water will evolve the Partnership Ecosystem to engage more with customers, since they will play an increasingly important role in making services sustainable. By engaging more with customers, they will better understand our challenges and increasingly support the solutions, many of which will require a change in customer behaviour. Customer support will be necessary to reduce water demand. Opportunities include the use of more efficient products, changing usage patterns and using meters to reduce consumption. Customer support will also be needed to support wastewater services. Opportunities include individual properties reducing rainwater through soakaways or using grass rather than Monoblock, and communities supporting blue green solutions.

For the first three years of the regulatory period, an investment of £2 million per year has been allocated to expand the reach and influence of the Partner Ecosystem, with a focus on engaging customers, building awareness, and supporting behaviour change through a range of external support and partnership activity.

Since it is difficult to quantify the potential of this theme at this early stage, no benefits are currently shown in SR27 Data Table 6. As the plans develop, and benefits are identified, they will be included in SR27 Data Table 6.

### *4.1.3 SR27 Research and Innovation*

**Our approach in SR27**

We follow a staged approach to research and innovation, increasing knowledge and asset capability, applying this through pilot trials and ultimately scaling through demonstrator projects. This approach has been successful in deploying ceramic membrane treatment for drinking water production and developing our resource recovery factory. These demonstrators provide operators and stakeholders real world application, inform investment planning and build confidence in new approaches.

We balance our portfolio to deliver short-, medium- and long-term benefits and value. This means being clear on what our research and innovation intent is and recognise, the risk profile, resources committed, measures of success and speed of delivery vary across the portfolio.

The research and innovation portfolio is balanced across:

- **CORE (30%):** deliver efficient and effective services with our current asset base
- **ENHANCE (60%):** ensure our assets and services can meet increasing customer demand and adapt to deal with the impacts of climate change, and knowledge and capability
- **EXPLORE (10%):** consider and evaluate emerging risks, technology trends and legislation and how these can be incorporated into our future service to meet our strategic ambitions

## Partnership working to facilitate Research & Innovation

Developing the knowledge and capabilities we need to deliver efficient and effective services now, and to adapt and transform services for the future require us to look for ideas and opportunities from a diverse range of sources. We have grown and expanded our research and innovation ecosystem to include our people, our customers as well as academia, research bodies, suppliers (existing and emerging), industry partners and beyond to ensure that we quickly identify, evaluate and implement new and emerging solutions. The specifics of who we work with will change over time to fit the challenges we are trying to address and the opportunities that emerge. Working in partnership ensures that any investment in research and innovation from Scottish Water is leveraged with partner funding. Across our research and innovation programmes we aim to achieve on average 10:1 leverage i.e. £10 for every £1 invested.

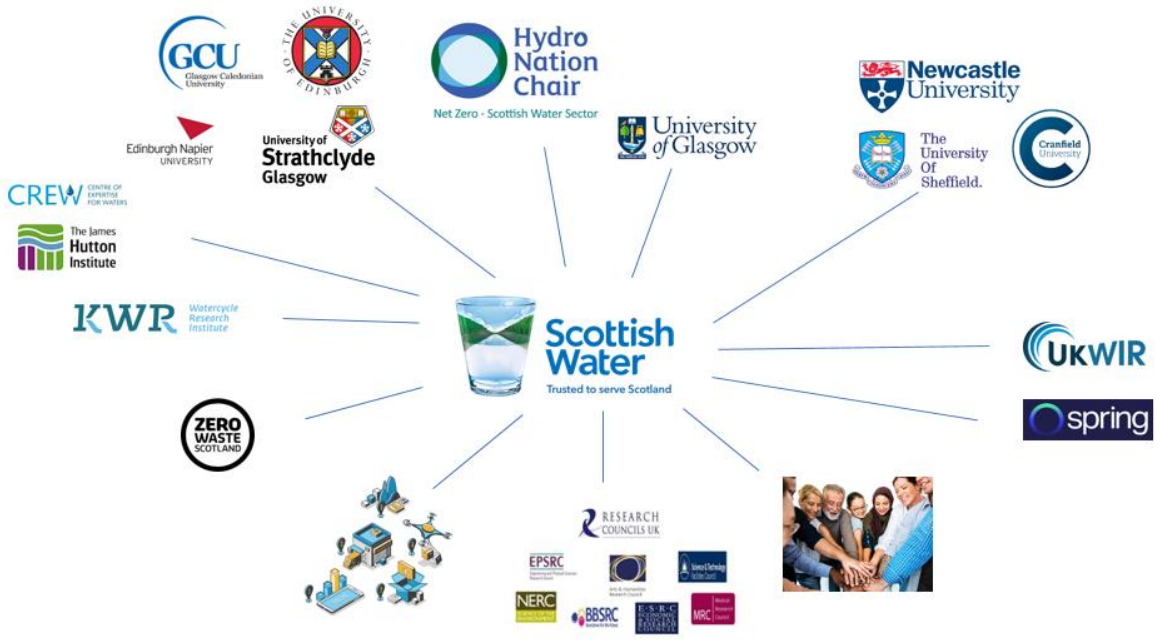


*Figure 1: Our Research & Innovation partnership network*

Key partners in our Research & Innovation ecosystem are:

