

# Appendix 2 Leakage and Pressure Management

November 2022

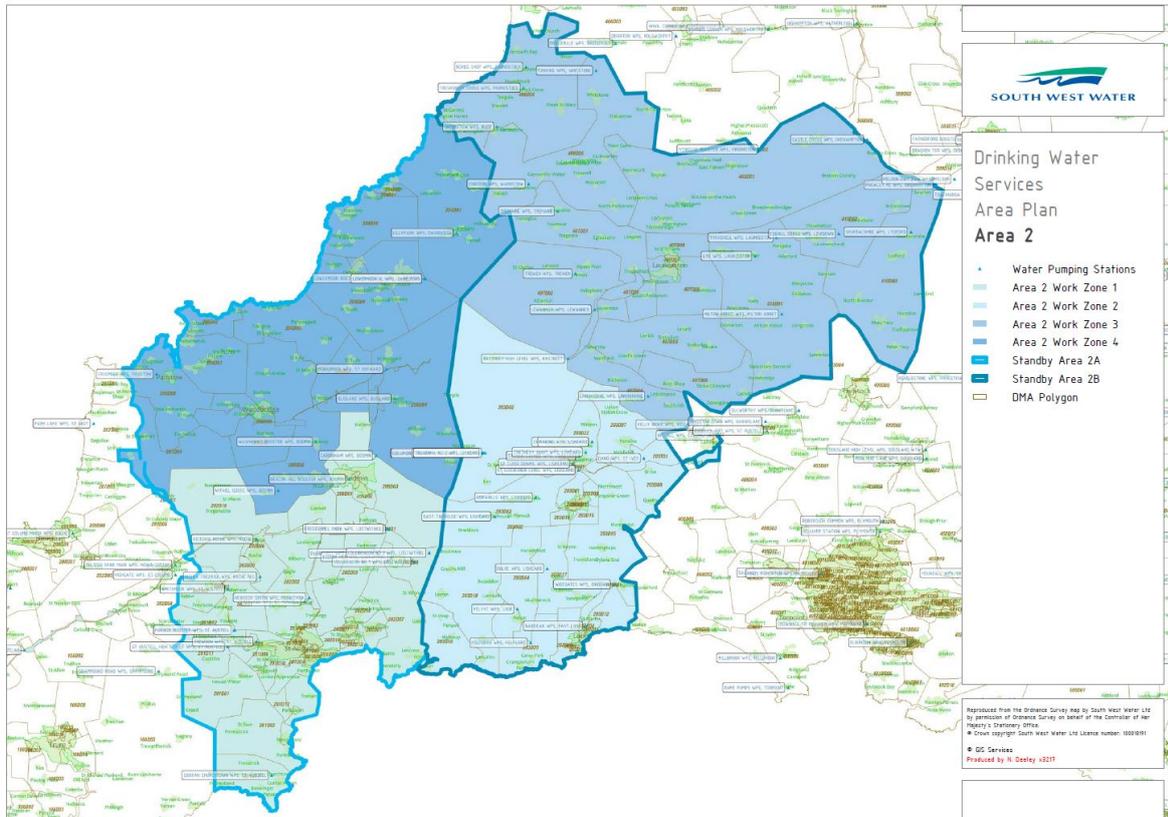


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Figure 2 – Operational Area 2



### 1.1 Regional Leakage position 2021/22 - pre drought

South West Water achieved its best ever regionally reported, in-year, leakage performance in 2021/2022, 90.6 MI/d. This ensured the three-year rolling target was met, following a deviation from target in the year 2020/21, and aligning performance to the AMP's overall reduction target of 15%. 2021/22 performance improvements were developed through implementing industry best practice, which resulted in the establishment of an in-year leakage recovery plan (Distribution Input Recovery Plan) with enhanced governance and controls including, these initiatives were regional and did include the Cornwall zones of Stannon/Colliford/Restormal.

The reported level of leakage for Stannon/Colliford/Restormal in the year 2021/22 was c. 35 MI/d.

Regional projects included:

## Hawk's Tor Pit Drought Permit Application 2022

- Operational and investment plan to reduce leakage levels
- Pressure management activities
- Increase detection staff / new processes and technology to increase number of leaks found
- Increased leak repair resource to reduce leak repair work basket
- Customer side leakage enhanced processes
- Increased telemetry, data review and analysis
- New /enhanced leakage management and estimation software platforms
- Alignment of leakage operational and reporting teams
- Weekly working group meetings
- PMO approach using project management tool for governance, monitoring, recording of activities within plan
- Commissioning of external reviews by industry experts
- Increasing / improving our coverage of properties within consumption monitors – enhancing individual monitors and expansion of Small Area Monitors (SAM's)
- Review of all reporting inputs, factors and allowances to ensure that demand (consumption) and leakage are reported more accurately.

The activities above focused on operational improvements, network leakage reductions and leakage reporting enhancements, and have delivered significant reductions in leakage with target achievement reported for 2021/22 in-year and 3-year average leakage levels. Continuation of our leakage reduction plans are expected to achieve the targets for the remainder of the AMP7.

