

United Utilities Water

UUW response to the 2022 Freeze-thaw

28 February 2023

About this document

This document summarises how the mid-December 2022 freeze-thaw event impacted upon United Utilities and how United Utilities prepared for and responded to these impacts.

As set out in this document the event had significant impacts across the entire U UW region. We have therefore, sought to provide a comprehensive and candid response which aligns with and responds to the points raised in Ofwat's letter of 16 January 2023. This report is structured as follows:

Section One provides an Executive Summary.

Section Two sets out the details of the 2022 freeze-thaw in the U UW and compares this to similar previous events that we have experienced.

Section Three sets out the impacts of the event and how we responded to these impacts, from planning and preparation, incident response, communication with customers and key stakeholders and identification of and support to vulnerable customers. In this section we also reflect on how we applied lessons learned from the 2018 Freeze-Thaw event – the so-called “Beast from the East”¹.

Section Four sets out the numbers of customers who were impacted by the event and our approach to compensation payments for these customers.

Section Five reflects on the lessons we learned from this experience and the changes we intend to implement for the future.

¹ Key lessons learned from the 2018 event and subsequent review are set out in the following publications:

- Ofwat set out its industry wide findings in the report “**Out in the cold**”, published on its website at: www.ofwat.gov.uk/wp-content/uploads/2018/06/Thaw-report-FINAL.pdf
- Ofwat sent individual letters to all companies setting out its view of that company's performance during the incident. Its letter to United Utilities is available on the Ofwat website: www.ofwat.gov.uk/publication/letter-united-utilities-water-review-freeze-thaw-incident
- The individual company letters asked companies to consider the issues identified in “out in the cold”, in the company specific letter and in any internal review and publish a response to the matters raised. United Utilities' response is available on the UU website at: https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/looking-to-the-future/united-utilities-ofwat-freeze-thaw-findings-2018-web-ready.pdf

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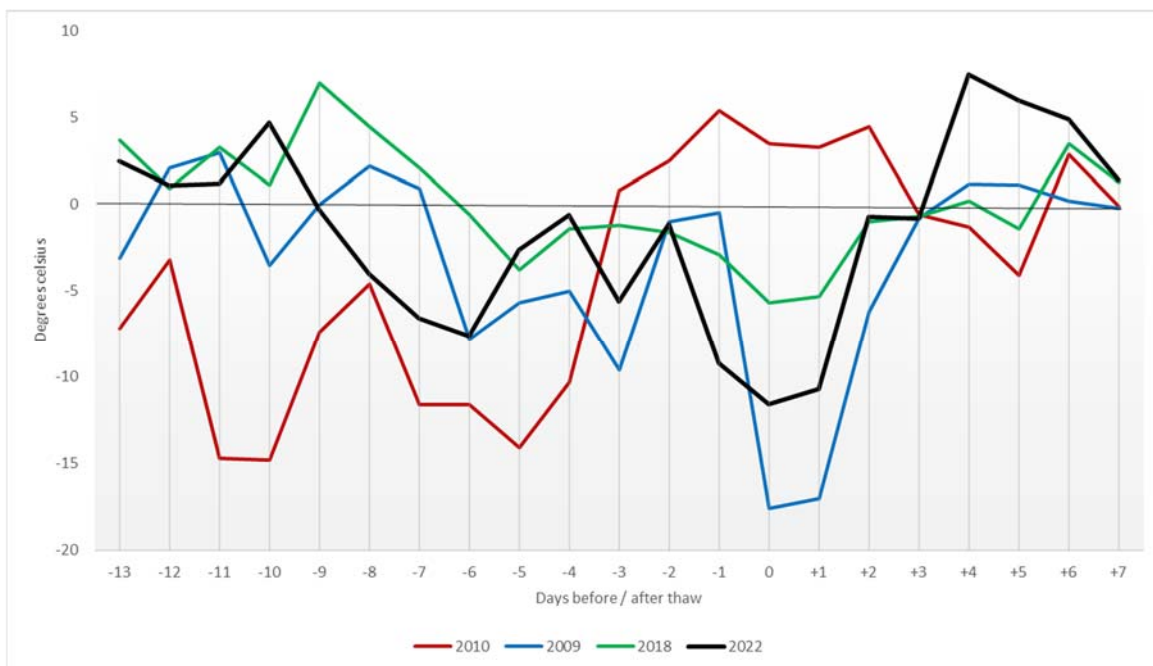
1. Executive Summary

The 2022 Freeze-Thaw

The 2022 Freeze-thaw began on 6 December, when air temperatures fell below freezing point. Temperatures remained at or below freezing point for ten days reaching a low of -12°C on 15 December. Temperatures remained below freezing until 17 December; then then began to rise very rapidly. Air temperatures reached 8°C by Sunday 18 December and, remarkably, were as high as 14°C by Monday 19 December.