**Hydro Nation Chair (HNC) Programme** – hosted by University of Stirling, this partnership between Scottish Water and the Scottish academic sector is delivering a critical mass of water and environmental research and knowledge focused on enabling Scottish Water to deliver our net zero ambition. The HNC programme has delivery partners from Stirling University, Glasgow Caledonian University, Heriot-Watt University and UK Centre for Environment and Hydrology to support key outcomes that enable our beyond net zero ambition. These include process emissions, low carbon infrastructure and enhancing natural systems.

### Wider Water Industry and Research Bodies

We work collaboratively with researchers across academia, primarily in the UK, where there is alignment with the water sector vision, our long-term strategy or business plan.

- **University of Glasgow** - £5.8m programme grant exploring new ways to provide decentralised water and wastewater treatment for rural communities beyond the reach of the public network. This aligns with Scottish Government's commitment to provide access to clean water and safe sanitation to all and the programme is developing water and

wastewater treatment technologies, enhancing existing systems and identifying changes required to policy and regulatory landscape to support adoption.

- **W**ater **I**nfrastructure **Re**silience (WiRE) doctoral programme - co-fund PhD projects with Cranfield, Newcastle and Sheffield universities. The programme aims to develop future technical engineers and scientists for the water industry and provides knowledge and capability focused on key industry challenges [ e.g. reducing leakage, reducing process emissions and more effective water treatment.]

- **Cross Industry Collaboration** – work with funding agencies (UK Research and Innovation), industry networks (IBioIC and Zero Waste Scotland) and other water companies as appropriate. IBioIC and Zero Waste Scotland are key partners in resource recovery projects including characterisation of materials recovered and establishing cross-sector links with potential markets.

- **International Collaboration –** we have a strong track record of working with water operators and research bodies internationally. We will continue to seek out partners with shared challenges and common aspirations to leverage funding and knowledge.

- **Napier University –** PhDs looking at the prevalence of antimicrobial resistant (AMR) genes in the freshwater environment. This supports the UK National Action Plan on AMR to determine the contribution of AMR from human and animal medicine and the wider environment. This will inform future investment for the water industry and prescribing practices for NHS and veterinary practice.

- **University of Highlands and Islands –** aligned with the broader AMR action plan and source control of pharmaceuticals to prevent environmental pollution. Lead a partnership between Scottish Water, SEPA and NHS Highland exploring pharmaceutical formulations that are less harmful to the environment whilst maintaining efficacy.

**UK Water Industry Research (UKWIR)** conducts collaborative research on behalf of the water industry in the UK and Ireland. The research output from UKWIR produces the evidence to underpin current industry performance, create common approaches to cross-industry challenges e.g. process emissions, and informs future policy and regulation and creates the knowledge needed to respond to future needs e.g. climate adaptation.

**SPRING** is the UK water industry's innovation accelerator with the aim of increasing the amount and rate of innovation and reducing the burden on innovators and companies by streamlining the innovation process. [This creates a focal point for shared challenges set out in the Water 2050 Innovation Strategy, and common solutions, enabling greater collaboration and leverage of resources and reducing duplication of effort. SPRING works in partnership with UK water companies to facilitate innovation, share knowledge and support the delivery of the Ofwat innovation fund (£200m 2020-2025; £400m 2025-2030)].

### *4.1.4 SR27 Key Research & Innovation Initiatives*

The primary focus of our Research & Innovation programme provides new knowledge and capability to support and enable delivery of our water, wastewater and net zero strategies. Cross-business innovation groups focused on each of these areas acts as the sponsor and governance mechanisms to identify and prioritise research and innovation requirements and ensure that the

outputs from the programme are implemented into the business. We have allocated £26.7m in the SR27 Reference Scenario to deliver the Research and Innovation programme.

Building on the approach in SR21 we intend to extend the Hydro Nation Chair programme that engages and builds capability across Scottish Academia (£3.615m) in research focused on net zero and circular economy priorities. The remainder (£23.097m) of the research and innovation allocation will be used to carry out research and innovation projects aligned to needs identified in Water Quality, Water Environment, and Climate Mitigation technical appendices. As in SR21, we will proactively seek leveraged funding where appropriate to scale the programme. We work extensively across the UK water industry to identify and deliver research and innovation through industry level collaborative research and innovation delivery mechanisms. This ensures that common industry level needs and opportunities are identified and coordinated research and innovation is carried out cost effectively through combined investment. Given the dynamic nature of research and innovation activity, the portfolio will adapt over time to reflect current and emerging needs and respond to threats and opportunities as they arise.