The workstreams resulted in a change to reported leakage from an in-year position of 136 Mld 2020/21 to 91 Mld in 2021/22. The reduction leakage can be summarised by the leakage reduction plan workstreams as follows in subsections 1.2 to 1.6 below:

### 1.2 Leak Detection and repair – 20 Mld – 2021/22

Leakage detection and repair in the year 2021/22 was centred providing fast-track leakage reduction with minimal lead times. Significant additional funding was approved and allocated for the delivery of the leakage reduction plan.

An enhanced leadership framework was established:

- 12 new staff were recruited into these teams in leadership roles
- 35 additional partner / contractor roles were created for leak detection
- 24 extra two-man repair crews were employed (again via our partner contractors) to fix the additional leaks identified and reduce the overall leakage workbasket. Additionally, a further 5 support drivers and 4 supervisors were engaged to support the increased number of repair crews
- The additional crews and support staff were brought in from further afield (some from the North-west) meaning that South West Water provided accommodation for them throughout their engagement
- Productivity and performance also increased from the use of new equipment and technology and from enhancing our own performance management.

Leakage detection activities by South West Water are delivered via a blend of direct and subcontracted labour. As part of our enhanced leakage plans, South West Water added 35 additional staff via our partner contractors to increase the volume of leak detection activities.

These teams provided leak-noise survey and Point of Interest ("**POI**") investigation resource, using digital analysis to provide next day issuing of work for leakage technicians to follow-up and carry-out 'pin-point' detection to promote repair jobs.

The assessed benefit of the additional detection (find) resource is 8 Mld, this being assessed from the increase in numbers of leaks detected.

The additional repair crew resource employed to fix leaks enabled a reduction of the overall leakage work basket from 800 open jobs at any given time (equating to volume of 15 - 20Mld) to less than 200 (5 Mld volume), as a result of the additional partner resources deployed. Therefore a 10-15 Mld benefit is derived from this activity (used 12 Mld mid-point for this overall assessment).

In addition to increased resource in traditional leak identification and repair, South West Water used the latest satellite detection techniques to improve performance. Utilis satellite imagery analysis utilises advanced algorithmic analysis to track the spectral signature of potable treated water (chlorine residual) in the ground.

More than 3,300 POIs were identified regionally. In many cases multiple leaks were identified at single POIs, leading to a conversion rate of around 50%. This technique was especially effective over our large stock of rural DMA's and trunk mains which often cover very large geographic areas and are difficult and time-consuming to investigate using traditional people-on-the-ground techniques. Traditional acoustic techniques are also challenging in such DMAs with long pipe lengths and few connections or mains fitting off which to monitor for leakage noise.

Dedicated experts were assigned to POI investigations to help promote success from the detailed analysis of the POIs through to sending detection staff in on-the-ground.

### 1.3 Pressure management activities – 6 Mld

South West Water have extensively invested in pressure management and 'network-calming' activities to control excess pressures that lead to more leaks and bursts and higher leakage.

New pressure control systems as well as undertaking maintenance on existing systems have been constructed. A project team comprising internal and dedicated external resourced enabled us to expedite delivery.

We prioritised no-interruption techniques for installation sites, using under-pressure valves and tees at all sites where more than 50 customers would experience a supply interruption of more than three hours. This enabled simpler planning and faster delivery.

A direct communication with our local highways' authorities' team was established for this workstream which again enabled us to minimise process delays and fast-track delivery.

New and optimised pressure control valves were set to reduce pressure throughout the Diurnal period.

A summary of project outputs is included below:

- 61 new pressure reducing valves ("**PRVs**") (with controllers) installed and optimised (plan continues to run with circa 25 new schemes under construction).
- 131 new controllers retro fitted on existing PRVs and optimised.
- 358 existing PRV controllers optimised.
- 240 PRV's serviced.
- 457 data logging projects carried out for pressure management investigations.

The measured output of the whole pressure management workstream amounted to c.6 Mld.

