WSX15 - Annexes - Water Networks Plus strategy and investment

Business plan
2025-2030

Wessex Water
YTL GROUP

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WSX15 - Annexes - Water Networks Plus strategy and investment

CONTENTS

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

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

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

A1 DWI drinking water quality

This annex contains confidential material and has been submitted to Ofwat separately.

A2 Demand management strategy

WRMP24: Demand Management Strategy

Wessex Water

September 2023

Wessex Water
YTL GROUP

Document revisions

Major version number	Details	Lead contact	Date
1	Final version	Hannah Daniels	14/08/2023
2	Revised for PR24 submission	Hannah Daniels	06/09/2023

Executive summary

This is an updated version of the Demand Management Strategy Appendix submitted as part of our revised draft WRMP24 to reflect changes made to phasing of smart metering and leakage activities for our final PR24 business plan.

Wessex Water forecast a supply demand balance deficit from 2035 due to proposed abstraction licence reductions. This deficit coupled with challenging regulatory targets on demand and leakage reduction provide clear drivers for investment and innovation in our demand reduction strategy. Demand reduction is integral to achieving three of our strategic outcomes[1]; safe and reliable water, sustainable abstraction, and net zero carbon.

Our preferred demand reduction strategy comprises three key areas: smart metering, customer engagement & water efficiency, and leakage reduction.

Customers are supportive of our proposals. There is support for measures to reduce abstraction from environmentally sensitive sources, but bill affordability is also a key issue. Customers typically have limited awareness of water issues but are keen to play their part in reducing their usage – many don't know how to do this though and so would like support and practical assistance. Customers are keen to see leakage reduction but are also keen that a variety of investment measures are implemented to secure water supplies for the long term.

Smart meter for households and non-households

Smart metering is at the heart of our strategy and the key to unlocking a step change in outcomes in the other two areas. We believe an ambitious smart metering programme is the innovation required to deliver targets and reduce requirements for future supply side schemes. Our preferred plan includes the rollout of advanced metering infrastructure (AMI) smart meters to 40% of our customers (including non-households) by 2030 and 95% by 2035 which will provide detailed usage data allowing us to better target both leakage reduction and customer engagement efforts.

Water efficiency for households and non-households

The availability of high-resolution consumption data arising from smart metering will facilitate ever better targeting of water efficiency services, and in particular our Home Check programme for household customers. From 2025-2030 our preferred programme will include 12,000 standard Home Check visits and 4,800 plumbing leak fix visits a year. In the same period, we plan to deliver over 160 visits a year to non-households to fix leaks and reduce water wastage. We anticipate continuing to work with schools and other not-for profit or community focussed organisations.

Leakage Reduction

We are committed to meeting our regulatory target of 50% leakage reduction by 2050. To achieve this, we will build on our current leakage reduction strategy with greater focus on expanding our acoustic logging and smart network capabilities, using data to bring about efficiencies in the 'find and fix' backbone of our operation. Smart metering data will also play a key role in the evolution of our leakage strategy, allowing us to identify customer supply

[1] wessex-water-strategic-direction-statement-2022.pdf (wessexwater.co.uk)

pipe leaks much sooner than current detection methods and improving the accuracy of zonal flow balance calculations. In addition to these ‘fix’ activities we will also expand strategies that prevent future leakage such as pressure management. We aim to reduce leakage by 3.5 Ml/d in AMP8.

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Table of appendices

Appendix Number	Report title
1	Artesia for Wessex Water - Considerations for smart meter rollout

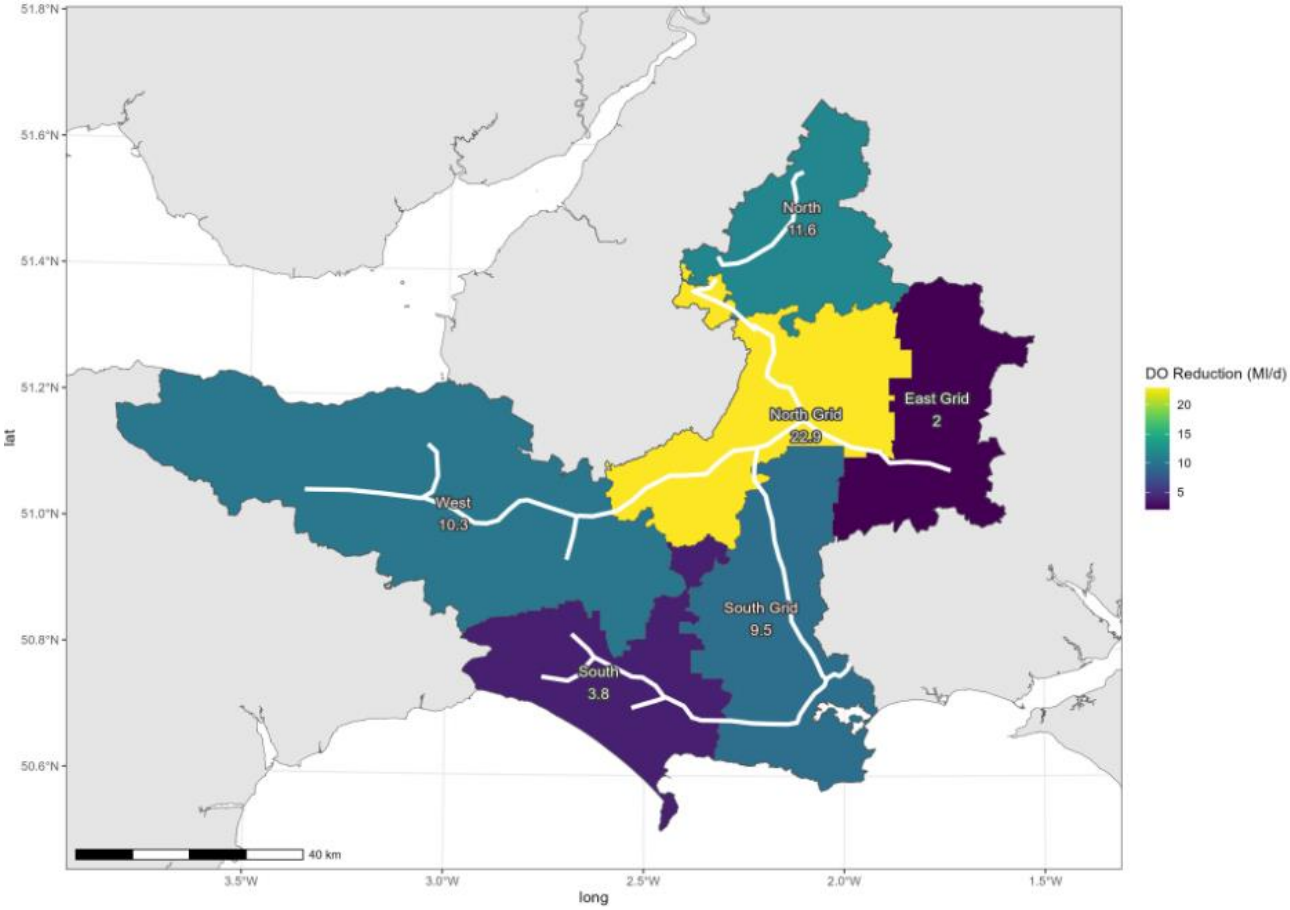
1 Demand management challenges and targets

Key Drivers

Wessex Water will be significantly impacted by proposed abstraction license reductions in 2035 and 2050 linked to environmental investigations associated with the WINEP and the longer-term Environmental Destination set out by the EA. Figure 1-1 shows the forecast dry year annual average (DYAA) distributed input losses resulting from sustainability reductions by 2050 across our six water supply planning zones.

The combination of abstraction licence reductions, with population growth (13% by 2050) and the impact of climate change means we are, for the first time, forecasting a deficit in our supply demand balance from 2035 if we take no action. This is a key driver for us to accelerate our demand reduction strategy to minimise the impacts of these licence reductions and reduce the requirement for significant supply side infrastructure projects where possible, aligning with our target outcome of net-zero carbon[2]. Reducing demand is key to two further strategic outcomes, achieving sustainable abstraction and maintaining a safe and reliable water supply for our customers.

Figure 1-1:Spatial distribution of DYAA distributed input losses resulting from sustainability reductions by 2050 across our 6 water supply planning zones.



In addition to the forecast supply-demand balance deficits, there are four main government targets linked to demand reduction and leakage and four interim targets (all interim targets taken from the Environmental Improvement Plan 2023).

Main targets & *Interim targets:*

- Reduce distribution input (DI) per capita by 20% from 2019/20 reporting figures by 31st March 2038 (The Environment Act, 2021) – This is a statutory target.
    - *Reduce DI per capita by 9% by 31st March 2027*
    - *Reduce DI per capita by 14% by 31st March 2032*
- Reduce personal water consumption to 110 l/h/d by 2050 (WRPG)
- Reduce consumption in the non-household (NHH) market by 9% by 207/38 and 15% by 2050 (The Environment Act, 2021)
- Halve leakage by 2050 and monitor progress towards this (WRPG)
    - *Reduce leakage by 20% by 31st March 2027*
    - *Reduce leakage by 30% by 31st March 2032*

Meeting these targets in the longer term will require investment and innovation as existing strategies become exhausted and remaining options, such as large-scale mains replacement, don't deliver a cost-effective solution.

2 Our Preferred Demand Management Strategy – Overview

Our Options Appraisal Appendix provides detail on how we developed options for the key elements of our demand reduction strategy, water effeicency, leakage and smart metering, separately before bringing feasible options together to form different demand option portfolios. These portfolios reflect guidance to consider demand management measures holistically, and also provide a breadth of ambition towards achieving associated targets.

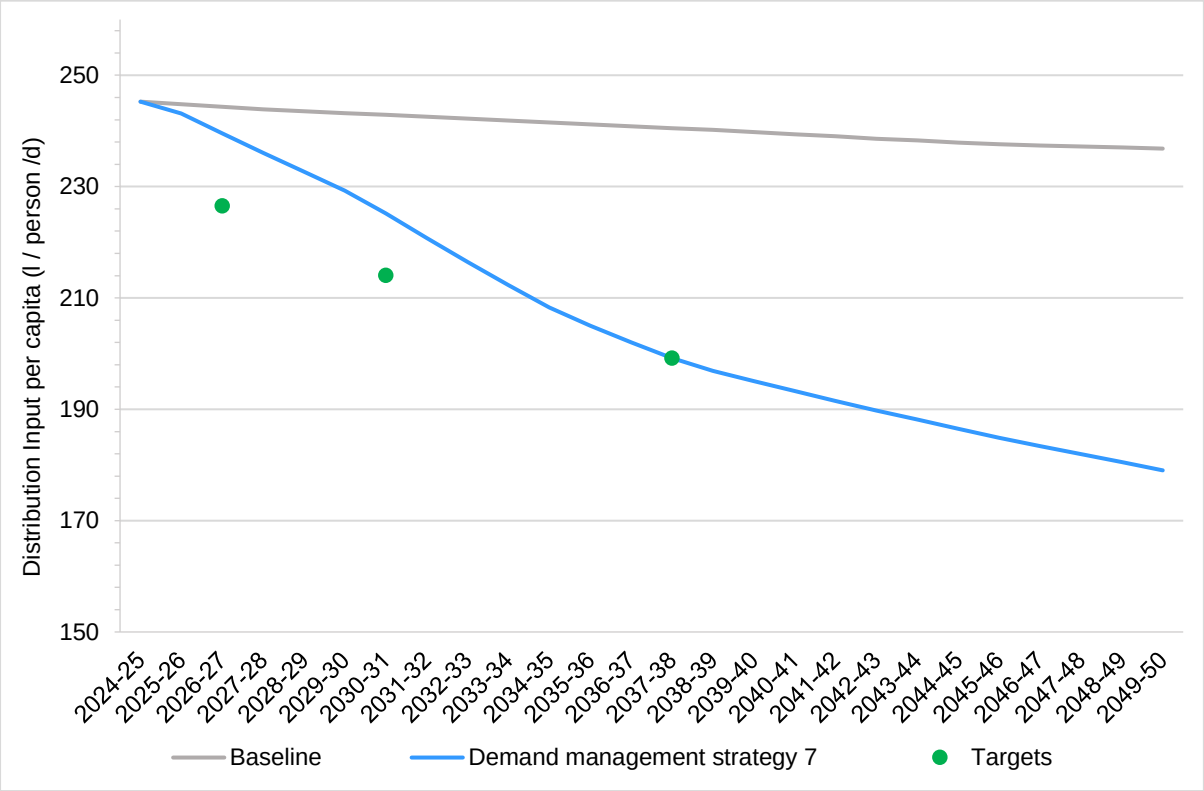
We considered seven different portfolios (see Options Appraisal Appendix section 4.1.4) and of these, demand strategy 7 was selected as part of our WRMP24 preferred best value plan alongside supply side measures. A summary of demand management strategy 7 is shown in Table 2-1 below. This is an ambitious strategy, appropriate for the level of challenge we face and the timescales in which we need to realise outcomes to help offset abstraction licence reductions. It meets our statutory target for 20% distribution input reduction by 2037/38 (see Figure 2-1) as well as longer term leakage and consumption reduction targets. This strategy also addresses feedback from our draft Water Resources Plan and aligns with expectations of both our regulators and customers.

In response to the July 2023 EA Information Letter 17/2023 to consider phasing activities from PR24 into future price review periods, we have adjusted our demand management strategy for our business plan from that proposed in our revised draft WRMP24. This includes a reduction in our AMP8 smart metering programme, reducing target smart meter penetration from 75% to 40%, and a reduction in our Leakage activity, reducing our target leakage reduction from 7.7 Ml/d to 3.5 Ml/d. Although these elements of our demand management strategy have now been phased to deliver less in AMP8, we still remain committed to achieving the same targets as proposed in our revised draft WRMP24 by the end of AMP9.

Table 2-1:Summary of our preferred demand management strategy

Demand Strategy 7 Summary	
Leakage reduction profile	3.5 Ml/d reduction in AMP8. Linear to 2050 thereafter to meet 50% reduction target
Metering strategy	Targeted smart metering roll-out in the Hampshire Avon area (40%), full roll-out by 2035 (95%).
Household water efficiency	Home Check Programme largest feasible scale by 2030
Non-household water efficiency	Largest feasible scale by 2030
Government water efficiency labelling	Defra Scenario 1
Total demand savings (Ml/d)	2030: 19.89 2038: 60.69 2050: 88.16

Figure 2-1. Demand management strategy 7 alignment with DI targets. Statutory target in 2037/38 is shown alongside interim targets in 2026/27 and 2031/32.



3 Customer views

The demand management strategy in our preferred plan has been shaped by customer research undertaken specifically for this WRMP and by insight projects associated with our wider PR24 business planning programme. All research projects have been undertaken to follow Ofwat's expectations for high quality research.

At the time of writing, we have outputs from the draft triangulation of relevant insight prepared by Sia Partners for our October 2023 business plan – which are presented in WRMP24 Decision Making and Uncertainty. To triangulate insight sources Sia Partners' followed CCW's best practice guideline for triangulation for the water industry. To recap, and for completeness in this chapter, the key customer insights relevant to sustainable abstraction and affordability issues are presented in Table 3-1 alongside how our demand management plan meets these expectations. The insights presented here may be subject to change as further triangulation is undertaken as part of the business plan in advance of submission in October 2023.