Following the approach described in 4.1.3, our SR27 research and innovation programme is aligned with our investment strategy for water, wastewater and net zero in SR27 and towards delivering on our Long-Term Strategy. The technical appendices for water quality, water environment and climate change mitigation provide the context and detail of why and what research and innovation is needed. This is summarised below.

**Ensuring excellent water quality and a continuous supply**

- *Catchment management* enables us to manage the environmental factors impacting on raw water quality for our drinking water systems. As the weather patterns change, we need to have a greater understanding of land use impacts on quality and quantity and what changes we can make, in collaboration with others to minimise deterioration or improve quality. This reduces the downstream need to increase the levels of treatment. Working with FORTH ERA at University of Stirling we are utilising in-situ multi-parameter monitors and satellite sensing Increased use of satellite and environmental monitoring and modelling enables us to identify priority areas for activity and the likelihood of improvements.

- *Enhancing the resilience and efficiency of water treatment processes* remains an ongoing challenge due to variations in source water quality driven by climate change and the identification of emerging contaminants. The water treatment programme has already identified ceramic membranes and ion exchange treatments that increase the robustness of treatment and reduce the ongoing maintenance costs. We are advancing further work looking at flat sheet membranes as a potential enhancement to existing filtration plants. This has the potential to provide more robust treatment and increase the capacity of existing works within the current footprint due to higher treatment rates. We are further exploring the use of ceramic membranes in nanofiltration applications. These are predominantly in our rural treatment systems and these membranes could replace the current polymeric PCI tubular membranes (85 sites) increasing operational performance and life.

- *Aesthetic quality* is an important issue for customers, and we will be continuing with research work on taste and odour compounds both from raw water (e.g. Geosmin and 2-methylisoborenol (MIB)) and disinfection by-products, such as trihalomethanes and halo-acetic acid compounds. With drier periods and reduced storage in raw water reservoirs, there is an increased risk of manganese discolouration in distribution. We are developing monitoring and modelling techniques to better understand what drives increased manganese in raw water and identify better management and treatment options.

- *Demand reduction* through better leakage management, increasing awareness of domestic consumption and offsetting the use of drinking water for non-potable purposes will be further explored.

- *Integrated water resource management* through the utilisation of surface water and grey water will be investigated to determine whether this can support demand reduction in existing and new developments.

- *Leakage management techniques* are continually evolving, and we are continually evaluating and implementing new approaches to reduce our leakage levels. Increased consumption monitoring at a domestic level will support this and will potentially encourage reduced consumption.

**Protecting and enhancing our water environment**

- We need *better understanding* of the impacts of multiple inputs to the environment as well as sewer and wastewater treatment discharges to ensure that investment we make has the desired benefit. Working with FORTH ERA at Stirling University we are carrying out research that will better evaluate the impact of interventions on the water environment so that collective action delivers the improvements needed. With the increasing knowledge and awareness of micropollutants, removal through better treatment will be a project focus.

- The *resource recovery demonstrator* on our waste water plant at Alloa will evaluate the benefits of resource recovery on treatment efficiency and effectiveness and the impact on overall emissions. The resource materials recovered will enable quality testing and identification of potential onwards uses. Working with Stirling and Clackmannanshire City Deal we are developing a green economy hub concept in the Forth Bank area of Alloa to support the creation of new enterprises based on resource recovery.

- *Optimising treatment* - we need to build the learning from research on process emissions to understand the optimisation of wastewater treatment to balance effluent quality, energy and chemical consumption, resource recovery and reducing emissions. This will require the development of simulation models to better control the process.

- *Managing the biology of wastewater* – advances in identifying and managing the biological processes within wastewater treatment provide the opportunity to better optimise wastewater treatment. Historically the focus of wastewater treatment has been on reduction of biological loading, but with increased awareness of micropollutants and process emissions, better control of the biological communities in wastewater process is required. Research will be carried out to determine whether biological communities can be tailored within a works to target specific contaminants and balance biological treatment and minimise emissions.

- *Small scale wastewater treatment* covers a significant number of assets. A research and development focus will be on balancing nature-based solutions with wastewater treatment to maximise circular economy benefits and reduce emissions, whilst delivering resilient effluent quality.

- *Advanced Thermal Conversion (ATC) technologies* - in collaboration with suppliers and UK water companies to gain deeper insights into their operation and the materials produced. This knowledge will help us identify target markets, collaborate with SEPA to create regulatory and commercial pathways, and develop value chains for recovered resources. Additionally, these materials will be used to explore opportunities for phosphorus recovery from char and ash, while informing waste treatment solutions for small-scale rural and island communities.