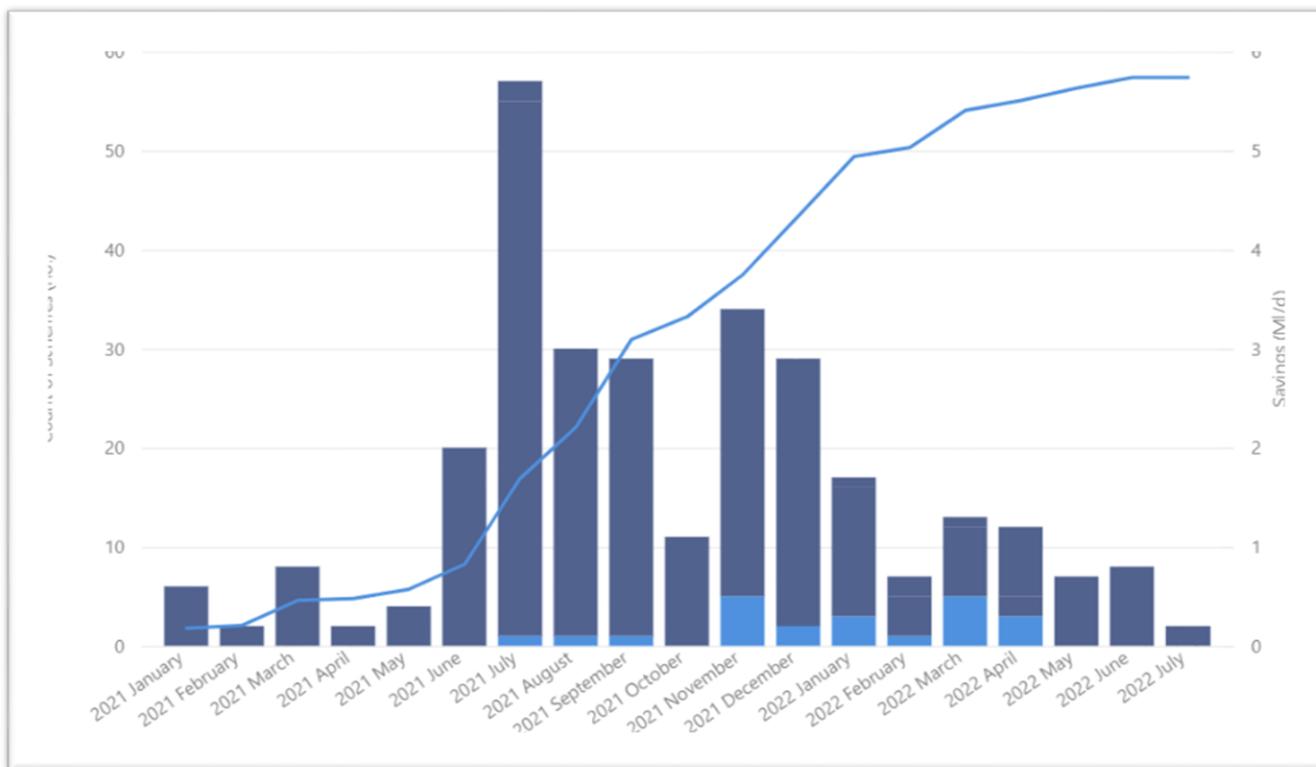
See Figure 3 below showing the relationship between new pressure valves installed and total leakage reduction.

**Figure 3 - Total leakage reduction**

*Blue cumulative Trend line – Total leakage reduction*

*Light blue bars - New Pressure Valve digital Controllers*

*Dark blue bars – new pressure valves installed*



### 1.4 Trunk Mains – 3 Mld

Specialist suppliers were appointed to provide active leakage control services to upstream assets e.g. trunk mains and service reservoirs. These additional upstream resources supported the location and repair of c.3 Mld from trunk mains.

### 1.5 Service Reservoirs ("SR") – 1 Mld

South West Water's SR cleaning program had been enhanced, during every SR clean a drop test was conducted. Leakage can be identified by the drop test, as can 'passing' valves. The assessment data from the increased drop test activity was fed into the reporting component, providing a small benefit of c.1 Mld.

### 1.6 Customer Side leakage – 14 Mld

Losses from customer supply pipes continues to be a significant component of reported water loss. Enhancing active leakage control efforts in this area was also identified as a high-priority, fast-reacting activity.

Three primary routes of identifying private losses exist:

- higher consumption / bill triggers (84% meter coverage in South West Water),
- customer contacts reporting a leak and
- leaks detected via targeted DMA ALC sweeps.

All potential leaks are investigated and, subject to several threshold parameters, an ex-gratia offer can be made to facilitate the fix of the leak. This is the fastest way to ensure a repair is made, with notice and enforcement processes risking protracted leak-run times.

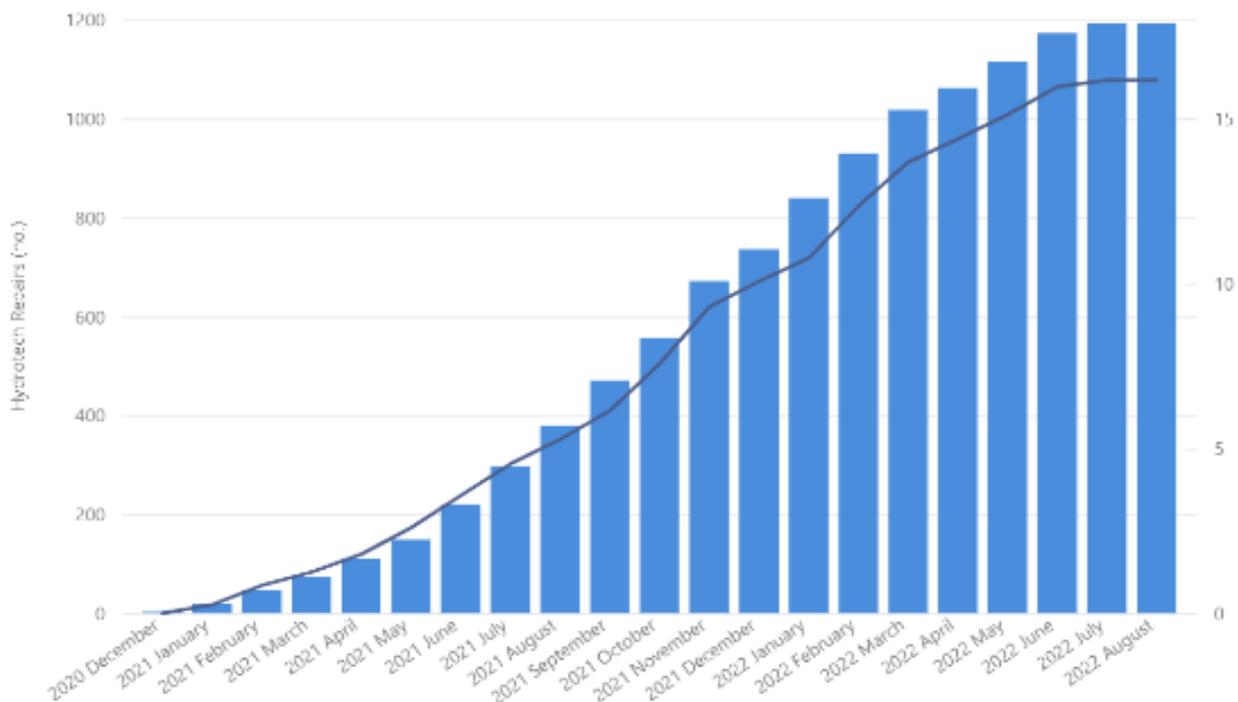
As part of our enhanced leakage strategy, the trigger thresholds for considering an ex-gratia repair / intervention were reduced from 10 litres per minute and over to 5 litres per minute and over.