Table 3-1: How the plan meets customer preferences

Key customer insight	How our plan addresses the insight
Customers generally have a low awareness of the importance of water conservation.	The combination of smart metering roll out and wider water efficiency services for households (Home Check) and non-households will help customers understand their water usage, drive reductions in water wastage (leaking toilets and taps) and support behaviour change through enhanced engagement.
Customers either underestimate their water usage or don't pay attention to it at all.	
A common perceived benefit of installing smart meters is to save money on water bills.	
Leakage is commonly a preferred solution for reducing demand and reliance on abstraction.	Our preferred plan will see leakage reduce by 50% over the 25 year long term horizon
Customers expressed strong support for reducing reliance on abstraction from vulnerable sources, even beyond the proposed targets for reduction, and to pursue a combination of alternative supply and demand options.	The demand and supply measures we'll implement will mean we can accommodate licence reductions from the most sensitive sources.
An increasing number of customers are facing financial difficulties as a result of the cost-of-living crisis and there has been a rise in anxiety relating to being able to pay current and future water bills. There is more willingness to pay from customers for improvements to environmental protection than in making significant customer service improvements.	The measures contained in our plan focus on delivering environmental benefits to meet our regulatory obligations at a pace that is mindful of impacts to bills in the near future – wider testing of bill affordability is, at the time of writing, underway for our PR24 Business Plan.

For more information on our customer research please see:

- WRMP24 – Pre-Consultation and Customer Research
- WRMP24 – Decision Making and Uncertainty
- All research reports are published on our customer insight web page

4 Smart metering

4.1 Strategy summary

Table 4-1: Summary table of key benefits of smart metering

Demand reduction strategy target	Value from smart metering
Engage with customers to reduce average consumption to 110 l/h/d by 2050	High resolution consumption data will enable demand savings to be made against two elements of household and non-household demand: • Rapid detection of properties with continuous flows that may be indicative of internal plumbing leaks. Customers can then be notified of the likelihood of a leak, which may have gone unnoticed, and offered support to fix with an associated water efficiency programme (involving advice and/or leak fix service). • Many customers currently have a low understanding of how much water they use in part because their consumption data is currently only available on a 6-monthly basis, or monthly for some NHHs. The availability of higher frequency usage information presented to customers in engaging and appropriate ways can support behavioural change to drive reductions in consumption.
Reduce non-household consumption by 9% by 2037/38	
Halve leakage by 2050	• Rapid identification of customer side leaks, reducing run times • Greater understanding of network, highlighting higher leakage zones to focus active leakage control activities

To help inform our smart metering strategy, we have engaged with Artesia consultants who have experience in this field. They have written a smart metering review focusing on the benefits and deliverability of our proposed programme. This is included as a separate appendix and referenced throughout this chapter. We have also carried out market engagement sessions with seven prospective suppliers to help inform our technology and delivery strategy.

We plan to fully deliver our smart metering programme by 2035 to realise the benefits as soon as possible in line with an adaptive-pathway to inform future rounds of WRMP planning and investment decisions on supply side schemes. Timely completion will also be key in meeting our statutory DI reduction target in 2037/38 and ensuring we keep pace with the data revolution already well underway across the industry.

We have chosen advanced metering infrastructure (AMI) over advanced meter reading (AMR) smart technology as this provides high resolution usage data allowing us to realise greater benefits. To achieve our target meter penetration, a combination of different communication technologies (licenced radio and low powered wide area network) may be required due to the topography of our region and dispersion of customer properties.

Our approach to smart meter rollout will achieve maximum impact as quickly as possible. The first areas targeted will be those affected by licence reductions in 2035 linked to conservation of chalk streams in the Hampshire Avon. We will aim to complete installation street by street, DMA by DMA as far as possible to realise install efficiencies, greater accuracy in our flow balance calculations and associated leakage benefits. We have

accounted for 5% of properties being un-meterable usually due to physical pipework constraints or shared communication pipework.

As smart meter data becomes available it will quickly bring efficiencies to current demand reduction strategies and allow us to develop new tools for engaging with customers on water efficiency. As technologies develop, smart metering could become the backbone of a smart network strategy that allows continual progress towards efficiency of the whole supply system.

Tables summarising associated costs and demand reduction benefits for both household and non-household smart metering programmes are shown below (Table 4-2 and Table 4-3).

Table 4-2 : Summary of household smart meter installation numbers, costs and benefits

	AMP8					AMP9	AMP10+
	2025-26	2026-27	2027-28	2028-29	2029-30	2030-2035	2035-2050
Smart Meter Installs – total (000s)	48.22	48.18	48.25	47.88	47.50	356.40	52.67
Smart Meter Installs - none to AMI (000s)	11.01	10.67	10.38	10.12	9.91	68.27	0*
Smart Meter Installs - basic to AMI & new properties (000s)	37.21	37.51	37.87	37.75	37.59	288.12	52.67
Smart Meter Installation Costs[1] (£000s)	£14,569	£14,346	£14,164	£13,206	£12,840	£101,106	£36,118
Smart Meter Operating Costs (£000s)	£713	£1,313	£1,915	£2,511	£3,103	£28,363	£116,737
Cumulative Demand Reductions[2] – Normal Year (Ml/d)	0.69	1.59	2.66	3.87	5.20	14.86	20.24

*Smart metering at saturation, and so subsequent meters installed are for meter replacement only under this category. Costs for these replacements are included in the cost lines.

[1] Includes meter installation, IT startup costs for the first three years of AMP8 and meter replacement costs.

[2] Includes metering linked consumption reduction, and customer supply pipe leakage savings.

Table 4-3: Summary of non-household smart meter installation numbers, costs, and benefits

	AMP8					AMP9	AMP10+
	2025-26	2026-27	2027-28	2028-29	2029-30	2030-2035	2035-2050
Smart Meter Installs – total (000s)	3.36	3.35	3.34	3.33	3.32	26.56	0*
Smart Meter Installs - none to AMI (000s)	0.19	0.18	0.17	0.16	0.16	1.16	0*
Smart Meter Installs - basic to AMI (000s)	3.17	3.17	3.17	3.17	3.17	25.40	0*
Smart Meter Installation Costs[1] (£000s)	£1,015	£1,012	£1,008	£1,004	£1,001	£15,829	£63,438
Smart Meter Operating Costs (£000s)	£42	£84	£125	£167	£208	£2,034	£8,089
Cumulative Demand Reductions[2] – Normal Year (Ml/d)	0.30	0.62	0.93	1.25	1.58	4.14	4.25

* Smart metering at saturation, and so subsequent meters installed are for meter replacement only under this category. Costs for these replacements are included in the cost lines.

[1] Includes meter installation and meter replacement costs.

[2] Includes metering linked consumption reduction, and customer supply pipe leakage savings.

4.2 Current metering position

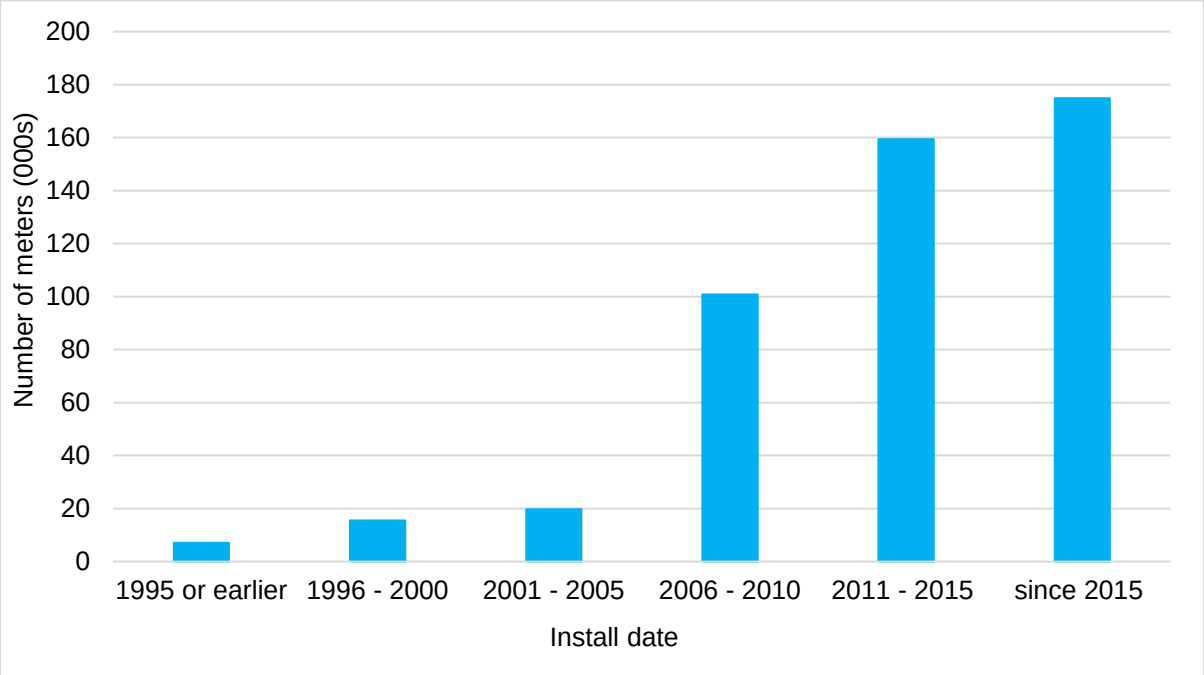
At the start of AMP8 we forecast approximately 75% of households we supply will have a meter fitted, and for non-households this increases to around 95%. Since 1990 all new properties have been fitted with a meter, customers can opt to switch to a meter at any time (and are encouraged to do so by our Money Back Guarantee) and in 2017 we introduced a compulsory change of occupier metering policy to drive meter penetration upwards.

Our current meter stock is primarily standard meters requiring manual reads but a small proportion (approximately 6000) are AMR meters that have short range connectivity so can be read more efficiently without opening meter boxes or entering properties. AMR meters were first installed when the older 'scan pads' were withdrawn so they were used for internal meter fits that enabled reading externally. We then evolved an AMR option for new connections, applicants have the option to select AMR meters and pay the additional cost compared to a basic meter. The uptake for this has mainly been in multi occupancy developments.

Thirty percent of our current meters will have been installed 15 years or more by the end of AMP7 and sixty three percent will have reached this age by the end of AMP8 (see Figure 4-1) indicating our current meter stock is ageing and significant replacement will be required in AMP8 to ensure meters remain compliant and accurate.

The entirety of the Wessex Water region has been classed as a water stressed area since 2021 by the Environment Agency which gives us powers to compulsory meter our customers if we consider this beneficial to our demand management strategy.

Figure 4-1: Graph showing install dates for current meter stock.



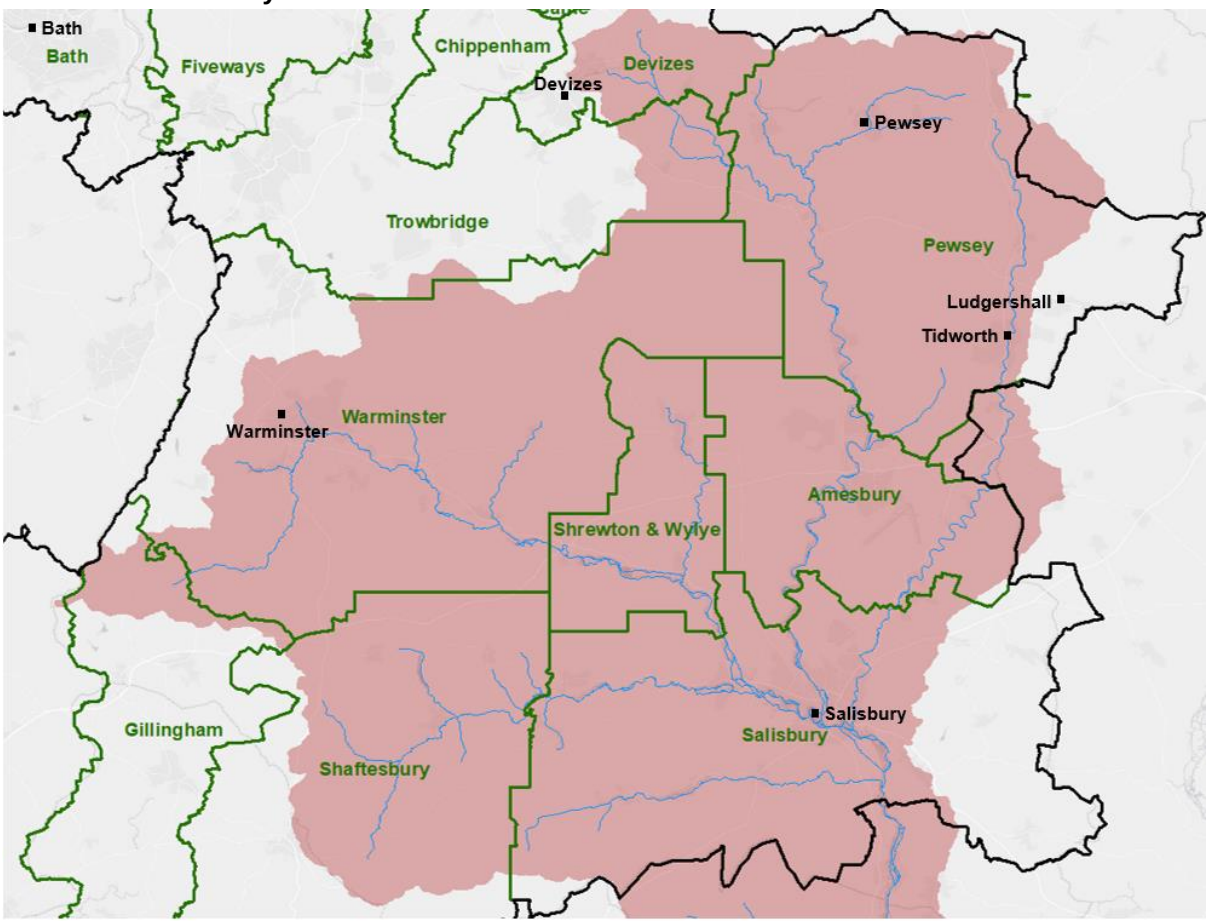
4.3 Our approach to Smart Metering

We considered five smart metering delivery strategies as part of our options appraisal process, further detail on how these options were considered and used to form wider demand option portfolios can be seen in our WRMP24 Options Appraisal Appendix.

Our preferred demand option portfolio includes an ambitious smart metering roll-out programme to achieve 40% smart meter penetration by 2030 and 95% by 2035.

We will focus our initial AMP8 rollout in the Hampshire Avon catchment and connected areas to the East and South of our region that will be affected by abstraction licence reductions in 2035 associated with protecting chalk streams.
Figure 4-2 below shows supply zones within the Hampshire Avon catchment. These zones and areas connected to these zones via key trunk mains and our integrated supply Grid, including Trowbridge, Bath and Poole will be the first target areas for smart meter roll-out. This is due to the relative higher value of demand savings in these areas compared to our region as a whole as these savings will provide the greatest environmental benefits and reduce the requirement for future supply side schemes.

Figure 4-2: Water into Supply Zones (green) within the Hampshire Avon catchment (red) with its tributaries and key towns indicated.



Within these zones we will target urban centres first as this will allow us to achieve the greatest impact due to population density. 78% of properties in our region lie within just over 10% of the geographical area (Table 4-4Table 4-6), so targeting these areas will bring efficiencies in meter installation due to reduced travel times and a more straightforward communications solution (for example if radio is used less masts are required to cover a smaller area). We aim to install smart meters street by street, where possible completing whole district metered areas (DMAs) before moving onto the next to maximise benefits to our leakage reduction programme by improving flow balance data.