- *Monitoring* – Further research is needed to understand the connection between wastewater networks and treatment systems. This includes evaluating the impact of widescale surface water removal and improved water efficiency on network performance, influent flow variability to wastewater treatment works (WWTWs), treatment performance, and compliance risks. Expanding trade effluent discharge monitoring and enhancing WWTW inlet quality monitoring could provide early warnings of treatment issues, enabling proactive compliance efforts. Some of this work is currently underway and will continue into SR27.

**Climate adaptation and mitigation**

- *Process emissions* from wastewater will become the largest source of greenhouse gases as other parts of the economy decarbonise. There is a lack of international knowledge on methane and nitrous oxide emissions from wastewater systems and their management. We are developing better monitoring systems to quantify emissions and understand the processes that influence them. Our focus is on minimising emissions through process optimisation while maintaining compliance. In collaboration with the University of Glasgow, we are exploring microbiological control in wastewater systems to manage emissions and examining the impact of resource recovery, gas capture and utilisation, and non-biological treatment methods. This will minimise the production of nitrous oxide and release of methane from our treatment systems.

- Promote research and innovation and undertake trials on *$CO_2$ capture technologies* from our wastewater treatment processes. We have identified Carbon Capture and Utilisation technologies that can produce material for cement production that reduces the carbon emissions associated with infrastructure.

- *Nature-based solutions* are increasingly used in wastewater treatment and surface water management to reduce environmental impact or for non-drinking reuse. Collaborating with academic researchers and the Royal Botanic Gardens in Edinburgh, we aim to find the optimal plants for various applications and broaden their use.

- *Infrastructure emissions* from our investment delivery are an important part of our net zero goals. We are collaborating with our supply chain, other infrastructure organizations, and academia to identify lower carbon construction materials, especially for concrete and steel. Detailed requirements are provided in the Climate Mitigation Technical Appendix.

- We shall continue to *develop our understanding of the impact of climate change* on the quality of our raw water sources, particularly in relation to variations in rainfall patterns, extreme weather events and increasing temperatures. Research and development in the following areas will be required:
    - Understand the risks to source water treatability associated with climate change impacts, including algal blooms, taste and odour and increasing levels of organics and pathogens;

- Assess the efficacy and environmental impacts of nature-based, in-reservoir and catchment solutions;
- Development of monitoring and modelling techniques to predict and manage variations in raw water quality, including organics and pathogens.

**Lighthouse Projects**

A key challenge in driving innovation through to implementation is overcoming resistance to change that can slow down the rapid and wide deployment of new technologies and ways of working. Often termed the "valley of death", many new technologies and business models struggle for traction. To overcome this, Scottish Water created a framework, Lighthouse Project, that gives innovative approaches the greatest chance of success. This approach creates an environment that encourages and supports:

- Cross-functional and multi-partner teams to facilitate and progress Lighthouse projects
- Ring-fenced funding to ensure that Lighthouse projects are treated as large scale innovation projects with appropriate risk profiles
- Strong senior leadership to unblock delivery and overcome barriers to progress
- A learning and open mindset to ensure that progress towards outcomes is the focus and learning is valued

This framework has been used to ensure that a new technology, e.g. ceramic membranes and Nereda, areis embedded into our solutions library or can be used to provide focus to addressing a strategic imperative e.g. achieving lead free Scotland.

We have allocated £15m in the Reference Scenario to deliver lighthouse projects in SR27. Some of this allocation may be required to continue with the River Almond Lighthouse and the Craigleith Blue Green scheme in Edinburgh. Provisional scopes of potential lighthouse projects that align with strategic challenges and aspirations within the long-term strategy have been included in Appendix B. These will be developed further to determine strategic relevance and feasibility of partnerships. The scoping of these will be funded from the innovation allocation in IPS with any investment to deliver subject to investment prioritisation.

# 5 Assumptions and Uncertainties

## 5.1 Assumptions

**Transformation –** We use a range of assumptions when estimating the costs and benefits of individual projects within our Transformation themes. These are based on the best available information at this stage, and will be developed and updated as projects approach launch and costs are firmed up. In addition, new information may come to light that shows that it would be in customers' interests to pursue different Transformation projects, or to focus our attention on a sub-selection of activities that will drive outsized benefits for customers. We will continue to engage with WICS and key stakeholders as our Transformation plans develop – both for the Final Business Plan and as we approach the start of SR27.

**Ofwat Innovation Fund** – The success of the Research and Innovation programme over recent years can be attributed to high levels of collaboration within the water industry driven by the introduction of the Ofwat Innovation fund in England & Wales, and consistent funding from UKRI in water related research and doctoral training centres. This has provided high levels of leveraged funding and driven collaboration at an industry level. While the innovation fund has been extended from 2025 to 2030 and increased from £200m to £400m, it cannot be assumed that the fund will continue indefinitely.

**Academic funding** – Additionally, the UK research landscape, and more recently and pronounced, the Scottish academic funding landscape, has come under increasing cost pressures. Reduced levels of collaboration and funding would result in increased cost to Scottish Water in developing new knowledge and capability and likely slow down the rate of progress.