This was a more sustained freeze and more rapid thaw than other recent freeze-thaw events in 2009, 2010 or 2018. Figure 1 below shows the night time temperatures experienced during each of these four events, as measured at Manchester airport. Note that the 2010 event had a longer cold period following the minimum temperature than the other events, so the coldest day (day zero) is misaligned for this event.

Figure 1 - Recent freeze-thaw events – relative night time temperatures



Freeze-thaw incidents present several challenges which can threaten to disrupt the service we provide to customers:

- Long periods of freezing temperatures, for durations long enough for the cold to penetrate deep into the ground, cause water mains and exposed/unprotected pipework in properties to freeze.
- The subsequent warming leads to ground heave and thawing of pipe work, which causes leaks in the water network, leaks in customer supply pipes and leaks from private plumbing (both domestic and commercial, internal and external).
- The increase in leakage results in a rapid increase in demand. This can be hard to respond to as cold temperatures can either freeze or reduce the efficacy of treatment processes. Many water treatment works are also limited in the rate at which they can increase their output, for chemistry and water quality management reasons.
- In certain circumstances the cold weather can also restrict access to more remote operational sites.

Taken together, these impacts mean that immediately after a freeze-thaw event, demand for water increases due to losses from leaks and pipe bursts. At the same time, it can be more difficult to produce water to serve the demand if treatment plants are being run at close to full capacity and treatment processes slow down. If the amount of water demanded exceeds the amount of treated water being produced then the amount of water available in storage reservoirs reduces over time. If this persists, then supply to customers can be disrupted.

Rezoning supplies and transferring water by tanker can help top up service reservoirs in areas where there is a risk to supplies in the short term. However, in order to return the system to a stable state, leaks need to be found and repaired quickly and production needs to be returned to normal levels.

Preparations for and management of the 2022 Freeze-Thaw

UW has collaborated with the Meteorological Office (also known as the Met Office) to identify prospective freeze-thaw events. We utilise a daily Met Office data file to feed a daily dashboard. This reflects a 14-day weather forecast, a district by district forecasting model that highlights the risk of potential freeze-thaw conditions and an early warning system which triggers preparations for a significant weather related event.

This data led UW to trigger detailed preparatory work on for the freeze-thaw event on Monday 5 December. Preparations included:

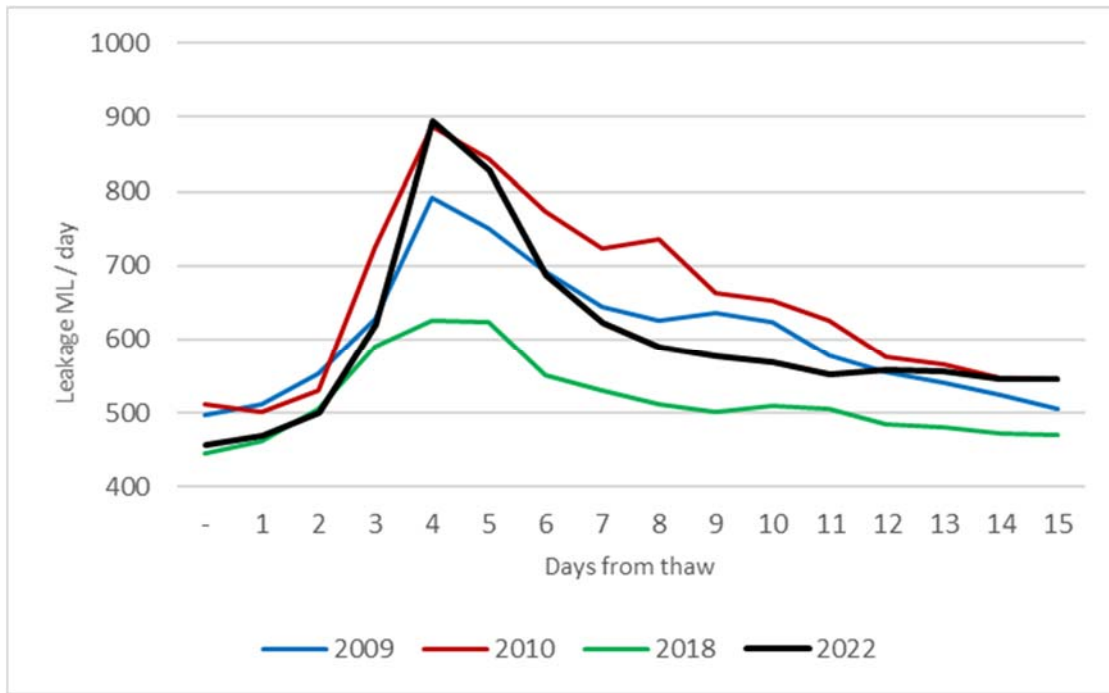
- establishing effective governance and escalation routes through the company and to key external stakeholders;
- maximising storage at service reservoirs, to increase the available supplies;
- ensuring that our 48 water tankers were readied, in the event that they were needed to move water across the region;
- expediting or suspending planned maintenance at our water treatment works in order to ensure that production capacity was maximised;
- readying customer service operations to deal with an increased number of customer calls;
- implementing plans to ensure staff availability to maintain and recover service following the thaw;
- ensuring that operational partners had the additional resources required to increase the number of leak repair gangs; and,
- readying customer and stakeholder communications plans to be used both before and after the thaw.

Impact of the Freeze-Thaw

As measured by the amount of water lost to leakage, the immediate impact of the Freeze-Thaw was very significant. Within 48 hours of the thaw commencing, demand for water rose to 20% above normal December levels. This was largely due to water being lost through leakage, both from elevated leakage on our own network and also due to significant bursts on customer pipework and plumbing.

Figure 2 shows the spike in leakage caused by the thaw and the subsequent reduction in demand as leaks were identified and repaired. Overlaid on the chart is the equivalent pattern for previous incidents in 2009, 2010 and the 2018 “Beast from the East.” These show that the 2022 incident was more severe in its initial impact. However, recovery was more rapid than the equivalent incidents in previous years.

Figure 2 - Recent freeze-thaw events – leakage recovery



We believe that this is, at least in part, reflective of improved effectiveness of U UW in responding to the incident and of improved awareness, engagement and activity from customers in preventing and repairing private leaks. For example, we readied and deployed a large number of leakage gangs, repaired private leaks where these were having a significant local network impact and communicated with customers to provide both preventative and restorative advice.

Despite these efforts and the pace of recovery, the initial increase in leakage led to a demand increase far in excess of that experienced in the 2018 event.

On Monday 19 December daily demand reached a peak of 2,200 ML/day. By comparison, the daily demand peak experienced in 2018 was 1,920 ML/day, some 280 ML/day or (16%) lower than in 2022.