In addition, our policy preference was changed to pipe renewal rather than spot repair. Where the supply pipe material is one of an identified type, the customer is offered a full renewal free of charge, instead of a spot fix, to reduce the number of repeat private leaks on high-risk pipe types.

With c.84% of customers on measured accounts, and close to 100% having a boundary facility to fit a meter, South West Water can readily determine leak flows. In the year 2021/22 c.14 Mld of leakage reduction was on customer supply pipes, a record high for this activity for SWW.

Figure 4 below represents the total leakage saved (trend) and interventions (customer leak repairs and pipe renewals) required to achieve the leakage reduction.

Figure 4 - Graph showing total leakage saved against leakage repairs



## 2 DROUGHT - COLLIFORD WRZ – WATER LOSS ACTIVITY AND PERFORMANCE IMPROVEMENTS (JUNE TO DATE)

Responsiveness to water losses, including leakage due to drought has seen the redeployment of the maximum sustainable level of direct and supply chain labour technicians into DWS operational areas 1 and 2, covering the Colliford WRZ.

No fewer than 36 field technicians have been working in operational areas 1 and 2 since June 2022, the normal number, pre DI recovery and drought being c.15FTE. The additional field force has led to significantly increased numbers of found leaks. The average of the detected leaks in the rolling prior 12 months significantly uplifted since drought activities commenced.

**Figure 5 – Detected Leaks in Operational Areas Colliford WRZ (Area 2).**

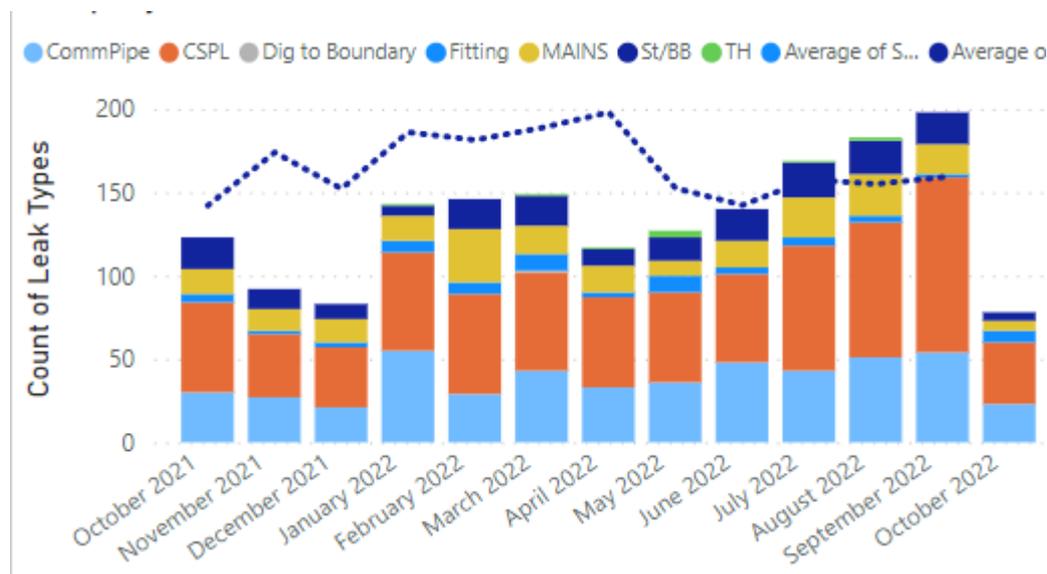
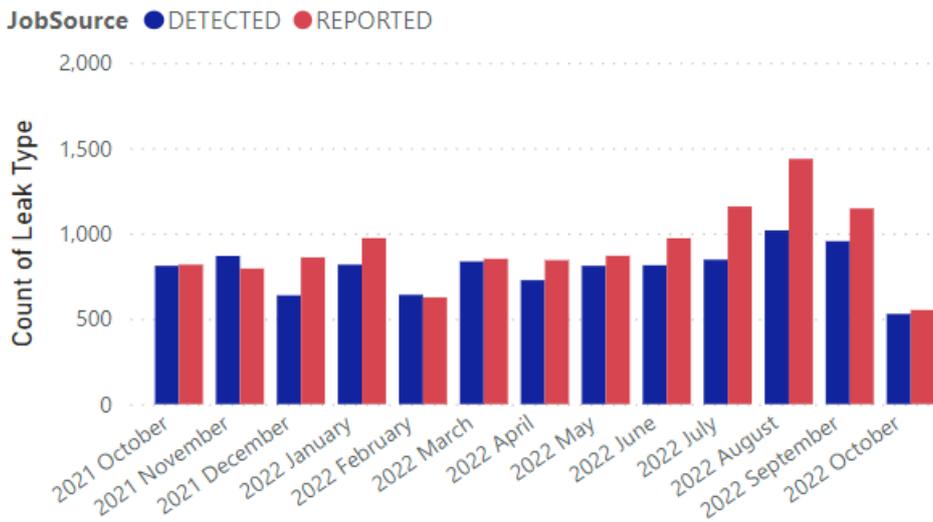