## 5.2 Uncertainty

At this stage of planning, there is significant uncertainty as to the exact costs and benefits associated with individual Transformation projects. Unlike other investments within this business plan, we typically do not have historical examples of similar projects as a benchmark – with many initiatives representing frontier improvements across the water and related industries. Individual cost and benefit estimates remain subject to revision as we approach the start of SR27, and it is likely that some projects will materially outperform our assumptions while others will not achieve initially anticipated benefits. We deploy strong governance structure to monitor outcomes and can adapt if programmes are not delivering value for money. However, our overall confidence that the Transformation portfolio can, in aggregate, meet the efficiency challenge within the regulatory period is high (reliability C) for a number of reasons:

- **Historic performance** - The listed themes are a continuation of similar initiatives conducted throughout SR21. With over 100 initiatives delivered in SR21, we have increased confidence in the planning, governance and execution processes we have developed.

- **Application of transformation risk** – We have applied a transformation risk adjustment to all benefits, as has been the practice on all early initiatives (initiative level 1) during SR21. The SR21 risk adjustment of 50% has been validated by the portfolio throughout the SR21 regulatory period. Since SR27 is further into the future, and the themes are at the earliest stage of assessment, a risk reduction of 60% has been applied to all benefits estimates.

- **Appropriate benefits quantification** – The more difficult to quantify benefits associated with Standardisation, Lean Total Productive Maintenance (TPM) and Team Scotland have been excluded until benefits and overlaps with other themes are better understood.

- **Spend to save** – The portfolio is expected to be enhanced by spend to save initiatives, which will be identified within the regulatory period and funded locally.

In summary, our Transformation reliability is band C, since data is derived from external quotations; extrapolations of existing initiatives and lessons learned from comparable projects. Our accuracy, particularly when considering downside variation (fewer savings than planned) is band 4, since well tested risk adjustments have been applied.

# 6 Conclusion

This Technical Appendix has set out our SR27 approach to our Transformation and Research & Innovation Programmes.

The core purpose of our Transformation programme is to support the Scottish Water Strategic Ambitions - focussing on Service Excellence, and Great Value and Financial Sustainability. Our Research and Innovation programme, which is anchored in collaboration with academia, will continue to be a key provider of knowledge and capability, enabling delivery across all key investment areas - also helping us deliver on our long-term strategy.

We are proposing to:

- Invest £110 million across six Transformation themes during the SR27 regulatory period, with £295 million in net benefits forecast to support Scottish Water's cost efficiency challenge of 0.8% per annum.; and
- Invest £26.7m to extend the Hydro Nation Chair Programme that engages Scottish Academia in research focussed on net zero/circular economy priorities (£3.615m) - and carrying out continued research and innovation aligned to the needs identified in Water Quality, Water Environment, and Climate Mitigation Technical Appendices (£23.097m).

Our approaches across both programmes have been built on our successes and lessons learned from the SR21 period - and tackle the three key challenges we have identified: increasing extreme weather, population growth and change, and tighten regulatory requirements.

These projects and programmes help us achieve improvements in our services, whilst making our operations and investments incrementally more efficient and productive. Every improvement that we make in this way leads to better outcomes for customers, lower bills or reinvestment back into our assets. They enable us to deliver on our ambitions of Service Excellence, and Great Value and Financial Sustainability.

# Annex A: Transformation in SR21

Transformation initiatives are on track to contribute £49 million of gross (£30 million of net) Tier 1 benefits over the SR21 regulatory period. The top five initiatives contribute over 60% of the total Tier 1 benefits. They are listed below:

**SR21 Procurement** – although predominantly delivering Tier 2 savings (as planned), this initiative is also forecast to deliver Tier 1 savings.

**Wholesale Transformation** – the Wholesale Service processes were streamlined to better respond to the customer's concerns, improve right first time and reduce waste.

**Project SWIFT** – SWIFT has improved the efficiency of field work, whilst reducing carbon emissions and improving service.

**Co-pilot Upscale** – the introduction of Co-pilot increased the productivity of the pilot groups to such an extent that its deployment has been upscaled.

**Functional Hub** - the Functional Hub is deploying the capabilities and culture to enable the business to continuously improve its processes.

### Transforming our business

The transformation portfolio includes over 100 initiatives. Each regulatory period, the portfolio is balanced to ensure that all costs are returned in financial benefits within the period, whilst also supporting non-financial initiatives. Financial benefits include monetary savings, creation of capacity, avoided costs and additional income. Non-financial benefits include service excellence improvements and carbon reduction.

New initiative opportunities are actively sought across all of Scottish Water's operations, processes and locations. For each new initiative, a financial baseline is defined as well as the associated one-time costs, ongoing costs, whole life costs, one-time savings and recurring savings. Whereas the original intent was to balance the portfolio to ensure the total financial investment was returned within the regulatory period, Scottish Water has recently introduced a hurdle rate for financial initiatives.