Figure 3 - Integrated supply zone – demand and production December 2022

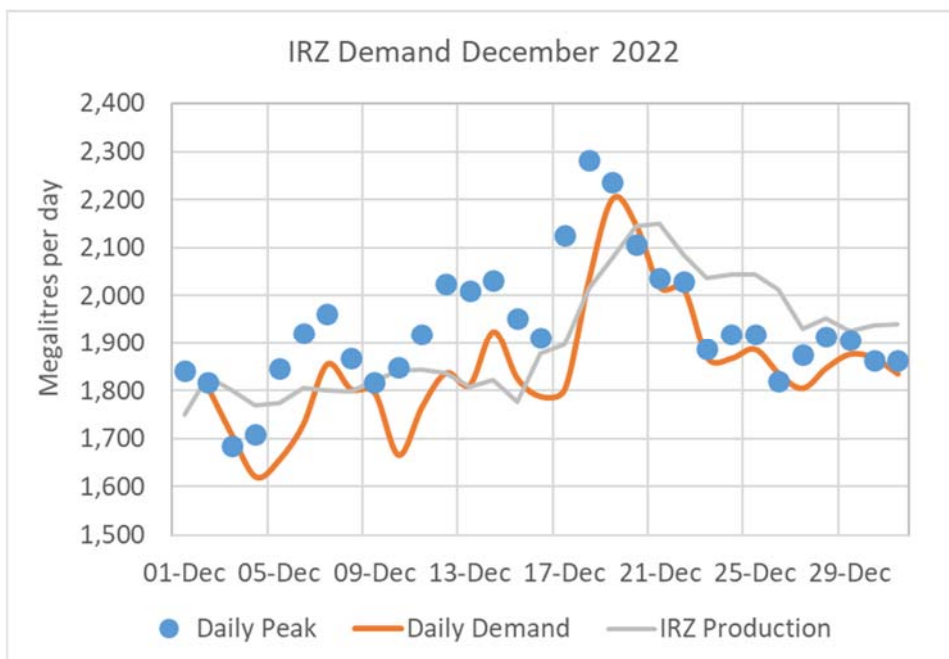


Figure 3 shows the spike in demand in our integrated supply zone, leading up to and following the thaw event. The figure also shows the pace and extent to which we were able to increase production in response to the demand increase.

Due to the combination of the reduction in leakage and the increase in production, normal operational levels in our demand zones were restored by 22 December, with a small number of service reservoirs taking slightly longer to reach their normal operating range.

Impact on customers

Notwithstanding all the effort made to reduce the severity of customer impacts and to recover service to normal levels as soon as possible, a significant number of customers did experience disruption during the events of December 2022. A total of 22,464 customers were off supply for more than 12 hours. This figure includes 20,368 household customers and 2,119 non-household customers. Nearly 18,000 of these were in the Lancaster and Morecambe area.

Customers in Lancaster and Morecambe normally receive the majority of their supply from Lancaster water treatment works, with a smaller volume provided from the integrated supply system. However, ongoing essential maintenance work at this treatment works had resulted in the supply being provided purely from the integrated supply system.

The combination of the freeze-thaw and the limitations on the volumes that could be supplied from the integrated system, meant that on the evening of 18 December, to protect supplies into critical asset, such as Heysham Power Station and to local hospitals and to ensure that levels in service reservoirs and key trunk mains did not reduce to levels that could have resulted in water quality impacts, we took the decision to restrict supplies into parts of the Morecombe area. The work at Lancaster WTW was completed early on the 19th December, with production levels increased to record levels. This allowed service levels to be refilled and supplies to be restored.

This was the single largest incident of service disruption during the freeze-thaw period, although most customers in the area experienced less than 48 hours of disruption to service.

We very much regret the impact that this had on those customers, but because the situation was being managed, we were able to plan for and to some extent mitigate the impact. For example, ahead of and during the loss of supply we were able to provide clear information to local stakeholders, ensure that there were adequate bottled water supplies in the area and take particular steps to protect vulnerable customers through our priority services offering.

Compensation payments to UUW household customers totalled £1,414,880 in GSS payments and a further £276,000 in discretionary payments. A further £413,775 was paid to non-household properties via their retailer.

Over half of household customers received compensation within 10 working days, rising to 79% within 15 working days and over 94% within 20 working days. Any customers paid more than 20 days after the disruption were provided with an additional £20 compensation to reflect the delay in payment.

Recovery

On 23 December production levels remained strong and leakage was reducing. This had allowed us increase the volumes in our regional storage facilities by 0.2 billion litres compared to the previous day. We also only had one ongoing event, impacting a small number of customers in Manchester.

Despite this recovery, the senior leadership team continued to coordinate the incident response over the Christmas period in order to ensure that issues were fully resolved. The incident team met twice a day and maintained a cover rota 24 hours a day until the incident was formally closed on 3 January 2023. Throughout this period we continued to have additional resources in place and contingency plans on standby if they needed to be activated. Work still continues on residual leaks that will have occurred during the incident but which may be more difficult to find and repair.

Lessons learned

As part of this report we have reflected upon how UUW's performance in preparing for, managing and recovering from the incident compares with the 2018 "Beast from the East" incident. We start from a position that in 2018 we were judged to have performed relatively well and therefore in most cases we were making incremental improvements. Overall, we consider that we had learned key lessons from previous incidents and entered the 2022 freeze-thaw with improved capabilities as a result. This was particularly beneficial given that, in the North West, the conditions surrounding the 2022 freeze-thaw incident were more extreme than the "Beast from the East" with the freeze more sustained and the thaw more rapid than in 2018.