Figure 6 below shows the number of detected leaks compared to customer reported leaks in the Colliford WRZ. Detected leaks are found due to their typical invisibility and the reported leaks are reported to us due to their visibility. Reported leakage is often responded to more quickly due to service affects (low pressure/No water/flooding), with detected leakage requiring additional effort to locate the leak e.g. with acoustics or listening equipment.

**Figure 6 – Detected Leaks compared to Customer Reported Leaks in Colliford WRZ**



The business is investing £3.3m (£2.0m Customer leakage, £1.3m on mitigating network leakage) on initiatives to further reduce water losses in the Colliford WRZ.

**Table 1 – Initiatives to reduce water loss in Colliford WRZ**

Drought Project Description
DMA OPTIMISATION
<i>Aqualogic DMA Ownership / Optimisations</i>
<i>Digital Twin (Model Development)</i>
<i>Digital Twin (follow Up Field Services)</i>
BABE AND TM DMW SURVEYS
DEPLOYMENT OF SENSORS IN DMAS
DEPLOY ACOUSTIC AND PRESSURE SENSORS
PRESSURE MANAGEMENT OPTIMISATION CORNWAL
<i>Basic hydraulic Limiting of Valves</i>
<i>Installation of New Valves and controllers</i>
LOSSES AT SWW SITES (WWTW)
WEEKEND WORKING/OVERTIME/INCENTIVISATION
CUSTOMER LEAK REPAIRS
WATER EFFICIENCY
SUPPLY CHAIN ADDITIONAL ALC RESOURCES
<i>WLLS Resources x 4</i>
<i>MWS Resource x 6</i>
ENHANCED HH NHH SUPPLY PIPE LEAK DETECTION
SATELLITE SCANNING AREAS 1 & 2 ANALYTICS

# 3 COLLIFORD WRZ WATER LOSS MITIGATION SUB PROJECTS

## 3.1 Pressure Management

Managing pressure is a key component of water management and loss control in a supply network. It is essential that pressure management is a balance of achieving the stated and expected water service standards, low pressure being a key measure of customer service. SWW has an estate of Pressure management (PM) valves in the Colliford WRZ. These valves are controlled to varying degrees of sophistication – from fixed hydraulic, programmed profile or remote critical point signal input. Pressure control is a business-as-usual component of water loss control and calming of networks. BAU activities supporting PM include:

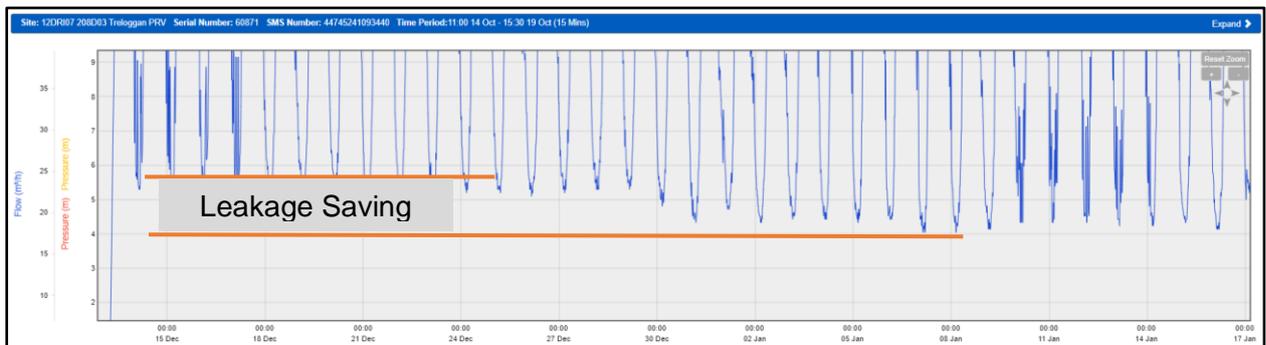
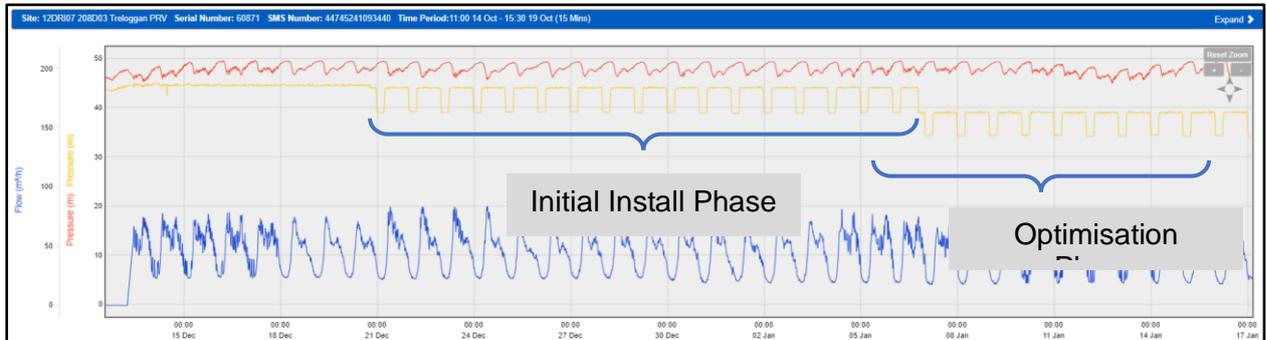
- Installation of new control valves
- Optimisation of existing control valves (hydraulic)
- Optimisation of existing control valves (self-contained digital control)
- Optimisation of existing control valves (External input signal controlled – critical point)