Potential initiatives must now demonstrate their alignment with a structured set of approval criteria, which are reviewed and refined periodically, before progressing through Scottish Water's Unifier Gate 70 (IL2) for further planning. Benefits calculations and assumptions are then refined and validated by our finance specialists, and a benefits realisation plan is developed. This ensures benefits can be measured, tracked, reported and assured. Those initiatives that continue to meet the hurdle rate for investment, are promoted through the Unifier Gate 90 (IL3) for execution.

Initiative progress and benefits are tracked and reported monthly, comparing planned, forecasted and actual progress and financial benefits. This allows improvement teams to identify gaps, take corrective actions and maximise benefits. Realised benefits are verified by our finance specialists before initiatives pass Unifier Gate 110/120 (IL5) and are considered complete.

In addition to assuring financial benefits on an individual initiative basis, the transformation portfolio is subject to periodic internal audit to ensure its controls and procedures successfully define, document, monitor and track the realisation of all benefits.

The total forecasted Tier 2 (and Tier 1A) gross benefits for the SR21 period are £384 million. The largest 7 initiatives account for ~80% (£313 million) of Tier 2 (and Tier 1a) benefits and are detailed below.

### SR21 Capital Procurement

The advent of the SR21 regulatory period allowed Scottish Water to enter new partnership arrangements with its Delivery Vehicle 1 and 2 (DV1 and DV2) partners. New and anticipated efficiencies in the Plan, Prepare and Deliver phases of projects allowed for efficiency factors to be agreed upfront with DV1 partners, versus the SR15 cost basis. Improvements in the DV2 delivery model also allowed for rates efficiencies and rebates to be agreed upfront with DV2 partners, versus the SR15 cost basis.

DV1 benefits began in FY 2021-2022, whereas DV2 benefits commenced in FY 2022-2023, once contracts were in place.

The financial benefits each year are calculated by multiplying the capital investment expenditure by the SR21 percentage cost saving versus the SR15 baseline.

As well as providing financial benefits, the improved efficiency within the procurement process is delivering capital programmes within reduced lead-times.

### SIDM Programme

The Sustainable Investment Decision Making Programme (SIDM) programme, launched in 2020 was established to ensure we are managing our current assets effectively and planning for the wise use and investment of customers' money, by making smarter investment decisions. This includes showing how we are becoming more efficient in the investment decisions we make now on our assets using the best available data and analytics, but also how they are resilient and looked after for future generations to inherit.

The SIDM programme is a 10-year programme and will continue beyond the SR21 regulatory period, maturing our investment decision making approach.

### DV1 Execution Plans and Mobilisation

At the commencement of the SR21 regulatory period, Scottish Water and its DV1 partners collaborated to run pilot projects through the Plan and Prepare stages. With accelerated project launches, increased teamworking and streamlined processes, the pilots significantly reduced the time to navigate from Unifier stage 30 through to stage 90.

The pilots were benchmarked against similar SR15 project types (factory, conveyor and assembly) to establish cost baselines, savings targets per project type and a streamlined Plan, Prepare process.

### Waste Water Intelligent Networks and Improved Urban Waterways

Launched in 2022, the Wastewater Intelligent Network (WwIN) initiative is improving the operational awareness of the wastewater network. The implementation of 1,000 CSO monitors,

and 1,200 wastewater network sensors will provide an overview of asset and network condition and performance. This real-time monitoring will enable proactive flow management and prompt preventative interventions that will prevent expensive and environmentally damaging escapes.

As well as delivering financial benefits, preventing environmental escapes presents significant non-financial benefits for all stakeholders.

### Standardisation

Launched in 2021, the Standardisation initiative has simplified and standardised our designs to reduce the associated time, cost and carbon of DV1 and DV2 procurement programmes. The combination of improved requirements management, a move towards standard products, the introduction of a design library and the implementation of an E-portal to collaborate with supplier partners have reduced the cost and increased the quality of product designs and construction programmes.

As well as delivering financial savings, the introduction of the design library has enabled the re-use of low carbon designs, materials and techniques.

### Project Swift

Launched in 2021, SWIFT improves how Scottish Water and DV2 partners plan, manage, monitor and deliver field work across Scotland. SWIFT streamlines field work processes, integrating planning and scheduling with DV2 partners. By providing field teams with improved applications for planning, scheduling and delivery of work, response times and the associated costs of field work have been significantly reduced.

As well as providing financial benefits, the reduction in response times and increase in first time fix rates, improves customer experience and reduces carbon.

### Intelligent Water Networks – Source to Tap

Launched in 2021, the source to tap initiative ran a pilot to build intelligence related to our asset and network condition and performance in the Aberdeen area. This intelligence is helping to optimise operations and predict service issues, allowing for prompt preventative interventions.