In AMP9 we will initially focus our smart metering programme in urban centres across the remainder of our region, again maximising efficiency of roll-out and associated demand reduction benefits. We will then expand our roll-out to more rural and isolated areas. Smart metering properties in isolated settings is likely to be prohibitively expensive in AMP8 but as technology develops, for example advances in NBIoT, this will enable us to increase the reach of smart metering across our region. By the end of AMP 9 we aim to reach our target of 95% smart meter penetration.

Table 4-4: Breakdown of properties in Wessex Water region using Census Rural Urban Classification data[3]

Area category	Area description	Properties (%)	Area covered (Km²)	Area covered (%)
C1	Urban town and city	62%	486.7	5.5%
D1	Rural town and fringe	17%	401.7	4.6%
E1	Rural village	14%	3080.6	35.0%
F1	Rural hamlets and isolated dwellings	6%	4037.3	45.9%
C2	Urban city and town in a sparse setting	1%	11.4	0.1%
D2	Rural town and fringe in a sparse setting	0.2%	4.5	0.1%
F2	Rural hamlets and isolated dwellings in a sparse setting	0.2%	718.5	8.2%
E2	Rural village in a sparse setting	0.2%	61.8	0.7%

We will continue with our compulsory change of occupier metering policy. Where customers are currently unmetered in our target roll out areas, we will compulsorily install smart meters, but will not automatically switch them to metered billing. We will use the meter installation as an opportunity for engagement around water use and water saving and will encourage customers to switch to metered bills. We will still collect smart usage data from these properties that initially remain on unmeasured billing enabling us to identify and support reduction in supply pipe leakage and plumbing losses. We forecast that initial demand reduction linked to leakage and plumbing losses, coupled with customers transferring to measured bills voluntarily or through change of occupier over time will be sufficient to ensure we meet our regulatory distribution input reduction target.

Delivery by 2035 will allow us to realise demand reduction benefits ahead of associated targets in 2037/38 (reduction in DI input by 20% and NHH consumption by 9%) and keep us on track to meet future targets in 2050 (50% leakage reduction and consumption reduced to

[3] RUCOA_leaflet_Jan2017.pdf (publishing.service.gov.uk)

110 l/h/d). However, the earlier we realise associated demand reduction benefits, the sooner revised demand data can be used to inform planning decisions around supply side infrastructure requirements for PR29.

The below figures (**Figure 4-3** and **Figure 4-4**) indicate how our smart meter penetration will increase over time under our preferred roll-out option and how this compares to our current basic meter penetration.

Figure 4-3. Forecast household meter penetration to 2050 under our preferred smart metering strategy.

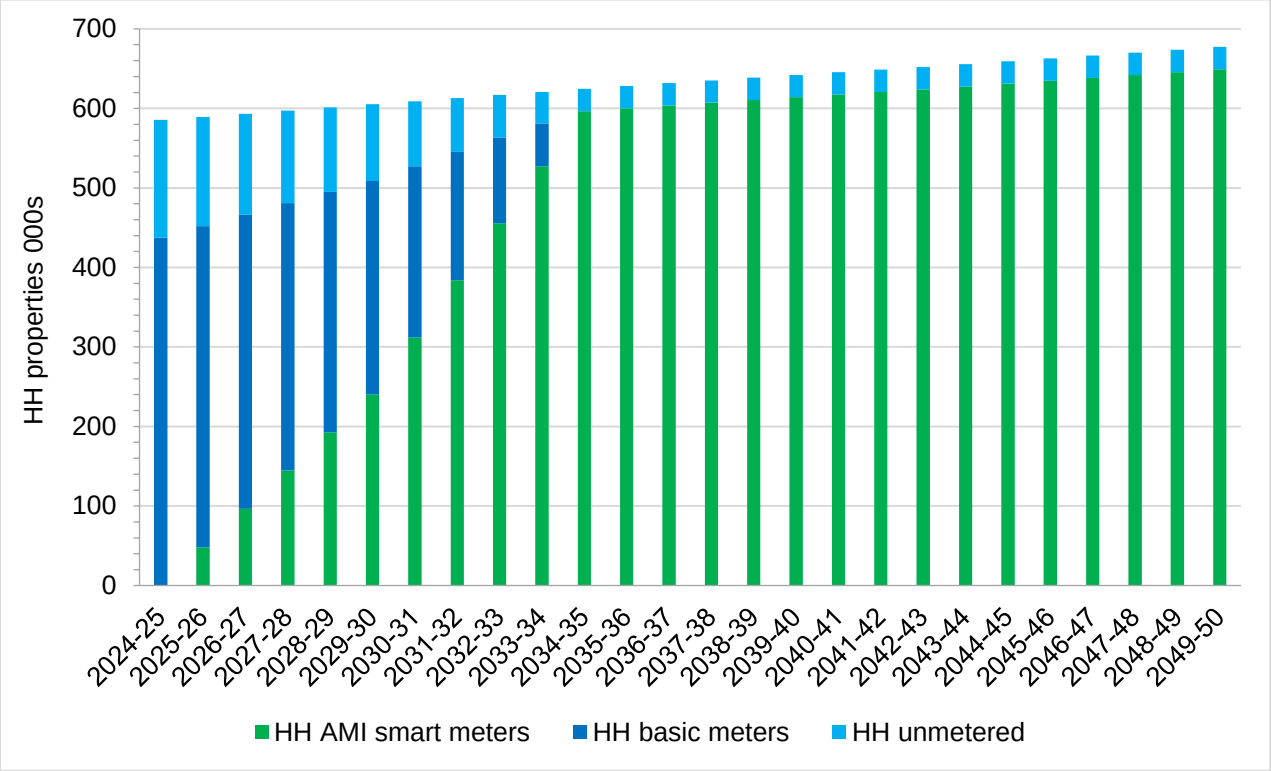
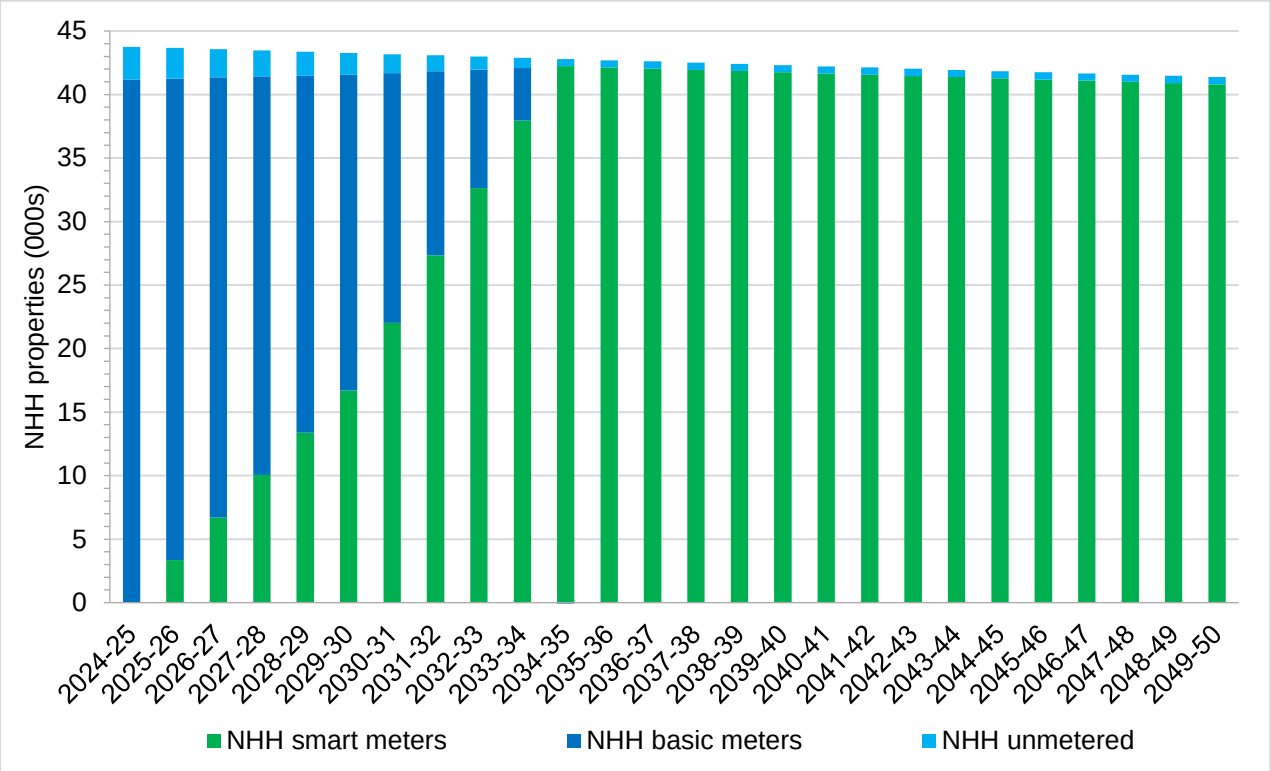


Figure 4-4. Forecast non-household meter penetration to 2050 under our preferred smart metering strategy.



Delivery

We appreciate that demand for smart meters, associated infrastructure and data services will be unprecedentedly high over the next 2 AMPs and beyond as the water industry undergoes a 'data revolution'. Furthermore, due to the scale of transformative infrastructure projects planned over this period in the Water Industry, deliverability of schemes generally will become challenging in terms of resources and skills. Against this backdrop, we believe the smart meter rollout speed proposed in our preferred plan is achievable due to the relatively simple nature of delivery methods and proven delivery of other water companies.

Our smart metering delivery strategies have been considered in the context of roll-out speeds achieved by other companies with more mature smart metering programmes. Our chosen roll-out speed is significantly slower than Anglian's and slower than Thames (Table **4-5**) indicating even without efficiencies of scale from which these companies may benefit, our ambitions should be deliverable. We will also aim to learn lessons from these companies and others through knowledge sharing sessions which should allow us to further optimise our programme.

Table 4-5: Meter install numbers comparison table AMP7-9.

	AMP7	AMP8	AMP9
Thames Water	365,000 (WRMP19) + 204'700 (GER)	900,000	
Anglian Water	1.1 million	1.1 million	
Wessex Water		257,000	383,000

Smart meters will be supplied in a ready-to-go state already connected to relevant communication infrastructure such that installation requires minimal technical expertise and could be delivered in-house. We have existing resource experienced in meter installation which could be scaled and ring-fenced to meet programme requirements. Approximately 55% of our current meters are screw-in concentric meters that will require no chamber modifications to house a smart meter, i.e., are currently in a Atplas meter boxes with plastic lids that shouldn't impeded communication of the meter, so swapping these basic meters with a smart meter should be quick and efficient. Where in-line meters are installed, chamber modifications are required, internal install is required or a property is unmetered, these installs may require additional effort and resource which is factored into our plans.

Through market engagement sessions, we have established that communications solutions exist to enable smart meters to be installed in most existing chamber types, through communication modules that attach to the inside of covers, external antenna, or 'bridging' devices. These innovations could reduce the amount of chamber replacement's required boosting roll-out efficiency and deliverability. We will aim for maximum penetration of smart meters but won't spend disproportionate efforts on meter installs where it is not straightforward during the initial roll-out period and have accounted for 5% or properties being unmeterable. However, to provide a fair service to all our customers, if a customer wants to be smart metered and is deemed as unmeterable due to a connectivity issue, we may look to initially install an AMR meter which provides some benefits over basic metering with a view to upgrade to an AMI meter/ AMI functionality when this becomes available. For customers that are deemed unmeterable for physical meter install reasons we will aim to resolve issues through future innovation.

To resolve difficulty in smart metering joint supplies, Thames Water have employed a strategy to install mini bulk smart meters to realise some of the smart metering benefits without having to split connections into individual supply pipes. The issue of shared supplies is less prominent in our region; however, this is something we would consider as our smart metering programme progresses.

A significant component of delivering smart metering successfully is the communication infrastructure and data acquisition, storage and analysis. We may look to procure this as network or data as a service package from a supplier with experience in this field. This model removes the risk to Wessex Water of installing and maintaining a communication network. This is an innovative approach to procurement for Wessex, but this type of project uniquely lends itself to this and our market engagement has shown suppliers either have established partnerships or are beginning to partner with other companies (communications providers, meter providers, data management and analytics services) to provide this service in response to customer demand.

Technology

Type of meters

We have considered the use of both automated meter reading (AMR) and advanced metering infrastructure (AMI) technologies and concluded that AMI would provide the wider benefits required to facilitate a significant shift in how we manage leakage and engage with

our customers to realise usage efficiencies. The granularity of data provided by AMI (typically 60-minute data points but can be as frequent as 15-minute) will allow us to achieve greater value from our investment than AMR as it will positively impact all aspects of our demand reduction strategy and is a more advanced technology so a more future-proof low regret option. We consider AMI technology to be sufficiently mature such that a delay in roll-out will have negligible impact on the quality of the end solution delivered. AMI is also better aligned with our aspiration of reaching net zero carbon by 2030 as it will reduce the requirement for meter readers in vehicles.

Demand for AMI smart meters globally is driving innovation in meter technologies, such as the hydro powered AMI meters currently being developed in partnership between Suez and Northumbrian Water[4]. We will aim to partner with suppliers that share our passion for innovation, and design in scope within our procurement model to trial and implement new meter technologies as they become available during our smart metering programme.

Communication infrastructure

Due to the topography of our region and dispersion of customer properties, we forecast that more than one type of communication infrastructure solution will be required to achieve our target of reaching 95%smart meter penetration. We may look to utilise a combination of licenced ultra-high frequency (UHF) radio and low powered wide area network (LP-WAN) radio solutions to achieve this, ensuring providers can guarantee comparable sufficient battery life (15 years), aligning with meter life to reduce the requirement for maintenance/replacement during this period (incurring additional cost for repeat visits). We will aim for communication network infrastructure to be installed ahead of or concurrently with smart meter installation such that benefits are realised rapidly and battery life of meters isn't wasted.

Data management

Smart metering in isolation will not deliver demand reduction benefits, how we communicate associated data to our customers and utilise it internally to inform leakage reduction and water efficiency activities will be key to the success of this programme. This programme is also a timely opportunity to improve the asset data we hold for our meter stock including useful information on exact locations, chamber types and meter depths that will benefit future maintenance activities.

To ensure a high level of data completeness and continuity of service, we may look to utilise a data as a service model with a provider delivering data storage and basic analytics. We will make data available to customers via a customer portal or app and for use internally to support demand reduction strategies.

[4] SUEZ and NWL partner in smart meter project | SUEZ in the UK

Customer engagement

Our customer engagement strategy for smart metering will be designed to maximise the demand reduction benefits, enhance our customer service offering and improve our relationship with customers. The design of services, customer journey to onboard them to participate and ongoing engagement activities will be developed from shared insights from other companies' roll out programmes to date, our own research programme and collaboration with others in the sector to ensure best practice.

Our own customer research (See WRMP24 Decision Making and Uncertainty) has recently identified the importance of framing the benefits of smart metering to customers appropriately and in advance. If we ask customers (without informing them of the benefits of smart metering first) if they would like a smart meter, only around 30% respond positively. However, if customers are asked if they would like more regular updates on their usage and bill information, 55% respond positively. Setting out the benefits of smart meters to customers as part of the roll out engagement programme will be key to increasing appetite further to successfully achieve the demand reduction benefits.

Smart meter household usage information will be presented to customers via an app or portal so they can develop their understanding of how they use water and how changes to their usage can impact their bills. The app will be part of our wider digital engagement strategy allowing customers to access other services within their account alongside the smart metering elements.