Our frame worked supplier for network field services was commissioned with further investigation for further optimisation of all appropriate pressure control valves in the Colliford WRZ, some 800 valves were desktop reviewed. This drought-initiated study and field intervention plan was all additive to BAU. The desktop study concluded that some 200 valves were worthy of further field investigation and optimisation. The sum of optimised and installed valves 202 valves – 31 new installations and 171 optimisations. The additive activity yielded the following leakage reduction, including a comparison of optimisation actions in the previous year (2021/22):

	Savings (MI/d)	
	Apr 21 -Mar 22	Apr 22 - Oct (wk 42)
Colliford	<b>1.09</b>	<b>0.9</b>

Below is an illustration of the demand reduction benefit achieved for one typical pressure management scheme if Colliford. The demand reduction was achieved wholly from

pressure management, the indicated drops in flow are not linked any leak repairs, purely from pressure reduction into the DMA>



### 3.2 Pressure Management – continued focus – full affect March 2023

Further pressure management schemes will be focused on in the Colliford WRZ. The continued optimisation, and a number of new schemes, is forecast to benefit losses by 0.3ML/d.

### 3.3 District Metered Area ("DMA") Optimisation – 0.5Mld – full affect March 2023

The specific target level for every reporting DMA is well established. The Minimum Achievable Leakage ("MAL") are known for all DMAs. In Colliford WRZ, those MAL values are being re-evaluated. South West Water has commissioned the services of the expert supply chain to undertake in-depth studies of DMA performance. The DMA Ownership and Optimisation pilot has incentives built into the contract to drive innovative solutions for water loss and usage reductions in the selected DMAs. The DMAs selected are ranged to ensure the maximum opportunity for demand reduction is possible. In selected DMAs South West Water shall be:

- Operating at MAL
- Ensuring consistent standards
- Providing trunk main focus
- Targeting high non-household consumers – DMA exports

The project plan was altered in June to singularly focus on operational on the Stannon/Colliford/Restormal zones. The DMA's selected had levels of leakage within target for company performance but they were considered appropriate for further reduction due to their hydraulic, connectivity and asset construct.

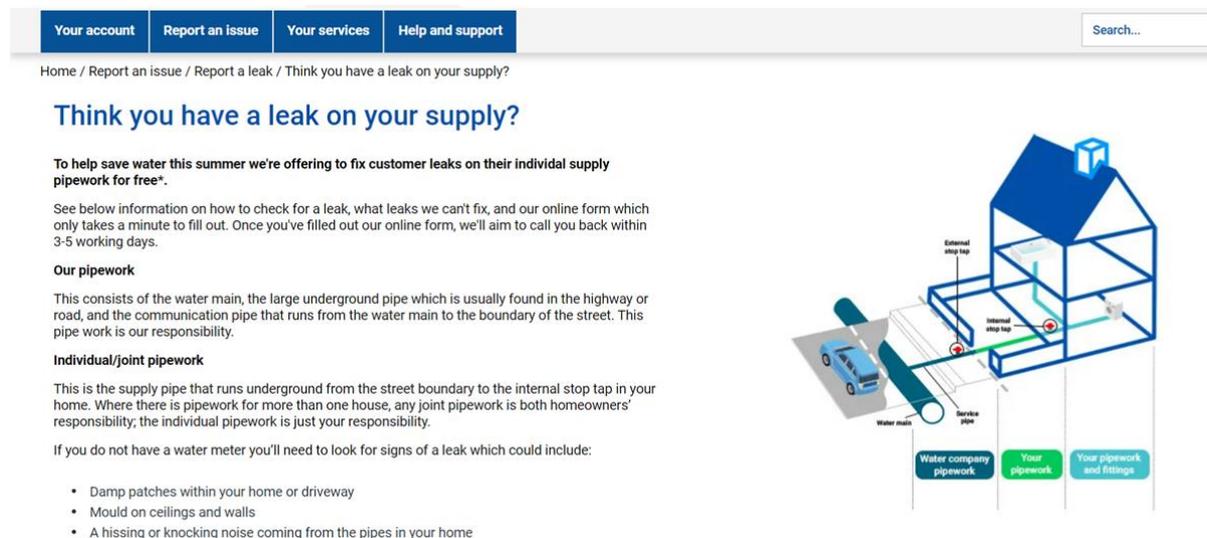
### 3.4 Customer Supply pipe Leakage

Enhanced customer leakage offerings have been part of our BAU process since 2020 when a dedicated team of customer leakage technicians was established. The fully resourced team amount to 23 FTE. From summer 2022 we have focussed customer leakage activity in the Colliford region and have intensively marketed the option for customer in the Colliford region to have a free supply pipe leak repair. Focus, increased detection and repair resources enables us to more than double the output – targetting c 230 repairs per month, up from a pre summer number of c 100.