Although disruption was experienced by around 23,000 customers, this was a relatively small proportion of the three million homes and 200,000 businesses in the area. Whilst we do not underestimate the inconvenience these customers may have experienced, most of them were off supply for less than 48 hours and prompt compensation payments have been made, learning again from the lessons from past incidents.

We have identified a number of lessons learned that we expect to apply to our own processes ahead of or in any future incidents of this type. We set those out at the end of this report. We will also be looking to understand what broader lessons from elsewhere in the industry should also be factored in to how we plan for, manage and recover from future freeze-thaw events.

We are also undertaking an independent review of UUW's incident management processes and arrangements, to test UUW's practice during the event against current best practice. Following the conclusion of the independent review, we will incorporate any material findings or recommendations into this report and publish the updated report on our website.

2. Details of the freeze-thaw in the U UW region

It is well established that cold weather in winter months has an impact on water systems. Increases in background leakage from moderate ground heave are common. All companies plan for and should be able to manage these smaller scale or more localised events.

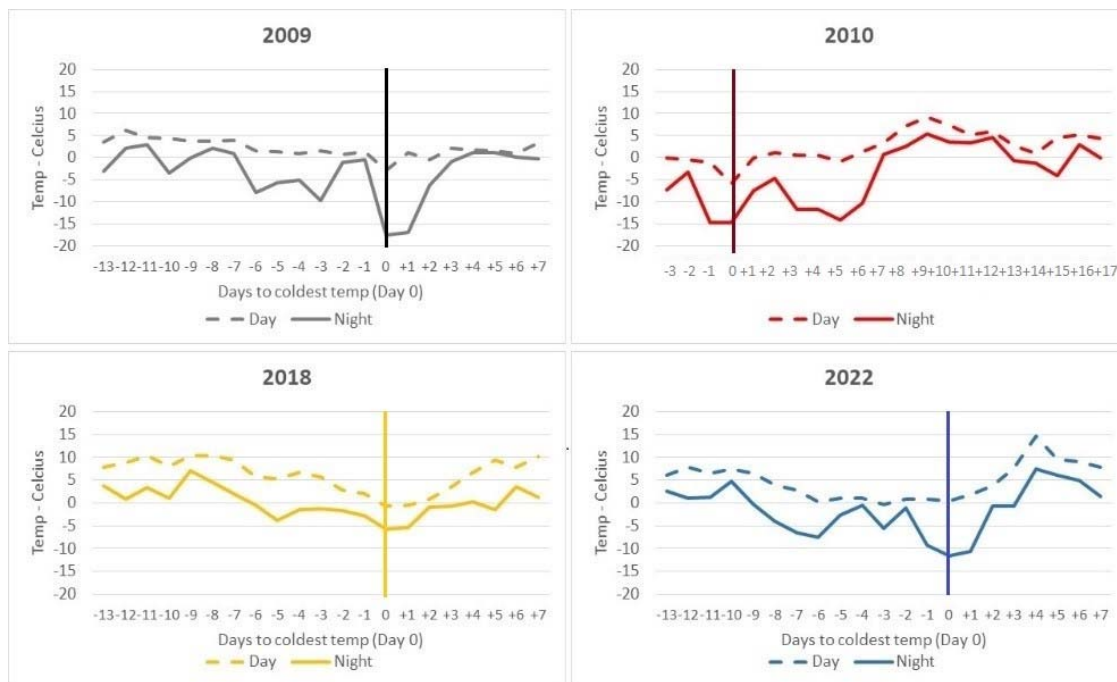
Major and widespread freeze-thaw events, where severe weather patterns that affect multiple areas across the region or even country are, however, relatively rare.

These events are typically characterised by periods of freezing temperatures for durations long enough for the cold to penetrate deep into the ground. This can cause water mains and exposed/unprotected pipework in properties to freeze.

The subsequent warming leads to ground heave and thawing of pipe work. This causes leaks in the water network, leaks in customer supply pipes and leaks from private plumbing (both domestic and commercial, internal and external plumbing.) These leaks can cause significant increases in water demand, driven by water being lost to leaks.