We will establish automatic notifications to alert customers of potential continuous flows or high usage that may be indicative of leaks or plumbing losses. The availability of hourly data will facilitate a significant shortening of plumbing leak run times, especially for the hard to spot leaks.

In alignment with our existing customer service offering, we will develop multiple channels for customers to receive usage information in a way that suits them.

Quality, regular engagement will support customers to reduce usage through behavioural changes. The information we collect from customers during the onboarding process when their smart meter is installed – such as whether the property has a garden and family life stage – will allow us to develop targeted, timely outbound messaging to encourage water saving.

Our smart metering roll out will be aligned with our water efficiency Home Check programme which is described in Section 5.1. The availability of smart data will enhance our high user targeting approach for water efficiency services.

4.4 Benefits of smart metering

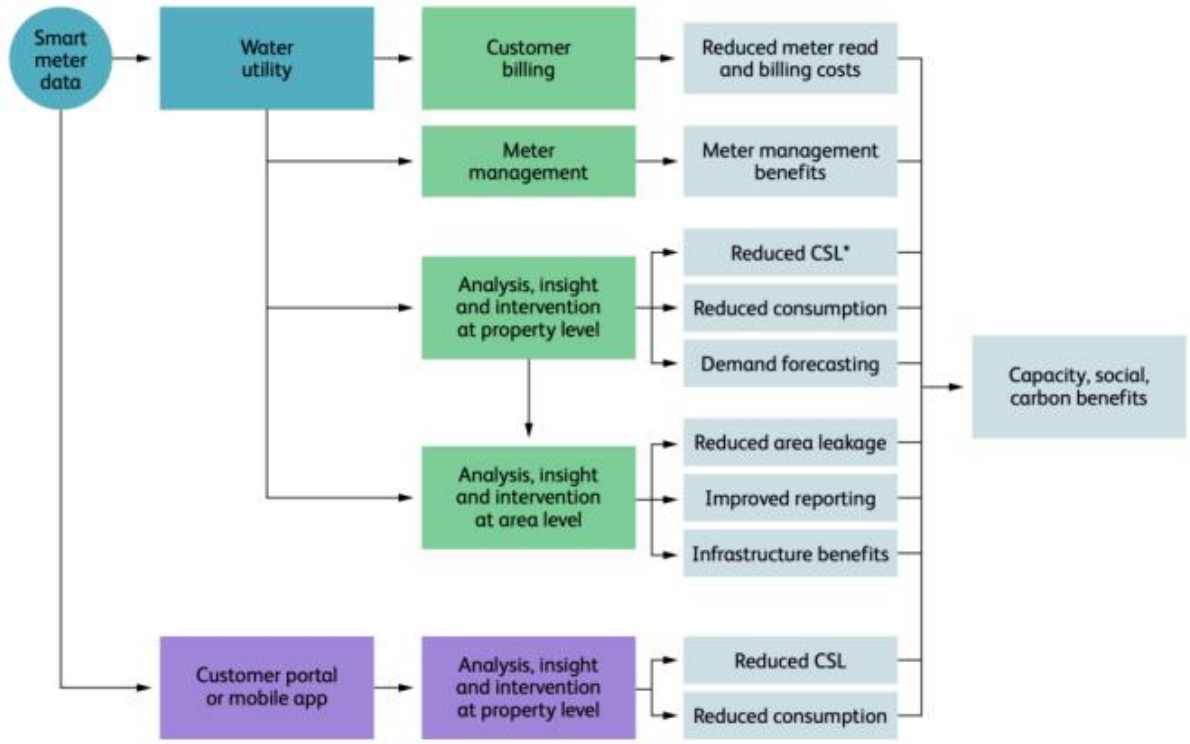
The benefits of smart metering centre around the valuable customer usage data smart meters provide and how this data can be transformed into demand savings through identifying and resolving internal and supply pipe leakage and offering tailored support to customers on water effeicency.

Currently, we typically obtain two meter reads a year from our basic meters, each providing a total volume used over six months. Where reads are significantly higher than a baseline for that property, this would be flagged, and the property may be subsequently visited by a customer inspector to ascertain whether the increase is due to internal plumbing losses or supply pipe leakage. From this type of data, we cannot detect smaller levels of wastage as small changes are likely to be attributed to additional people living in the household. It also provides no indication of how long the wastage has been ongoing within the six-month period.

Advanced metering infrastructure (AMI) smart metering provides detailed usage data at a property level, with hourly reads uploaded at least once daily. Associated supply pipe leakage or internal plumbing losses can be detected within days rather than waiting until the next six-monthly meter read or a customer phoning in when they've detected a visible leak. This granularity of data provides opportunities for efficiencies in existing demand reduction strategies as well as enabling new approaches, all to improve our level of service to both household and non-household customers and help protect the environment.

In addition to demand reduction, smart metering will bring further benefits such as providing the data required to better understand and predict customer usage to inform future business planning. It will also provide scope to introduce tariff innovation in the future to incentivise further consumption reduction and provide a fairer pricing system. A summary of smart metering benefits is shown in Figure 4-5 below.

Figure 4-5: Schematic showing summary of smart meter benefits from Artesia report for Wessex Water



Customer engagement

Smart metering can support reductions in household consumption arising from:

Identifying water wastage from internal plumbing, such as leaking toilets and taps, from the identification of continuous flows. High resolution smart metering data can be automatically analysed on a regular basis to identify such issues with can be notified to the customer and/or leakage teams and/or water efficiency teams to support with advice and plumbing leak fixes.

Customer behavioural change – the high-resolution water use information that can be shared with customers, via an app or other means, will empower customers to understand their water usage and thus make changes to reduce usage and manage bills if supported by appropriate water efficiency engagement.

Further benefits arise from the opportunity that smart metering provides for a strengthened relationship with household customers. It presents many additional engagement opportunities from onboarding to the frequency and type of usage information that can empower customers to manage their bills more and the potential for greater personalisation of future services.

Plumbing losses, customer side leakage and consumption reduction - Household customers

Customer supply pipe (CSP) leakage accounts for approximately 20% of total leakage in our region. Currently household CSP leakage is identified through, investigation of significant increases in 6-monhtly meter reads, customers informing us of leaks or our leakage inspectors identifying leaks as part of their active leakage control activities. The high-resolution usage data provided by smart metering will allow rapid identification of properties with plumbing losses or leaking CSPs by highlighting continuous night flows. Anglian Water, who have a mature smart metering programme, identified that approximately 20% of properties with smart meters fitted registered continuous flows of greater than 1l/hr in the year 2021/22[5].

Greater than 75% of all leaks repaired currently in our region are on CSPs or associated meters or connections, but more rapid detection afforded by smart metering will significantly reduce leak run times bringing considerable benefits to overall leakage reduction and efficiencies in resource required for existing leakage detection methods. In addition to this, there will be a one-off benefit during smart meter rollout as meters are installed and existing leaks are detected and resolved.

If a smart meter detects continuous night flow at a property, this will automatically be categorised based on the flow and communication appropriate to the flow category passed onto the customer. We hope to automate this process as far as possible using standard texts or emails but where more significant continuous flows are identified we will likely call customers directly to make them aware. We will continue to support all customers to resolve leaks both in their property and on their supply pipe. Anglian Water currently employ the following continuous flow categories[5]. We may begin with something similar but amend categories over time, so they align with the range of continuous flows detected in our region.

Table 4-6: Continuous flow categories used by Anglian Water to inform response to customers[5]

Leak split (priority)	Volumes (litres/hr)
P1	>1500
P2	500-1500
P3	40-500
P3A	8-40
P4	<8

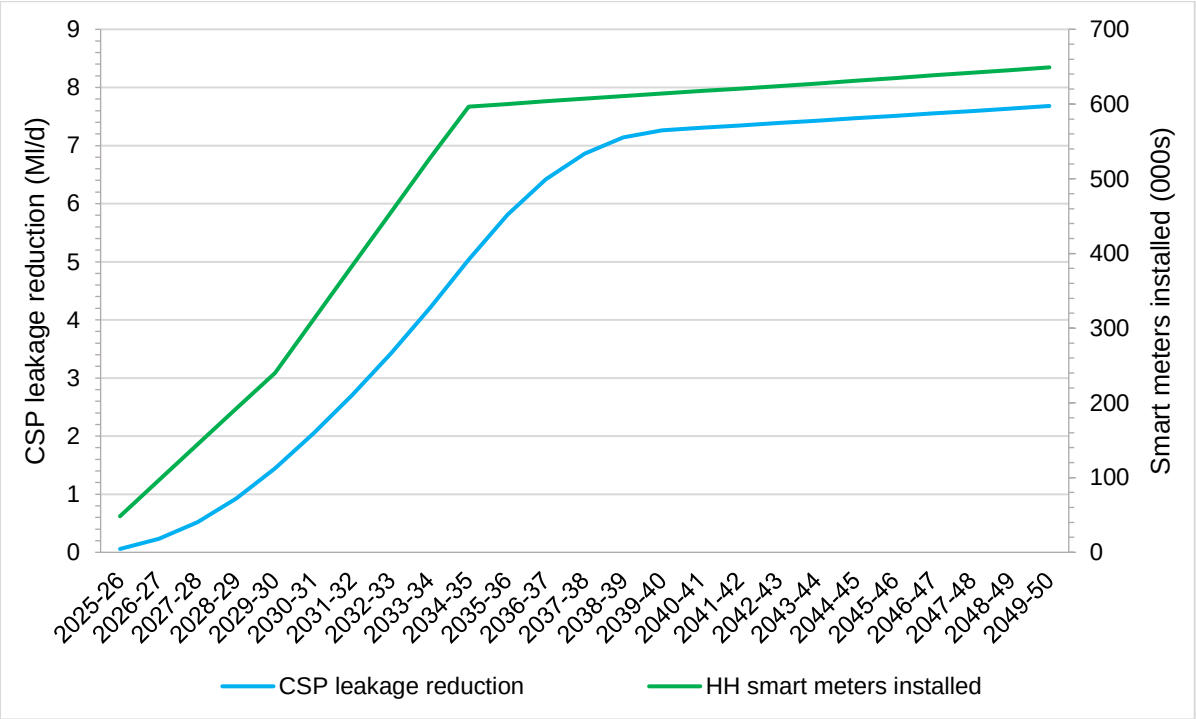
Research has been conducted by Thames Water on splitting out continuous flows to directly attribute them to either internal plumbing losses or CSP leakage (see Artesia paper for Wessex Water in supporting appendix). We will aim to use our own data and insight from others to refine this principle to add further efficiency to our continuous flow response in the future.

We have forecast the benefit of smart metering on household CSP leakage reduction to align with smart meter roll-out (see Figure 4-6). We have assumed one percent of total

[5] V2 Demand Management Preferred Plan (anglianwater.co.uk)

properties with new smart meters installed upto 2029/30 will have leaks fixed on supply pipes, and from 2030/31 onwards we have used the total number of properties with smart meters installed in a rolling 5-year period. This accounts for leakage identified through newly installed smart meters and existing smart meters that detect new leakage breakouts. The average leak volume used is ten litres per hour (the lower end of Anglian's P3A category), and our savings fall within a high and low range forecast for us by Artesia (see report in supporting Appendix) based on our smart meter roll-out numbers and insight from savings from other water companies such as Thames and Anglian. We have also offset supply pipe leakage savings 50% into the following year, as leakage detected through newly installed smart meters may not be fully resolved in the same year.

Figure 4-6: Graph showing the benefit of smart metering on household CSP leak reduction.



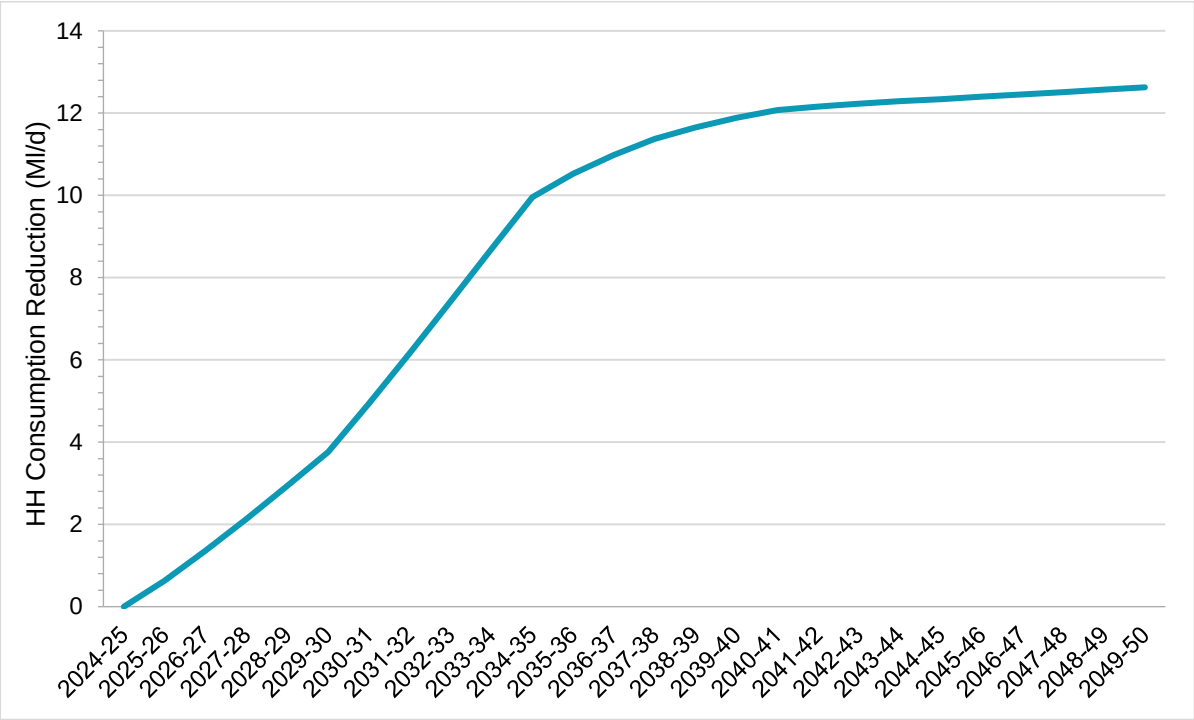
We have accounted for plumbing loss reductions as part of the overall consumption savings attributed to customers moving from unmetered to smart metered and basic metered to smart metered. We have calculated consumption reductions by reviewing those achieved and forecast by other companies with more mature smart metering programmes in their draft Water Resource Management Plans. Consumption reductions include changes in usage behaviour linked to being on a measured bill and savings due to resolution of internal plumbing losses such as leaking toilets. These savings are separate from consumption savings achieved through our water efficiency programme.

As there is limited evidence available for plumbing loss figures, plumbing losses are only split out in relation to consumption savings of currently unmeasured customers who chose to stay on an unmeasured bill after their initial switch to a smart meter. As we encourage unmeasured customers to move to measured billing, we will over time realise the full consumption benefits associated with smart metering. Figure 4-7 below shows forecast household consumption reductions linked to smart metering.

Key assumptions used to calculate household consumptions savings are shown below:

- unmeasured to smart AMI meter and measured billing – 15% consumption reduction
- unmeasured to smart AMI meter without measured billing – 2% consumption reduction (plumbing losses only)
- basic meter to smart AMI meter – 5% consumption reduction.

Figure 4-7: Graph showing total cumulative household consumption reduction linked to smart metering.