In response to the exceptional shortage of rainfall ("ESOR"), a number of changes were made to maximise the benefit in the WRZ. They included:

- Relocation of all regional resources to the Colliford WRZ (14 FTE)
- Full removal of the Litres Per Minute threshold, from 5 to 0 in Colliford
- Focusing on full supply pipe renewal over spot repair - no likely future leaks
- Increased maintenance resource from frame worked supplier
- Large media campaign advertising the enhanced supply pipe leakage service

Media campaign - website.



The screenshot shows a website navigation bar with links: 'Your account', 'Report an issue', 'Your services', and 'Help and support'. Below the navigation bar is a breadcrumb trail: 'Home / Report an issue / Report a leak / Think you have a leak on your supply?'. The main heading is 'Think you have a leak on your supply?'. The text below reads: 'To help save water this summer we're offering to fix customer leaks on their individual supply pipework for free\*.' It then provides information on how to check for a leak and mentions an online form. A diagram on the right shows a house with a blue roof and a blue outline. A green line represents the 'Service pipe' running from the 'Water main' (under a car) to the 'Internal stop tap' inside the house. An 'External stop tap' is also shown. Below the diagram are three colored boxes: 'Water company pipework' (blue), 'Your pipework' (green), and 'Your pipework and fittings' (green).

**Think you have a leak on your supply?**

To help save water this summer we're offering to fix customer leaks on their individual supply pipework for free\*.

See below information on how to check for a leak, what leaks we can't fix, and our online form which only takes a minute to fill out. Once you've filled out our online form, we'll aim to call you back within 3-5 working days.

**Our pipework**

This consists of the water main, the large underground pipe which is usually found in the highway or road, and the communication pipe that runs from the water main to the boundary of the street. This pipe work is our responsibility.

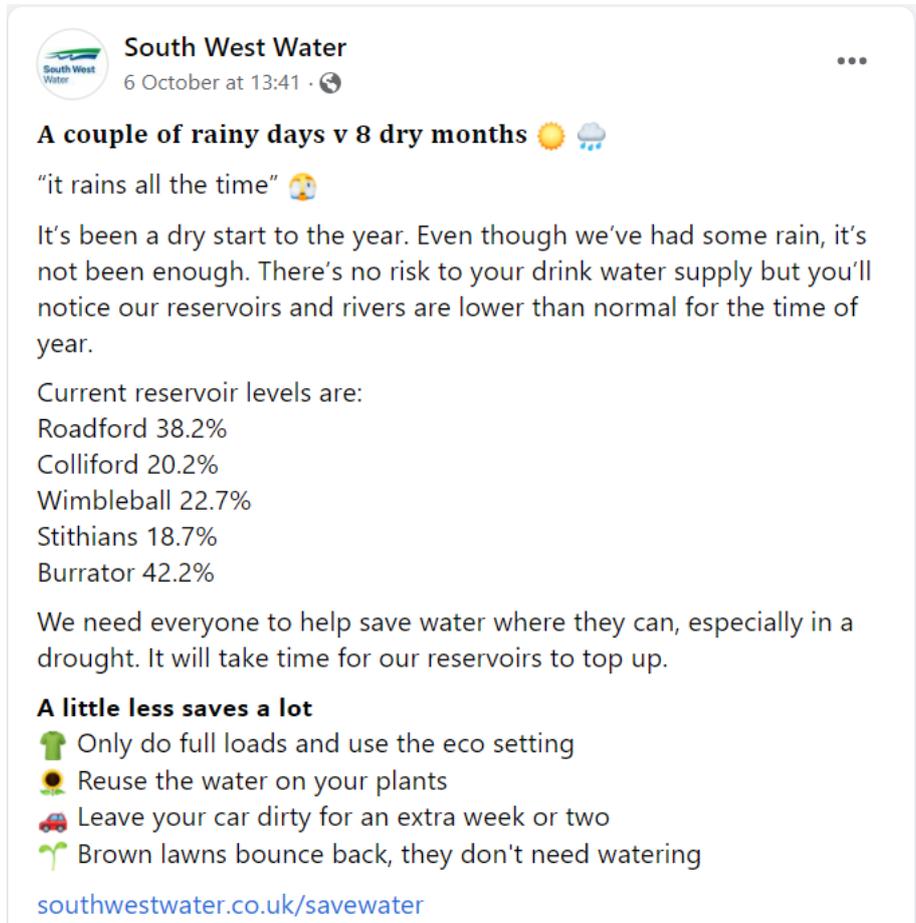
**Individual/joint pipework**

This is the supply pipe that runs underground from the street boundary to the internal stop tap in your home. Where there is pipework for more than one house, any joint pipework is both homeowners' responsibility; the individual pipework is just your responsibility.