As well as providing financial benefits, proactive water network management improves water quality and reduces interruptions, resolution times, leaks and extraction from sources.

### Other Initiatives

The remaining initiatives account for £71 million of Tier 2 (and Tier 1a) benefits and other, non-financial benefits. In many cases, the financial benefits are secondary to either carbon reduction or service excellence improvements. Examples of carbon reduction initiatives are the Exemplar wastewater treatment works and Exemplar large SPS initiatives, where live wastewater asset monitoring has reduced energy consumption and emissions. Examples of service excellence improvements include the streamlining of internal processes (I-journeys), the introduction of Co-pilot and the application of non-complex service delivery to increase productivity and reduce lead-times.

# Annex B: Sample SR27 Innovation lighthouse projects

**Proposal: Resource resilient development**

**Long-term Step: Reduce Demand on our Services**

**Outcome: Key role in enabling Scotland's sustainable economic and housing growth**

**Rationale:**

Society needs adaptation and mitigation strategies to respond to the climate emergency. Urban planning takes a non-systematic, siloed approach to development and provision of utility services. This increases the pressure on existing infrastructure and misses potential synergistic opportunities to address water management challenges and generate sustainable energy and heat.

Rethinking new residential and commercial developments has the potential to embrace circular economy thinking to better manage rainwater, surface water and waste water to reduce environmental impacts, and to provide local sources of sustainable heat and energy.

Ongoing work with University of Glasgow (Decentralised Water Technologies – Offgrid water) has identified potential opportunities to improve and integrate wastewater treatment and heat recovery systems. Internationally there is an increased focus on integrated urban water management to mitigate the amount of water abstracted from the environment and reduce the impact of surface water and sewer discharges to the environment.

**Lighthouse Scope**

Options that could be explored at scale and in partnership with developers, utility providers, planners, and community groups to scale up and implement alternative water management, wastewater treatment and heat / energy provision at a local level.

1. Integrated water management
2. Surface water and rainwater capture, treatment and recycling for non-potable purposes e.g. irrigation, toilet flushing, commercial uses
3. Private water supply point of use treatment alternatives
4. Source separated wastewater treatment
5. Black water and grey water separation – increased strength of effluent allows for anaerobic treatment, with heat and energy production. Heat and energy generated can be utilised to enhance the treatment processes with excess used to supplement community heat / energy systems and reduce fuel poverty/customer bills
6. Integrated waste management
7. Combine organic waste streams
8. treat anaerobically to generate energy and heat,
9. enables nutrient recovery
10. reduces process emissions

**Potential Partners**

University of Glasgow – Offgrid Water

University of Stirling – City Deal funding (c£7m) for intergenerational and low carbon housing

Homes for Scotland – representing house builders – unlocking development

**Proposal: Advanced Thermal Conversion (ATC) technologies – securing our bioresources outlets**

**Long-term Step: Collaborate and lead partnerships**

**Outcome: Protecting our water environment**

**Rationale:**

Advanced Thermal Conversion (ATC) technologies offer a range of potential benefits for biosolids management e.g. greater pollution destruction, less) dependency on land as an outlet for bioresources, greater capability to recover resources.

Scottish Water needs to build the supply chain in ATC, from the technology supplier to acceptance of the output materials, and build a future customer-base for the output material for the circular economy; this takes time and requires building new business partnerships.

We need to test future business models: at the small-scale for multiple organic material inputs and at the large scale as part of future resilience.

The capability to demonstrate, within SR27, will show the market, the technology providers, regulators, and customers that we are prepared to make bold commitments to the circular economy and to the environment.

**Lighthouse Scope**

There are 3 modes of demonstration to consider, but at this stage it is too early to select. Multiple demonstrations might be possible if we work with partners.

1. Scottish Water hosted demonstrator on a sludge treatment centre (STC), time limited
2. Partner-demonstrator (where either SW host or Partner host), time limited
3. Demonstrate on Scottish Water STC, with option to purchase and make permanent.

ATC technologies within scope for bioresources

- Large-medium pyrolysis
- Medium-small hydrothermal carbonisation
- Gasification as either standalone or as bolt on
- Hydrothermal liquefaction to demonstrate via a partner host (this would be for the supply chain to host e.g. Fire Fly)
- Keep option open to partner on other emerging ATC technology demonstration

**Proposal: Zero Process Emission site – 'Going beyond net zero'**

**Long-term Step: Transform and drive efficiency**

**Outcome: Protecting our water environment**

**Rationale:**

Following greening of the grid, process emissions (nitrous oxide and methane) from wastewater treatment works will make up 56% of Scottish Waters operational emissions. Solutions need to be developed to enable us to go beyond net zero by 2040. Projects are underway to mitigate these emissions through for process control and resource recovery by removing the causes of the emissions where appropriate – e.g. ammonia.

To achieve net zero process emissions there will be a requirement to apply these approaches and potentially capture and treat process emissions – be they N2O from ASP processes or CH4 from biosolids treatment.