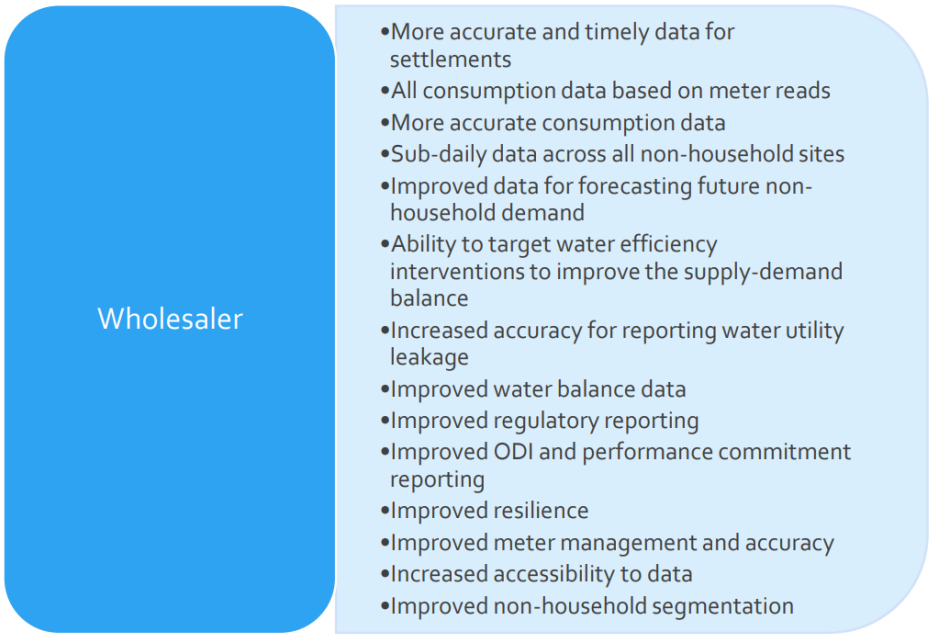
Plumbing losses, customer side leakage and consumption reduction - Non-household properties

Non-household (NHH) properties account for ~24% of water consumption in our region, so targeting efficiencies in this sector has the potential to contribute significantly to overall demand reduction. However, since the NHH market was opened in 2017, water companies as the wholesaler currently have no direct relationship with NHH customers as this is managed via water retailers, making influencing consumption challenging.

The NHH market operator MOSL and the Metering Committee has commissioned a report by Artesia into enhanced metering options for the NHH market[6]. Taken from this paper - benefits to wholesalers of enhancing metering for NHH customers are summarised below in Figure 4-8.

[6] A Strategy for Enhancing Metering Technology (mosl.co.uk)

Figure 4-8: Summary of benefits to wholesalers of smart metering NHH customers taken from Artesia report[6]



Realising these benefits will rely on clear channels of communication and data flow between water companies, retailers and NHH customers. As our plans develop further, we will be happy to liaise with retailers to allow them to account for smart metering deployment in their own future plans, both encouraging and supporting them to drive water effeicency with their customers in our region.

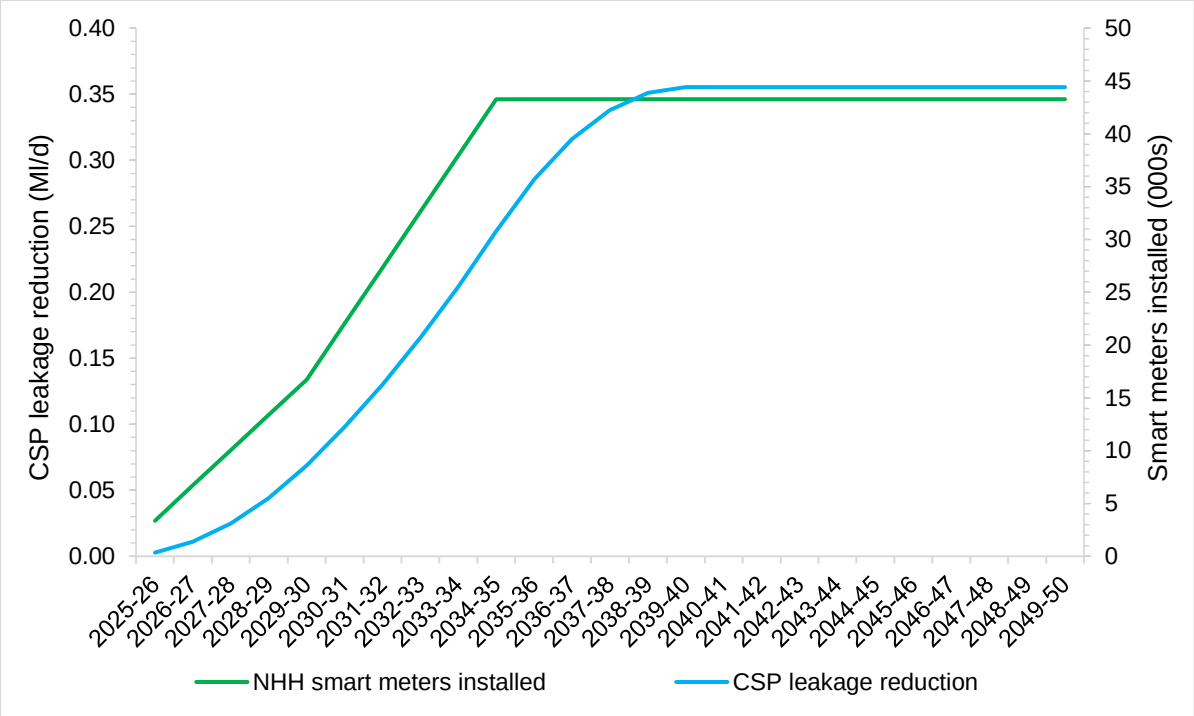
The Interim National Metering Framework for the NHH Market[7] suggests as smart meters are rolled-out, a change to water companies being responsible for reading of meter data (currently retailer's) would bring about improvements in this process. We would be supportive of this approach as this would allow us to obtain the most accurate figures for both billing and leakage reporting purposes.

We haven't forecast significant supply pipe leakage savings linked to non-households (Figure 4-9), due to potential difficulties in bringing about fixes (complexity of communication, typically longer supply pipes being more difficult to fix) and that a higher proportion of NHHs are already metered compared to HHs, some with more detailed usage data available from cello loggers so significant leaks may have already been identified and resolved. We have assumed a quarter of the proportion of NHH supply pipes will have leaks fixed compared to HH customers but that where leaks are fixed, these will on average be larger leaks (due to larger diameter supply pipes and higher usage), 27.4 litres per hour compared to 10 litres per hour for HHs. This is likely a conservative approach. The Artesia report for MOSL and the Metering Committee[6] estimates 25% of small meter non-household customers consumption is continuous flow, 5% for medium meters and 1% for large meters, making potential for leakage savings significant if approximately 50% of continuous flows are assumed supply pipe leakage. However, there are a greater variety of reasons non-

[7] file (mosl.co.uk)

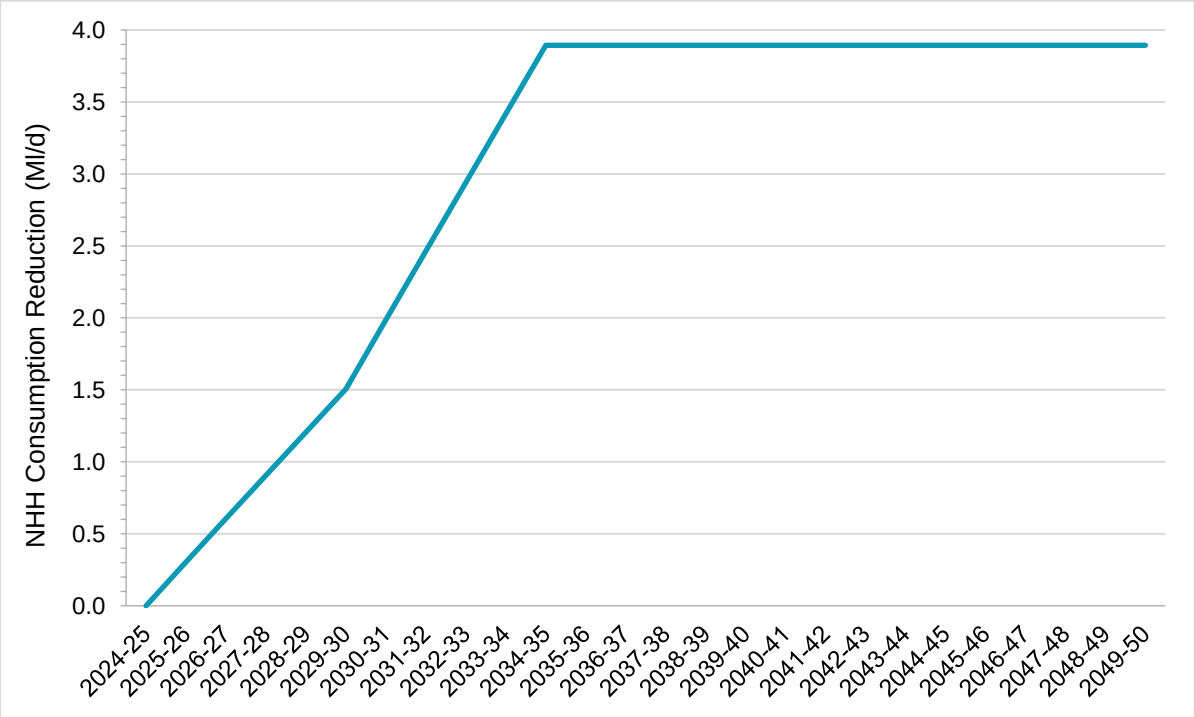
household properties may have continuous flows compared to households. We will update our assumptions on non-household leakage benefits in future business planning cycles once we have more real-world data to inform our forecasts.

Figure 4-9: Graph showing forecast benefit of smart metering on non-household CSP leak reduction.



As with household customers, we have forecast consumption reduction for non-household properties linked to changing from unmetered to smart metered and basic metered to smart metered (Figure 4-10). This consumption reduction combines both plumbing loss reduction and usage changes linked to smart metering. We have used the same consumption reduction figure as household customer for basic metered to smart metered (5%) this accounts for the majority of consumption savings as NHH meter penetration is already approximately 95%.

Figure 4-10: Graph showing total cumulative non-household consumption reduction linked to smart metering.



Supply side leakage

Current leakage detection methods for the supply side of our network involve analysis of flow and pressure data using WaterNet. Analysts can identify discrepancies between meters and elevated minimum night flows to inform areas of focus for leakage teams on the ground. Depending on meter locations, leaks detected could lie within large geographical areas making detection inefficient. Smart meter data will help build a much more comprehensive picture of flows across the supply network helping locate leaks quicker.

Having more detailed customer demand data will also allow supply demand balance in supply zones to be more accurately calculated than ever before, enabling higher leakage zones to be identified and active leakage control (ALC) activities focused to these areas. Through our market engagement we found most suppliers were able to programme smart meters to increase read frequency from hourly to fifteen-minute intervals between 2-4 am, further improving minimum night flow (MNF) comparison with network meters compared to standard hourly reads. Fifteen-minute read intervals over a relatively short period provides useful data on MNF without expending battery life significantly. This is most effective if there is full or close to full smart meter coverage in the zone. Improved zonal flow balance should provide marked efficiencies to current active leakage control (ALC) activities.

5 Water efficiency

5.1 Household

Baseline engagement on water efficiency

Our baseline water efficiency engagement with customers includes a combination of sharing advice and information and providing free water saving products.

We promote water saving messages to customers throughout the year. Our messaging and campaigns are driven by customer insight and behavioural science. We focus on key areas of water use and habits that people are most likely to adopt, including reducing showering time, clothes washing habits and looking out for leaky loos. We have started to include the financial benefits of saving water and energy in our comms and our research tells us that it is a big factor in encouraging customers to adopt new behaviours.

Our in-year water efficiency engagement is typically enhanced in the summer months to include specific messages focused on seasonal activities such as garden watering and outdoor use. This is consistent with our Drought Plan which sets out how we'll ramp up our communications if needed in dry weather.

Our online water use calculator GetWaterFit helps customers understand where they use the most water in the home and provides bespoke tips to help customers make water and energy savings.

Our team of education advisors visit schools across the region to engage with children about the environment and water resources. They provide education about how to save water at home and encourage pupils to spread the message to their families.

For 2025-30 we will continue promote water saving messages in the same way, using a range of communication channels to reach different customer types, including through social media, our customer magazine, local newspapers, out of home advertising and attending local events. We'll adapt messaging if there are changes to the insight we get from our research. We'll also continue to offer customers free water saving products such as eco showerheads, shower timers, buffaloos and leakyloo strips.

We are supportive of playing our part with Waterwise's UK Water Efficiency Strategy to 2030, in particular we are committed to raising awareness about the importance for checking for leaky loos and educating customers about the use of dual flush buttons in our messaging and campaigns, as well as through our Home Check service.

Home Check

The availability of high-resolution consumption data arising from the smart metering roll out will facilitate ever better targeting of water efficiency services, and in particular our Home Check programme for household customers. Our existing Home Check programme which involves an in-home visit from a technician to fit water saving devices, check for plumbing leaks and offer tailored behavioural advice on water saving, targets the highest water using

households using 6-monthly meter read information to maximise the savings per visit. The availability of hourly data will allow even more effective targeting and the rapid identification of continuous flows to reduce the run time of plumbing losses from leaking toilets and taps. Our Home Check service offers free plumbing leak fixes for customers that need it.

From 2025-2030 our preferred programme will include 12,000 standard Home Check visits and 4,800 plumbing leak fix visits a year. This is a significant increase in activity level from the current period (2020-25) which is seeing us deliver around 4,500 standard visits and 750 plumbing leak fix visits a year. Our experience of delivering in-home support to customers in programmes like these since 2016 will make the expansion of this Home Check programme feasible when paired with the smart metering programme to provide data and insight to target and drive the focus areas.

To help us meet the statutory demand reduction target by 2037/38 we expect to step up the Home Check activity level from 2030 to over 17,000 standard visits and over 8,500 plumbing leak fixes a year. This will represent a further significant increase in scale, and is undoubtedly ambitious, but will follow a further five years of delivery, monitoring, innovation and collaboration with customers though our water efficiency and smart metering programmes.

An example of the innovation we are currently applying to our Home Check service is our community ‘Rainsavers’ project in Chippenham. This trial involving over 200 households has seen us expand the Home Check offering to include the installation of free water butts and ‘soaker hoses’ to include garden water savings into the programme. A soaker hose is a porous pipe that, in this context, allows a water but to rapidly drain the water being collected during a rainstorm directly into borders and vegetable patches. Importantly though, the soaker hose is diverting rainfall away from combined sewers and therefore represents a holistic approach that benefits not only demand management but also our drainage and wastewater strategies. The findings from this project, undertaken in 2023, are still being assessed but customer feedback is indicating that it has expanded the community’s awareness of the issues of water use and rainfall drainage and that there is an appetite for engagement of this nature.

Learning from innovative approaches like ‘Rainsavers’ will help to shape and optimise the delivery of our future water efficiency engagement programmes and overall adaptive plan.

5.2 Government water labelling

The water resource planning guideline requires us to include in our preferred plan the assumption that government will introduce mandatory water labelling for appliances from 2025/26.

A Mandatory Water Efficiency Label will give consumers the information they need to make informed decisions when purchasing new water using products for their home. It will also help developers and water companies to improve water efficiency in buildings. It will likely involve a tiered labelling approach that allows products to be rated at levels of water

consumption, similar to the energy efficiency label. The label would be applied to common household products such as toilets, taps, shower outlet devices, dishwashers and washing machines.