If you do not have a water meter you'll need to look for signs of a leak which could include:

- Damp patches within your home or driveway
- Mould on ceilings and walls
- A hissing or knocking noise coming from the pipes in your home

Media campaign – social media



In September 2022 an additional £2m has been allocated to enhance the finding and fixing of an additional volume of CSPL's. The money will support the needed technicians and repair operatives to find and fix up to another 2000 customer leaks, increasing the targeted number per month from 100 to 230. This investment will see resources near exclusive focus in Colliford WRZ, covering:

- Five FTE field detection resources (supply chain sourced)
- C. 2,000 additional supply pipe repairs/renewals (supply chain sourced - annual)
- Estimate c 5MI/Day of total loss mitigation in Colliford WRZ by March 2023
- Reduce runtimes from the current (in leak process) – rolling benefit

### 3.5 Continued deferment of all operational water using network operation processes

All water using network tasks have been suspended. Most notable is the cessation of mains cleaning tasks. The process requires the acceleration of pipe flow velocity to generate a scouring energy at pipe/water interface. This effectively shears off settled/loosely bonded materials. The velocity increase is achieved by generating a measured discharge of water from washout and fire hydrants. Flows are calculated based

on the pipe diameter and can be as much as 1500LPM. The Colliford WRZ were the first of the regions activities to have ceased. The activity will remain deferred for a long as there are water resources challenges.

### 3.6 Satellite scanning for leaks

As referred to in the opening section, the innovative use of satellites to located leaks was deployed in regionally in 2021/22

A second satellite scan of the Colliford WRZ has been commissioned, with the POI's being returned for field investigations late in September. This additional scan covered the Colliford WRZ. A total of 6000km of pipes were scanned. The scan has generated around 1300 POI's. A dedicated team supply chain resources has been established to focus on these POI's. The expectation that the POI's will convert to some 250 leaks, leaks that are conventionally more difficult to be identified via traditional leak detection processes so might typically go un-noticed, unreported or detected.

### 3.7 Work basket – Targeting maximum of four-day clearance

South West Water's have significantly increase resources finding leaks, finding, promoting and fixing more leaks than any time previously. Despite this significant increase volumes of promoted work to our Repair and Maintenance (R&M) partner. Kier, as SWW's R&M partner have sourced additional repair resources to manage the increased workflow and deferred some other workstreams e.g. new connections to focus on leakage benefitting repairs and other interventions.

Colliford WRZ operating areas are 1 and 2 of 7 in total.

- Area 1 (Tolgus) – 30 live jobs (20<sup>th</sup> Oct), total live volume using 'Equivalent Service Pipe Bursts' ("**ESPB**") formula 1.44Mld
- Area 2 (Castle Canyke) – 25 live jobs (20<sup>th</sup> Oct), total live volume using ESPB formula 0.69MI

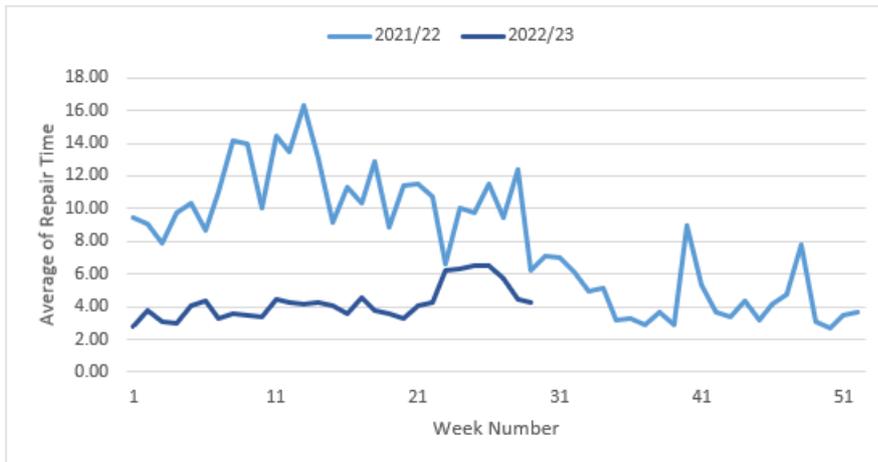


Figure 7 - Average Repair Time by Week for 2021/22 and 2022/23

### 3.8 Digital Twin - 0.3 Mld, full effect Dec 2022

This project is being run as a trial to understand the full benefits of “digital twin” which aims to recreate a digital version of a DMA, the digital version is created based on mains, property, flow and pressure data and allows for the identification of potential leaks, high demand or DMA breaches by comparing the digital twin which is not aware or does not have these “anomalies” built in.

Two DMAs have been targeted with an estimated saving 0.3 Mld, this saving is based on returning the DMAs current leakage back down to its historic minimum.

### 3.9 Leakage Performance

Annual daily average leakage is reported at year end. Weekly leakage performance is measured and reported but components that lead to the annual daily average are variable, so a range of trends are used. For targeting purposes, the most influencing parameter, the allowances used to determine actual night time leakage (0300 – 0400) are dual – averaged and profiled. Allowances vary through the year and are determined by the flow data logging of a large representative cohort of households. This value is a lagging metric and isn’t fully determined until year end.

Leakage performance charts use both the average and profile household night use allowances to indicate water losses. The most likely value of leakage is the seasonally adjusted allowance line and an indicator of dynamic changes in leakage from natural rate of rise (leakage occurring) and leakage reduction from finding and fixing.