**Lighthouse Scope**

This project seeks to employ a range of process emission options to achieve a zero-process emissions site.

This demonstrator will:

1. Measure the whole emissions of an ASP site using N2O monitors and air flow monitors in the off-gas flow.
2. Mitigate the whole emissions of a treatment works
3. Allow verification of liquid calculations versus total emissions for a whole ASP site
4. Demonstrate the cost and scalability of process emission solution.

Options for collection to be evaluated include:

- A full span Aluminium structure roof (highest carbon)
- A self-inflating gas bag (lower carbon)
- A suspending gas curtain (lower carbon)

Destruction/collection technologies to be evaluated include:

- Active destruction using
  - Acti-layer contained in a UV box
  - UV and Ozone box – e.g. Oxytec
  - Other
- Collection of N2O and scrubbing/compressing for use in other industry.

In conjunction with collection and destruction techniques mechanisms to control and manage the treatment process will be deployed and evaluated. These include:

- Nitrous oxide artificial intelligence and machine learning control philosophies
- Explore and deploy microbiology manipulation / control

**Proposal: Digital Management of Water Environment**

**Long-term Step: Reduce Demand on Our Services**

**Outcome: Protecting our water environment**

**Rationale:**

The River Almond Lighthouse project is developing a management approach to improve water quality in the River Almond to address improvement objectives driven by local action groups, environmental issues and desire for greater access to the water environment.

The project is leveraging the developing FORTH ERA Digital Observatory delivered by University of Stirling as part of City Deal funding. MOT4 Rivers, a NERC funded project, is providing increase monitoring of the ecological health of the Almond Catchment. Scottish Water and PFI assets in the catchment discharge into the river.

The River Almond catchment is also a selected Climate Change Adaptation Pioneer catchment.

**Lighthouse Scope**

Aim to operationalise outputs from FORTH-ERA / Almond Lighthouse and MOT4 Rivers to determine environmental / ecological capacity of water environment and identify priority inputs that need addressed at catchment level (Scottish Water and non-Scottish Water) to drive desired improvements.

Use the outputs to drive catchment level cost effective programme of measures and inform wastewater / wastewater network digital twins target operating conditions dynamically.

Develop digital twins of wastewater treatment works alongside our natural environmental catchment management to enhance exemplar wastewater operation and overall water management in the catchment to drive optimisation for compliance, emissions and cost, etc.

Link in our wastewater intelligent networks and optimising management of sewer flows in dry and overload conditions to minimise the amount of CSO spills in priority catchment.

**Potential Opportunities**

- FORTH ERA – Digital Observatory of Forth Catchment funded by Stirling City Deal
- MOT4 Rivers – NERC research looking at ecological health of rivers and factors impacting it – Stirling / Glasgow / UKCEH etc.
- Almond Lighthouse
- Severn Trent Zero Spill Hub – collaborative approach to “solving” CSO issues
- University of Exeter fellowship to develop Wastewater Digital Twin

**Proposal: Circular Economy Regional Development**

**Long-term Step: Collaborate and lead partnerships**

**Outcome: Reduce demand on our services**

**Rationale:**

Scottish Water is currently progressing phase 1 resource recovery demonstrator at Alloa Wastewater Treatment Works. This project aims to demonstrate and evaluate at scale the following opportunities:

- Diversion of waste products currently removed from landfill (e.g. grit)
- Extraction of potential resources from the wastewater stream that benefit compliance and process capacity (cellulose and algal removal of phosphorous)
- Understanding of the material quality that can be recovered, to allow for market identification, develop product specifications and achieve end of waste criteria
- Understand the operation and maintenance impacts of resource recovery
- Evaluate the cost and benefits of resource recovery at an operational works

Other opportunities for resource recovery were identified in the pre-design work for Alloa, including hyrdothermal liquefaction of biosolids and pyrolysis of screenings. The need and markets for these were less well developed and were held back for phase 2.

Alongside this works, Clackmannanshire Council is developing a community vertical farm enterprise and have the aim to create a regeneration zone in and around the Forth Bank area that the treatment works is located. There is City Deal funding available to support green growth in this area and Alloa could become an R&D centre for resource recovery. Scotland's International Environment Centre, based at Alloa College is co-ordinating the delivery.

**Lighthouse Scope**

Phase 2 would be a build on the phase 1 demonstrator

- Evaluate benefits of resource recovery in phase 1 and determine what elements should or could be made permanent
- Dependent on bioresources / resource recovery strategy, progress with HTL pilot
- Screenings pyrolysis evaluation – determine central v's local and material outlets

**Potential Opportunities**

Phase 2 would seek to leverage the SIEC work with Clacks Council to develop an R&D and Green Growth facility in the Forth Bank area. This would seek to include enterprise agencies and SEPA to speed up the development of green business and products.