As per the September 2022 Defra consultation on labelling we have assumed that labelling will be introduced without associated changes to building standards or regulations. The impact of this scenario will be to reduce per capita consumption by 1.5 litres per person per day by 2035 and by 13 litres by 2050. For the Wessex Water supply region this amounts to savings of 2.2 Ml/d by 2035 and nearly 20 Ml/d by 2050.

To ensure customers understand and engage with the new water labelling information our preferred plan includes an allowance for engagement campaigns and activities to help realise the demand savings plus engagement with building developers. While changes to building standards are not being included in this government measure at this time we are keen to support future work in this area through partnerships, research and lobbying.

5.3 Non household

Our smart metering roll out will include non-household properties and we commit to working with MOSL, retailers and business users to ensure the data captured by smart meters is appropriately available within the market to improve billing accuracy and stimulate demand reductions through the identification of continuous flows which may be indicative of wastage, plumbing losses and external leaks.

In 2022 we relaunched a non-household water efficiency programme following a hiatus of several years since market separation. Our current programme has focussed support to schools and has been delivered through collaboration with both retailers and the Department for Education. The programme focusses on identifying and resolving leaks and wastage arising from toilets, urinals and taps. In 2022-23 we visited 91 schools; this activity was one of the most cost-effective elements of our water efficiency strategy.

Our preferred plan for non-household demand management for 2025-30 will facilitate over 160 visits a year to non-households to fix leaks and reduce water wastage. We anticipate continuing to work with schools and other not-for profit or community focussed organisations. This programme will be supported by the smart metering roll out that will provide high resolution usage data to identify continuous flows – which can be investigated for leaks/wastage – and therefore enhance targeting.

Our assumed model of delivery for the non-household water efficiency programme of visits is wholesaler-led, although collaboration with retailers is integral to the engagement with individual business users. We are actively engaged with the Retailer-Wholesaler Group's Water Efficiency Sub-Group which we see as a vehicle to support innovation for collaboration between wholesalers and retailers to enhance water efficiency in the non-household market.

The combination of a smart metering for non-households and the targeted water efficiency programme will ensure we meet the targets to reduce business demand by 9% by 2037/38 and 15% by 2050.

6 Leakage Reduction

Our overall approach to leakage reduction is to meet the government target of 50% leakage reduction by 2050 through a combination of conventional leakage activity and smart meter roll out. The leakage reduction profile chosen as part of our preferred demand management portfolio, 3.5 Ml/d reduction in AMP8 linear thereafter, ensures we meet this long-term target in the best value way.

Our proposed leakage reduction profile and alignment with associated targets is shown in Figure 6-1, our main target is 2050 but interim targets in 2026/27, 2031/32 and 37/38 are also shown. The baseline in year starting position is 76.5Ml/d from 2017/18. The proposed leakage reduction profile will reduce leakage to 38.25Ml/d by 2050. This section explains the activities that will be undertaken to achieve this leakage target. A summary of cumulative leakage reduction for 2025-30 split by activity is shown in Figure 6-2 below.

Figure 6-1: Baseline and final plan leakage profiles and alignment with targets

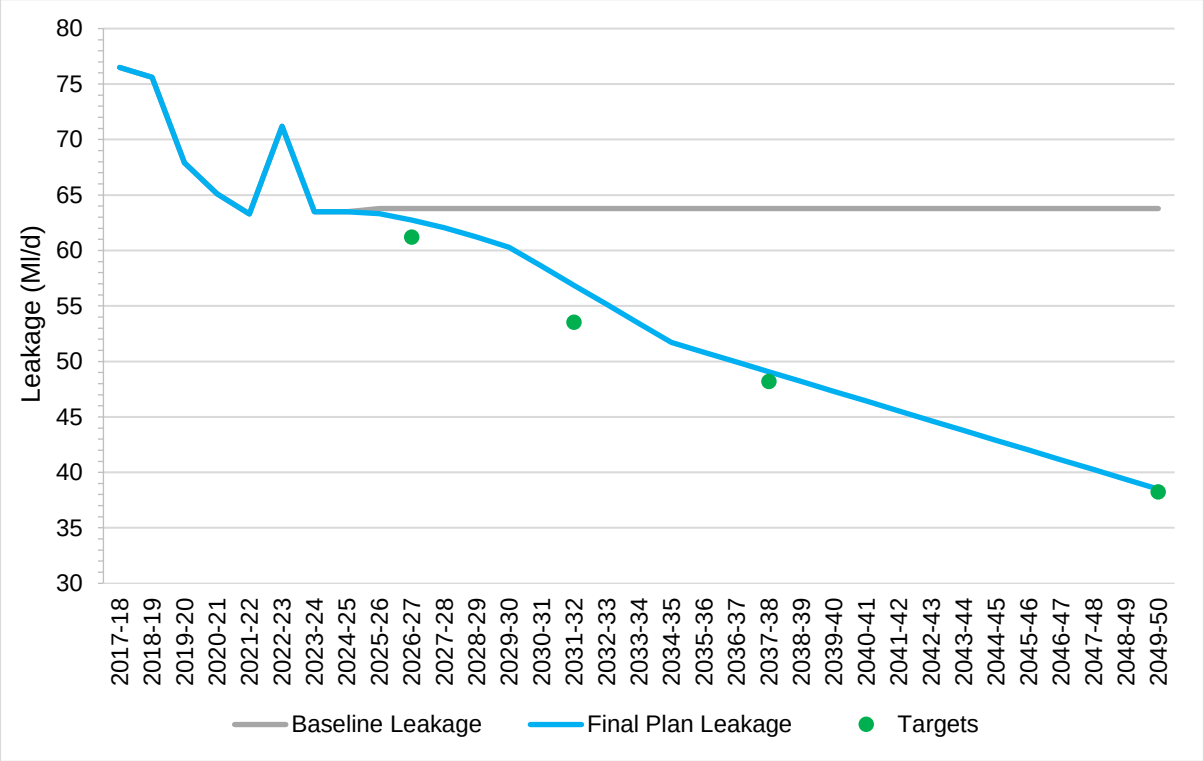
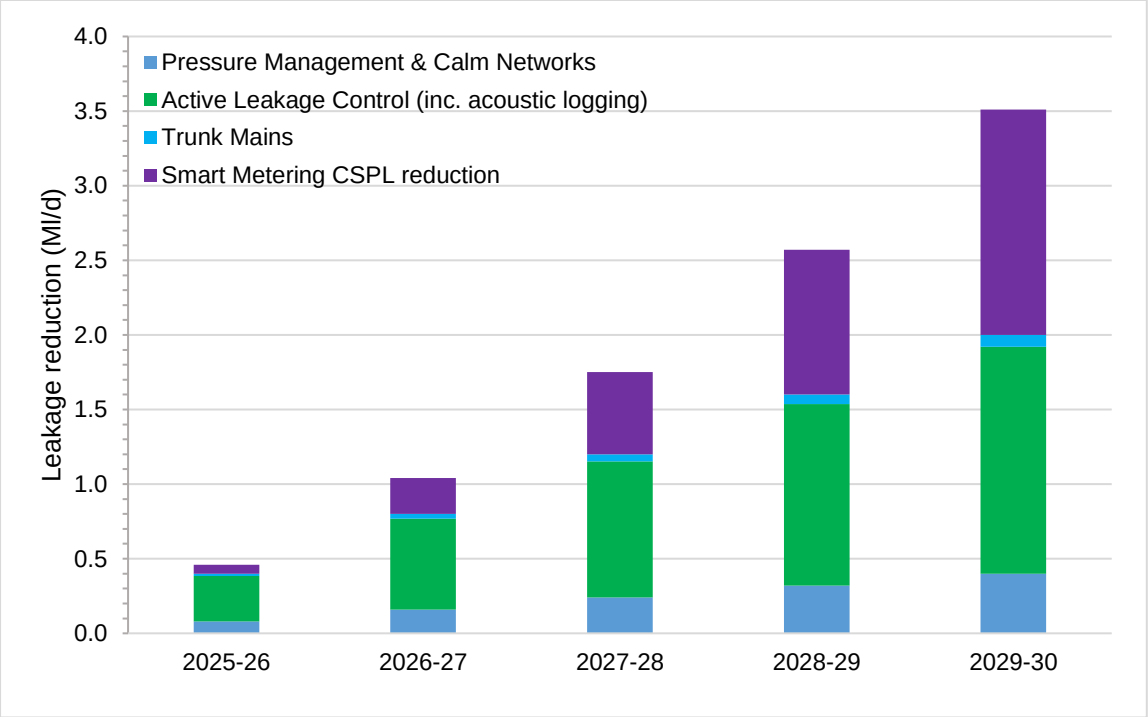


Figure 6-2: Forecast leakage reduction for AMP8 split by activity.



6.1 Active Leakage Control (ALC, including acoustic logging)

Active Leakage Control (ALC) is the term used to describe the central leakage management policy of monitoring our network for leakage, and then deploying resources to detect the source of the leakage, then repair crews to fix the leakage. We currently find and fix around 15,000 leaks each year and around 50% of these leaks are invisible.

We monitor leakage on our 12,000 km water mains network by segregating it into discrete District Metered Areas (DMAs), into which we can measure flow rates. Within DMAs, we create further discrete network areas, known as Control Zones, which enable us to home in on leakage increases more effectively.

Our leak detection is carried out by a core team of Leakage Inspectors, who are highly skilled and aided by the latest technology and equipment to help locate leakage quickly and accurately. Most leak detection technology is based on acoustic principles to identify leaks through characterising sound. We have thousands of acoustic leakage devices deployed across our network that monitor for the occurrence of leaks and provide early alerts.

Our AMP 8 plans in this area include:

- Creating new Control Zones between 2025-30, to break our current DMAs down further to identify specific areas of higher leakage more efficiently.
- Increasing the size of our Leakage Inspector detection and repair teams to minimise leakage increases and respond more quickly to leakage breakout.
- Increase the number of acoustic loggers installed, significantly increasing the proportion of our network covered by this technology.

6.2 Smart Metering and Customer Supply Pipe Leakage

Customer supply pipe (CSP) leakage currently accounts for approximately 20% of the total leakage in our region. Customers own and are responsible for their own supply pipes, however, we currently operate a generous free leak repair policy which includes supply pipe replacement where required for pipes up to twelve meters in length, unless cost of this is excessive due to reinstatement of decorative paving etc. This policy allows us to realise leakage benefits associated with CSP leak repairs by ensuring leaks are resolved promptly once identified.

CSP leaks are currently either identified by customers who contact us to report them or by our leakage inspectors identifying them through ALC activities. Smart metering will initiate a huge shift in how we identify CSP leaks as there will be detailed flow data for every metered property allowing rapid identification of continuous flows, a proportion of which will be associated with CSP leakage.

We plan to install 257,000 AMI smart meters on household and non-household properties by 2030 (increasing to 640,000 by 2035). These meters will provide hourly flow data for each property with data uploaded daily to our company platforms and customer portal. Data analysis software will automatically identify continuous night flows and categorise these in order of volume. We will inform customers and continue to support them to resolve leaks both in their property and on their supply pipe, significantly reducing run times compared to traditional supply pipe leakage detection methods.

6.3 Pressure management (including calm networks)

Forms of pressure control are widely applied at Wessex Water as an effective leakage management approach. Benefits go further than immediate reduction of leakage rates – effective pressure management also helps reduce burst rates, and creates a “calmer” operating network, which prolongs asset life and reduces water quality risks such as black, brown, orange (BBO).

Pressure management

We have a very mature pressure management operation, with around 2,000 pressure reducing valve (PRV) assets in service, controlling the pressure delivered to around three-quarters of WW properties. These PRV assets are monitored and maintained by an established, skilled team of technicians. The valves are often fitted with the latest technology full modulation control devices. These devices regulate pressure as flow varies, allowing us to operate a stable network, providing consistent levels of service to customers whilst minimising leakage rates.

Our AMP 8 plans in this area include:

- Increasing the number of full flow modulation control devices we have in operation to further optimise pressure delivery.
- Expanding the range of control technology to include creating up to 100 closed loop systems. Closed loop systems regulate pressure delivery to a set point, such as the

highest property in an area, to ensure good service standards are operated throughout. This method of control will also be installed where the water supply is boosted by pumps. Closed loop systems allow careful management of local network pressure, optimising control to supply minimum pressure to a critical point without over pressurising other sections of the network, reducing leakage risk.

- We will increase the team of skilled Technicians installing and maintaining equipment.

Calm networks

Calm network activities involve identifying pressure transients through monitors and software and then taking action to reduce or eliminate the cause of these transients. Pressure transients are temporary waves or pressure that cause stress on pipework and fittings which can lead to leaks or bursts. On pumping mains, quick stopping and starting of pumps can cause pressure transients, a solution to this may be installing variable speed drives to initiate a slow start or installing a surge vessel. Similar issues can be caused if valves in the network are opened or closed too quickly. To this end all Wessex Water Distribution and Leakage field staff have recently attended Calm network training to ensure they operate network assets in such a way as to minimise the risk of pressure transients.

Calm networks is a field where the use of new technology will be key to ensuring we have accurate information on the extent of pressure transients across our network. Identifying pressure transients in itself won't prevent leakage, a joined-up approach is required with other operational departments to ensure solutions are identified and implemented.

Our AMP 8 plans in this area include:

- Creating a dedicated team to focus on calm network improvements, with the aim of further preventing bursts and potential interruptions to supply for customers.
- Installing high resolution monitors to identify pressure transients that may occur in our networks and cause leaks and bursts.
- Designing and implementing solutions to minimise pressure surges.

6.4 Trunk mains

Trunk mains refers to the pipe networks generally upstream of the DMA areas where water is delivered to most customers. Trunk mains are usually strategically important in conveying large volumes of water over large distances, such as between water treatment centres and service reservoirs, and transfer mains that make up our integrated water supply Grid system. Trunk mains are generally large diameter and operate at higher pressures through less populated areas of the region.

Due to operating parameters, trunk mains don't have the consistent minimum night flows seen in other areas of the network and maintaining accurate flow metering is also more difficult. This makes leak detection on trunk mains uniquely challenging, especially coupled with having less places to install acoustic detection technology (less hydrants, air valves etc.).

Our AMP 8 plans in this area include:

- Expanding the Trunk Main Leakage team, increasing the number of Engineers working on these networks to improve leak detection outcomes in a challenging environment.
- Invest in additional monitoring and measurement, which will involve significant engineering works to deliver. For example, metering improvements to enhance data accuracy and better identify leakage.

6.5 Smart networks

Smart networks incorporates elements of several other leakage activities bringing together data from all monitoring devices. Being able to monitor our supply network allows us to effectively manage leakage, allowing us to “see” leakage events sooner and respond. We currently have over 5,200 monitors strategically placed across our network, collecting flow and pressure data. This data is transferred into our leakage management software, where alarms and reports are configured to ensure we become aware of any emerging leakage events. We plan to install more of these monitors, as detailed in activities described above, to achieve an even greater granularity of coverage.

Of the current network monitors installed, over 67% communicate data every 15 minutes with the remaining 23% being on daily reads. The proportion of monitors read at 15-minute intervals will increase significantly over AMP8 as all new or replacement monitors are installed with this logging frequency. This increase in data will move us further towards live network management.

This additional network monitoring coupled with our plan to install 257,000 AMI smart meters on household and non-household properties by 2030 (increasing to 640,000 by 2035) will provide a significant increase in data all contributing to make our supply network smarter than ever before. We will aim to integrate data efficiently to build an accurate representation of our network and tools that will aid leakage reduction over the long term.

Smart networks also bring benefits to other areas of supply performance, associated data is used by a dedicated control room team (Network Response Co-ordinators) contributing to minimising supply interruptions and enabling us to reduce associated customer contacts by proactively contacting customers effected by a large leak or mains burst before they contact us.

Annex A. Reference list

1. Wessex Water (2022). Strategic Direction Statement. Available at: wessex-water-strategic-direction-statement-2022.pdf (wessexwater.co.uk)
2. Government Statistical Service (2017). The Rural-Urban Classification for Output Areas in England. Available at: RUCOA_leaflet_Jan2017.pdf (publishing.service.gov.uk)
3. SUEZ (June 2023). SUEZ and NWL partner in Ofwat Innovation Fund winner Hydro Powered Concentric Smart Meter Project. Available at: SUEZ and NWL partner in smart meter project | SUEZ in the UK
4. Anglian Water (Dec 2022). V2 Demand Management Preferred Plan (anglianwater.co.uk)
5. Artesia for MOSL (April 2022). A Strategy for Enhancing Metering Technology (mosl.co.uk)
6. Strategic Panel (April 2023). Interim National Metering Strategy for the Non-Household Market. Available at: (file (mosl.co.uk)
7. Wessex Water GetWaterFit

A3 M&G Enhancement

This annex contains confidential material and has been submitted to Ofwat separately.

A4 Innovation

The following are examples of innovation, both recently and upcoming.

A4-1.1. Recent innovation

A4-1.1.1. Alarm Intelligence

WHY? What's the underlying issue or opportunity being addressed? Our control room is hit with a large number of alarms every day, many times beyond its capacity to handle. A new team for alarm rationalisation has been built in the control room as part of an effort to reduce the number of alarms and standardise them. This application goes hand in hand with this effort by providing the control room will real-time information on the load, status and distribution of alarms across Waste and Supply. This information shall assist the control room managers in their decision-making. For example, when it needs to call in standby for support. The next step would be to identify greater potential issues from incoming alarms and alert the control room on repeat offenders and motifs found in the incoming alarms flow.
What did we do previously? The control room currently uses an existing application within ScopeX which presents them with a list of active alarms and a report showing historical data.
What is the innovation? Using cloud technologies to provide real-time data and analytics to the incoming alarm stream
What were the expected benefits? e.g. financial, compliance, reliability Control room performance and reliability Compliance by assisting to point out alarms and predict issues before they materialise
Have we reached any conclusions? What impact has it had? We are currently implementing an initial proof-of-value of a dashboard presenting real-time data to the control room
Next – what do we propose for 2025-30? We propose a full implementation of the project, including investment in analytics and machine learning

Any challenges for going further?

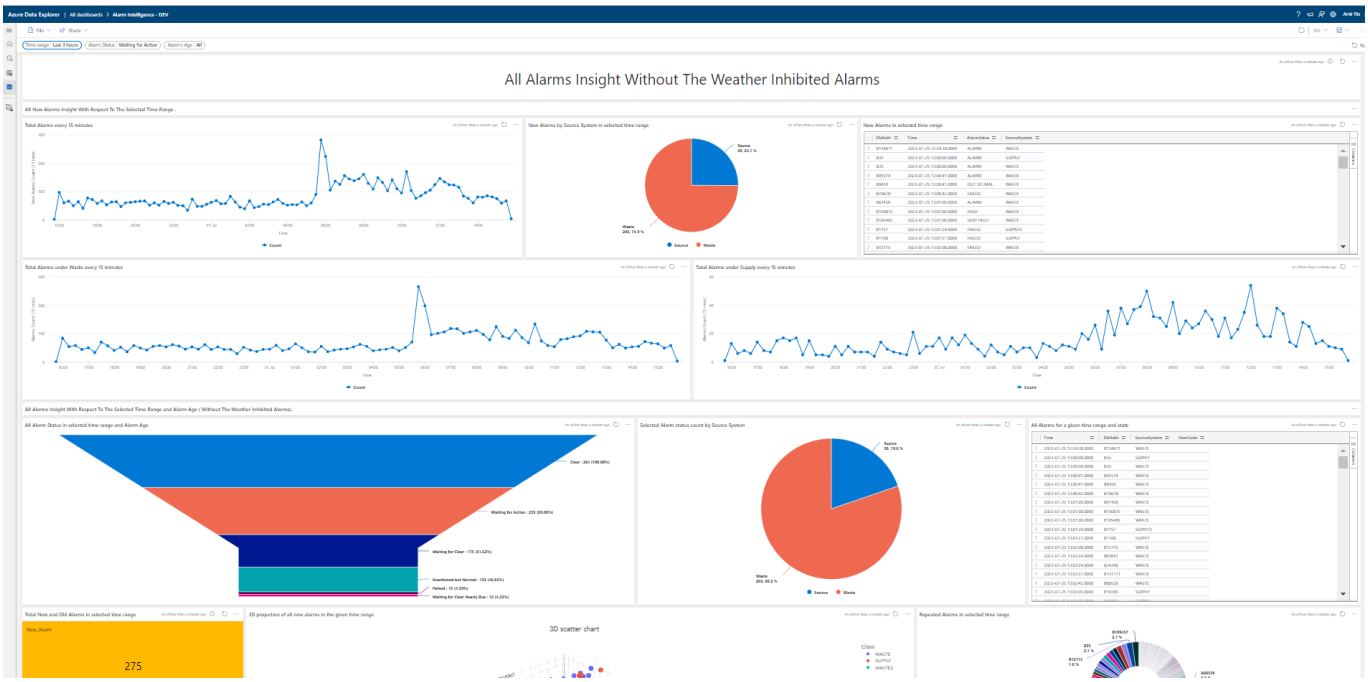
Cultural and process change in the control room

A machine learning model to identify motifs and to predict alarms and issues with minimal false positive alerts.

Financial points e.g. spend on trials, indicative cost savings,

IoT Lab PoV funding

Other comments



A4-1.1.2. Applying ‘intelligent’ analytics to enhance network monitoring & anomaly detection

WHY? What’s the underlying issue or opportunity being addressed?

Our long standing ‘alarm & alert’ capability is exclusively embedded within the telemetry system. This is largely based on very simple ‘threshold’ alarms which are fixed and do not offer any intelligence to adapt to changes in data points or link to associated instruments to improve confidence and enhance our response. Several areas and data types are being considered for analysis, in particular the Microwave and UHF

communications system applied to the strategic water supply GRID and Flow alarms from the water supply network are currently being analysed using MS Azure ‘anomaly’ detection capabilities.

What did we do previously

Reliant on threshold alarms set in telemetry which in essence only served to notify that at ‘failure’ had occurred with little or no proactive mechanism to alert users to a change or anomalous behaviour in an asset or instrument. Thus, response to these alarms allows only for a ‘reactive’ response sometimes with little or no time to prevent a service failure such as an interruption to customers water supply or the failure of a GRID communications point resulting in loss of remote control to strategic water supply assets.

What is the innovation?

What new technology or way of working? What scale e.g. early investigation; a trial?

By applying the analytical capabilities with MS Azure our IoT team have created a system of analysing pre-prescribed data points within telemetry to detect ‘deviations and anomalies’ in data.

In the case of the GRID communications system this has provided visibility of depleting battery charge and reducing signal strengths in advance of total failure. This provides limited but valuable time to intervene before a loss of comms occurs. This capability has already been deployed in the regional control room using a dedicated dashboard.

In the case of Supply network flow and pressure, the additional analysis provides a more dynamic means of monitoring and in several cases has generated more ‘real-time awareness of burst mains, especially at night when the traditional threshold alarms are least effective. This capability is currently being trialled by the Network Response Team within the regional control room and results so far are encouraging.

What were the expected benefits? e.g. financial, compliance, reliability

The aspirational benefits are listed below with examples;

- With improved statistical analysis of data points there is potential to increase confidence when alarms/alerts are received and reduce ‘false’ alarms and abortive responses
- To better identify changing data trends, alert potential failures and provide opportunities to intervene and reduce the risk of more severe or catastrophic failures. E.G Pump vibration & bearing temperatures
- To alert changes in network flows indicating the onset of a significant leak or burst which may impact customer supplies. Especially at night when threshold alarms are least effective and risks are greatest.
- To exploit the potential for improved ‘asset health’ monitoring E.G Pumps, motors, PRV’s to drive proactive and preventative maintenance.

Have we reached any conclusions? What impact has it had?

[Results so far are encouraging and suggests that there is potential to exploit these analytical tools to improve the data we have and optimise the use of additional real-time data]

Next – what do we propose for 2025-30? e.g. a trial; full implementation / rollout To continue developing these capabilities and implement some ‘productionised’ applications within the control room and wider business alike.
Any challenges for going further? To maintain an iterative process of testing and development working IT with an agile approach.
Financial points e.g. spend on trials, indicative cost savings, Costs are extremely competitive compered with previous ‘bespoke’ solutions and hopefully the costs of using these cloud based solutions will deliver the critical requirements we need to move forward.

A4-1.1.3. Flow and Pressure Monitoring

WHY? What’s the underlying issue or opportunity being addressed? The Water supply business is increasingly reliant on real-time data to drive effective responses to network events and meet industry performance commitments. Turning this data into ‘information’ is critical and the business is reliant on telemetry alarms applied to both existing and new network data points. The need to develop a more ‘intelligent’ system for alarms is ever more critical. Operations and IT have already trialled products which use ‘artificial intelligence’ (algorithms) as a solution but thus far they have failed, largely due to excessive numbers of ‘false alarms’ which render them ineffective. It is unclear if further developments within the AI arena will resolve this issue soon and there remains an urgent need to try and improve the current situation even on an interim basis.
What did we do previously? The current ‘threshold’ based alarms within PRISM telemetry are no longer adequate for our needs and fail to provide a step change in ‘proactive’ monitoring for service failures (bursts) and significant leaks. It is still commonplace for significant bursts to occur (especially at night) which do not trigger a threshold alarm but still result in a service failure. This project is mostly beneficial during the night hours, 1 am to 5 am, where customers would not be using water and would not be able to report on an issue.

What is the innovation?

But identifying anomalies using analytics tools in the cloud, we have a way to alert the control room and the operations teams about an issue before an alarm reaches the control room.

What were the expected benefits? e.g. financial, compliance, reliability

Expected benefits include compliance (responding to incidents ahead of time) and financial (quicker resolution)

Have we reached any conclusions? What impact has it had?

The implemented system is in trial with the operations teams and have successfully identified bursts in multiple occasions 1-3 hours before the control room received an alarm, and in some instances without an alarm ever arriving to the control room

Next – what do we propose for 2025-30?

A trial for six months with the control room followed by full implementation of the project, including further investment in analytics and machine learning.

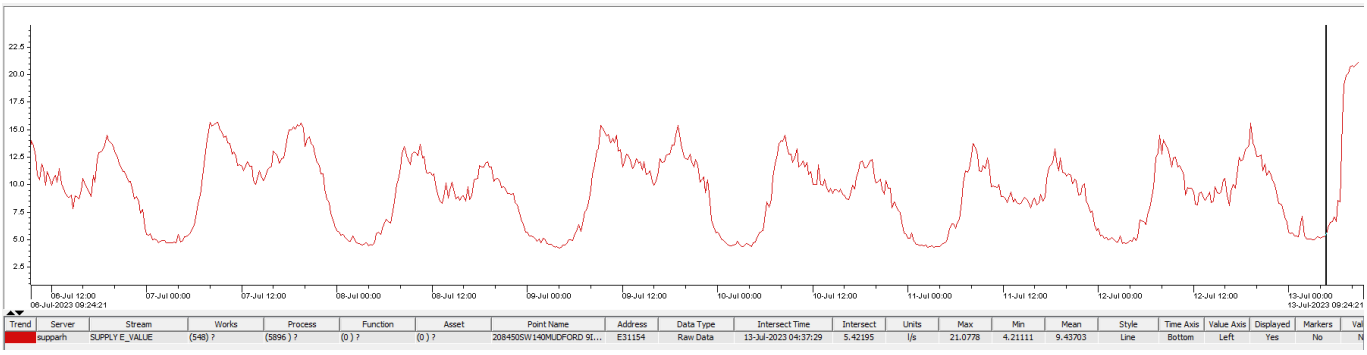
Any challenges for going further?

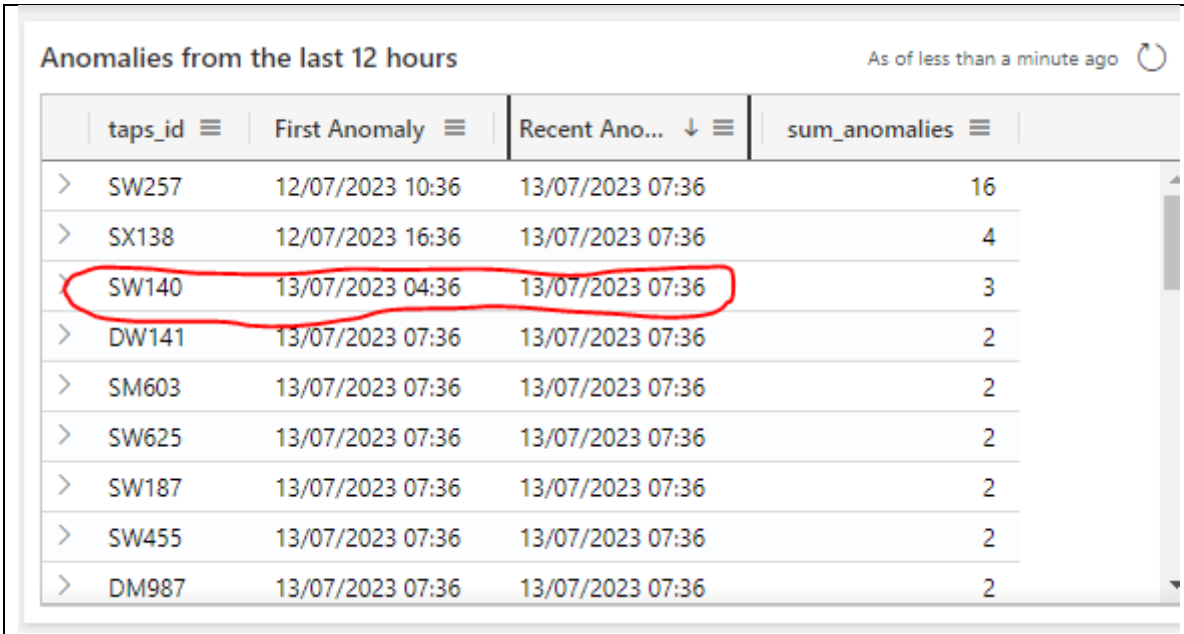
Cultural and process change in the control room

Financial points e.g. spend on trials, indicative cost savings,

IoT Lab PoV funding for what was implemented so far

Other comments





Anomalies from the last 12 hours — As of less than a minute ago

taps_id	First Anomaly	Recent Ano...	sum_anomalies
SW257	12/07/2023 10:36	13/07/2023 07:36	16
SX138	12/07/2023 16:36	13/07/2023 07:36	4
SW140	13/07/2023 04:36	13/07/2023 07:36	3
DW141	13/07/2023 07:36	13/07/2023 07:36	2
SM603	13/07/2023 07:36	13/07/2023 07:36	2
SW625	13/07/2023 07:36	13/07/2023 07:36	2
SW187	13/07/2023 07:36	13/07/2023 07:36	2
SW455	13/07/2023 07:36	13/07/2023 07:36	2
DM987	13/07/2023 07:36	13/07/2023 07:36	2

A4-1.1.4. Water Quality and Turbidity Monitoring

WHY? What's the underlying issue or opportunity being addressed?

The Water Supply Treatment team need to carefully monitor site and water quality and turbidity data to maintain regulatory compliance and efficient asset performance alike. There are three principal sources of data.

- PRISM telemetry data used both in real-time & via historic trend views.
- Site SCADA & PLCs used to access some data not routinely exported into telemetry.
- Scientific Systems (Scisys) for accessing laboratory sample results.

These systems are disparate and proactive analysis requires manual effort to produce useful information. This is a requirement of both operational scientists and site technicians alike. The information is used for both 'real-time' operation and retrospective investigations.

The POC has several specific benefit areas including;

- Optimising the use of existing data enabling a more effective assessment of information.
- Reducing an over-reliance on human-factors to collate the data and re-focus on analysis & information.
- Generate more proactive alerts to trends highlighted using statistical analysis and reducing the reliance on human factors to detect likely issues
- A reduction in risk of a nitrate failure in supply, impacting company performance service delivery and reportable incidents alike.
- Improved information to optimise accuracy of site monitors
- Demonstration of improved diligence to the regulator.
- Added longer term intelligence through data to support strategic outage planning

- Longer term data to support investment planning
- The potential to provide 'blending ratio guidance' to enhance existing Nitrate management plans & LEP's
- To identify further potential for wider application within Ops Water Supply and Waste alike
- Contribute to a discolouration risk & management strategy as required by DWI.
- Benchmarking water treatment & AMP7 water quality performance commitments)
- Identification of 'seeding' in downstream networks in advance of DWI driven investigations
- A partner to the 'cost per megalitre' initiative for sites

What did we do previously?

Presently, the team need to manually collate telemetry data from Nitrate monitors at sites and overlay sample analysis data from Scientific systems. This is collated primarily using MsExcel and the information is used to monitor Nitrate levels and drive site management in the following key areas;

- Critical thresholds to initiate nitrate treatment, blending, borehole management or removal of site from service to ensure compliance water quality standards
- Operational calibration and maintenance of site monitors to ensure accurate data
- Manual sampling frequencies for lab verification of site monitors
- Strategic site outage management, planning and prevention
- Re-introduction of sites following verified reduction in Nitrate levels including run to waste.

The team currently uses Amulet to view dashboards for monitoring data. Data points are difficult to map between SciSys and Amulet. When new signals are linked their meta data has to be filled in manually, then assigned to a site. Dashboards for each site have to be created manually although their format is usually very similar. The team uses Amulet for simple statistical analysis and identifying overall trends in data.

What is the innovation?

The new dashboard can be populated with real-time data from both PRISM and Scientific systems to eliminate the requirement for 'manual' data collection and import.

In addition, the application can be used to explore the introduction of 'alerts' for trend changes based on the existing nitrate monitoring thresholds. Filters in the dashboard might link sites geographically, by aquifer or network and perhaps generate a means of proactive 'blending' ratios for risk mitigation.

What were the expected benefits? e.g. financial, compliance, reliability

Expected benefits include compliance and financial

Have we reached any conclusions? What impact has it had?

This is still WIP, though the visibility phase where a dashboard presenting samples is already successfully implemented.

Next – what do we propose for 2025-30?

Link the know-how and mechanism with additional water quality initiatives such as Poole Harbour and continue to full implementation of the solution.

Any challenges for going further?

Access to relevant data in rea-time

Financial points e.g. spend on trials, indicative cost savings,

IoT Lab PoV funding for what was implemented so far

Other

A4-1.2. New or future innovation

A4-1.2.1. NexAI for Algal Monitoring (Ofwat Project)

WHY? What's the underlying issue or opportunity being addressed?

Algae and cyanobacteria form a key component of the water system but under the right conditions some species grow out of control forming dense blooms. There is a growing body of evidence that algal blooms will increase in both frequency and intensity, ultimately providing more challenges for water companies in safeguarding clean drinking water, protecting assets, and achieving acceptable water quality for all customers.

Monitoring of algal communities by the water industry at large is currently undertaken using traditional, time-consuming and resource intensive techniques. Yet significant potential exists for the improvement of

algal monitoring of water samples through the application of artificial intelligence (AI) for automatic image analysis.

What have we done to date? Working methods, technologies etc

The application of artificial intelligence (AI) to problems of environmental monitoring has started to take hold across industry, yet to-date no water company has developed or implemented an AI-based platform for algal community monitoring despite the obvious applications and advantages.

A proof-of-concept study to show-case the potential of AI-based algal monitoring; demonstrating how Convolutional Neural Networks (CNNs) can identify and count algal cells from simple microscope images. This project was funded by the Jean Golding Institute data-science hub and was conducted in 2021 as a collaboration between the University of Bristol and Welsh Water (link).

What is the innovation we propose for 2025-30? What new technology or way of working?
What scale e.g. early investigation; a trial; full implementation / rollout?

By 2030 the development of a working AI-based tool for the automatic identification and enumeration of algae from images of raw water samples. This will then be developed into an app that can be rolled out for use either with a laboratory-based or field-based microscope for automated high-throughput algal community profiling.

How advanced is it? e.g. early concept; being trialled elsewhere; demonstrated but not yet readily available; all ready to implement

This is early concept – as discuss a proof of concept has been completed to demonstrate the feasibility of AI-based algal analysis. This project will aim to develop full-scale AI-based software for the analysis of algae which to-date no one has developed.

What are the expected benefits? e.g. financial, compliance, reliability

The main benefit would be having an algal monitoring method that requires significantly reduced Analyst time in terms of identifying and enumerating algae. This would allow for increased monitoring of algal communities through space and time, and consequently a better understanding of how and when algal blooms occur.

In order to train the network, thousands of images of algal samples will need to be annotated with associated identifications. This will create a huge image library of real-world algal species that is greatly needed within the water industry to act as a training guide to new algologists.

CNNs represent a leading-edge technique that have numerous applications and benefits, with several additional use cases likely into the future. Building relationships with experts in CNN development, learning how they work and how to train them will prime water companies for their subsequent uptake into the future.

Any anticipated challenges?

General challenges that come with developing novel technology.

Financial points e.g. anticipated spend on trials, indicative cost savings No spend apart from Public Health Manager time. Wessex Water are not a financial contributing partner to this Ofwat project. Wessex are part of the project group offering technical support and advice.
Other comments **External people / organisations:** Welsh Water, Anglian, United Utilities, Cardiff Uni, Bristol Uni

A4-1.2.2. Digital Twins ('DT')

WHY? What's the underlying issue or opportunity being addressed? "Digital Twins" of built assets contain information about the "Physical Twin", by periodically updating the information held about the physical the digital can be used to make predictions in various scenarios. During Apollo 13 NASA used what is considered the first digital twin to test scenarios before they were put into action. Similarly, Wessex have the opportunity to build twins that can observe telemetry to control, monitor and forecast network behaviour
What have we done to date? Our existing regional control and monitor system, ScopeX, has a basic digital twin capability known as 'mimics'.
What is the innovation we propose for 2025-30? During design, construction and commissioning a significant investment is made in producing models containing both 3D geometry and associated data. Traditionally much of the value in this is lost after delivery which could be used in asset operation. Trials are in place by IoT Team to link geometry models with asset data and telemetry existing 2D schematic mimics. In addition, the new digital twins could support the integration of data from multiple sources, both internal and external. For example, Waste, Supply, and Weather, all on the same DT.
How advanced is it? This is new to Wessex Water, but already in use across many use cases in Industry 4.0
What are the expected benefits? e.g. financial, compliance, reliability In the short term mimics can be more readily understood and engaged with in terms of a 3D model giving a real-world view of assets position, geometry and current and predicted status. Integrated data presented on the DT will help operations in their day-to-day work.
Any anticipated challenges? Access to data Data integrity Cultural and process change

Financial points e.g. anticipated spend on trials, indicative cost savings
Currently selected as an IoT Lab proof-of-value to present capabilities and potential costs

Any other points
Would probably relate to ‘site of the future’ initiatives

Other

External people / organisations: Unity, Microsoft

Figure 1 - Existing Scopex 'mimic

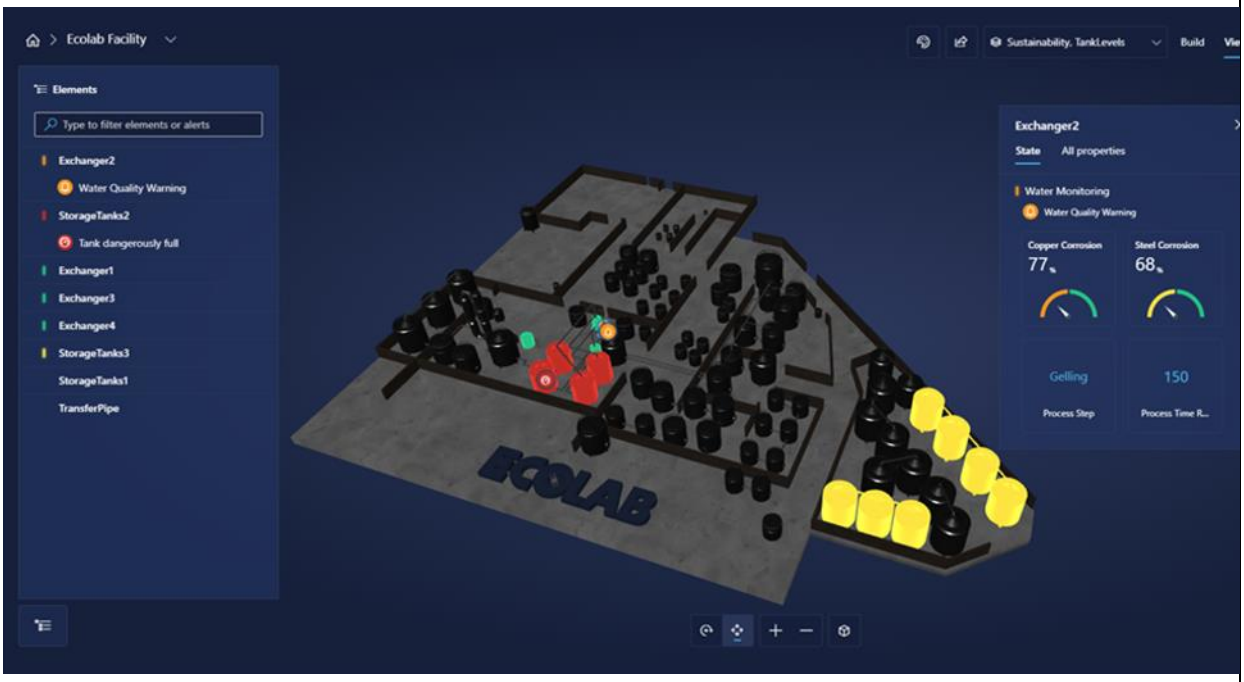
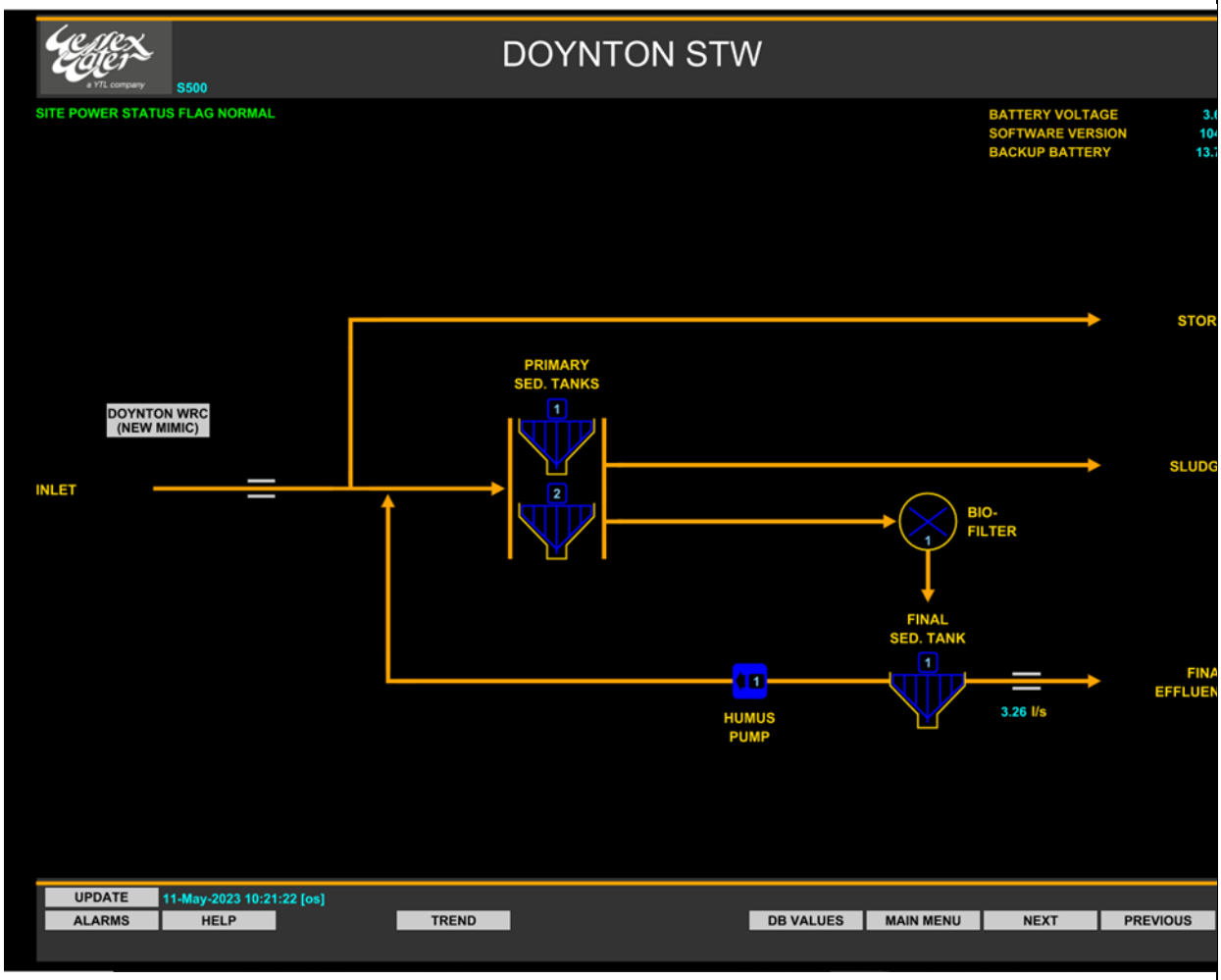


Figure 2 - existing Scopex 'mimic



A4-1.2.3. Telemetry (ScopeX) Health

WHY? What's the underlying issue or opportunity being addressed?
Our regional control and monitoring system, ScopeX, lacks health monitoring capabilities. For example:

1. Configuration mistakes
2. Standards validation

The target is to build an automated system that would monitor the internal configurations done in the system on a daily basis and issues report for issues found. Where possible, auto-correction could potentially be achieved.

What have we done to date? We currently rely of vigilance of people, when they happen to come across a mistake in configuration. For some issues, we are able to manually run reports to identify issues.
What is the innovation we propose for 2025-30? An automated way to enhance the health of potentially our most critical system used by the control room and operations, ScopeX. Once the infrastructure is in place, capabilities could be bolted on according to priority in the future.
How advanced is it? This is new to Wessex Water, we currently rely on manual work and local heroes
What are the expected benefits? e.g. financial, compliance, reliability Reliability and compliance
Any anticipated challenges? Access to relevant data Process and cultural change
Financial points e.g. anticipated spend on trials, indicative cost savings Trials to cost 70K
Any other points