In the North West we have experienced four major freeze-thaw events in the past 15 years: 2009, 2010, 2018 and 2022. Figure 4 shows the minimum night time and maximum day time air temperature measured at Manchester airport in the two weeks preceding and one week following the events in 2009, 2010, 2018 and 2022.

Figure 4 – Day and night temperatures measured at Manchester airport leading up to and after an event



Modelling work conducted by the UK Met Office following the 2018 ‘Beast from the East’ event indicated that the principal factors affecting a freeze-thaw event centre on prolonged periods of low air temperatures, ‘feels like’ temperatures (commonly referred to as wind chill) and warming (both rate and scale).

Overall the period preceding the thaw in 2022 saw air temperatures across the North West at or below freezing point for 10 days. This compares to 6 days for the incidents in 2009, 2010 and 2018.

Following this extended period of cold weather air temperatures increased rapidly, reaching 8°C by Sunday 18 December (three days following the lowest recorded temperature of -12°C) and 14°C by Monday 19 December. In 2018 air temperatures three days after the minimum temperature were 4°C.

This means that the 2022 “freeze” endured for longer and the “thaw” was considerably more rapid than was the case for other comparable incidents.

The extended period of cold weather along with the scale and rate of temperature increase led to a demand increase which was 16% higher than the 2018 event and generated our highest contact volumes in over 5 years, with 53,783 calls offered to call handlers during December 2022, which compared to 48,412 in March 2018.

An additional factor that will have increased the relative impact of the 2022 event compared to the Beast from the East was the timing of the event. The warming event and thaw occurred on a weekend, when we typically see a downturn in demand as businesses close/scale back. This will have resulted in a number of premises not being used when any frozen pipework thawed, which will have meant that the resultant internal leakage would not have been discovered and addressed until the business reopened following the weekend.

We also consider that the socio-economic backdrop to late 2022 may have led to some households reducing heating to save money. In some cases this factor may also have contributed to a worsening of the localised freezing of private pipework.

In conclusion, the event in December 2022 was a very substantial freeze-thaw event. Our analysis demonstrates that it was more significant than each of the 2009, 2010 and 2018 events, with the duration of the period of freezing temperatures, the scale and rate of warming, the timing of the event and the socio-economic background to the event combining to create a perfect storm of ‘freeze-thaw’ factors.

3. UU's response to the event

Introduction

Section 2 provided an overview of the nature of the freeze-thaw and set out the quantitative impacts of the event. In this section we provide a more in depth and qualitative assessment of how we responded to and managed the situation and how we had learned and implemented lessons following the 2018 event.

To ensure consistency and a common line of sight with previous reports, this section contains four sub sections, which are designed to directly reflect the structure of the lessons learned exercises that were undertaken following the 2018 freeze-thaw. These are:

3A - Planning and preparation

3B - Approach to and management of the incident

3C - Communication with customers and key stakeholders

3D - Identification and support for vulnerable customers

The fifth focus area from the 2018 lessons learned exercise - compensation - is addressed separately in Section 4 of the report.

To demonstrate how we have learned and embedded lessons from the 2018 event and then continued to enhance our capabilities, we have subdivided each of these four sections as follows:

- (1) Review and lessons learned from the 2018 Freeze-thaw, covering
 - How we performed during the 2018 freeze-thaw
 - Summary of Ofwat feedback on UUs performance in the 2018 freeze-thaw:
 - Lessons learned from the 2018 freeze-thaw
- (2) Subsequent enhancements to UUs capabilities
- (3) How we performed in the 2022 freeze-thaw

The key strategic lessons learned by UUW as a result of the 2022 event are summarised in Section 5 of this report. We are also undertaking an independent review of UUW's incident management processes and arrangements, to test UUs practice during the event against current best practice. Following the conclusion of the independent review, we will incorporate any material findings and recommendations into this report and publish the updated report on our website.

3A - Planning and preparation

3A.1 Review and lessons learned from the 2018 Freeze-thaw

How we performed during the 2018 freeze-thaw

In 2018 our preparation and planning – which was informed by lessons learned from the 2010/11 freeze-thaw and other recent events was generally seen to be effective.

- We had developed a range of detailed contingency plans, designed to cope with various events including the impacts from a freeze-thaw equivalent to the 2010/11 event. These are updated regularly.
- Our 'Winterisation of Assets' plan was already active, learning from the 2010/11 freeze-thaw event.
- Our annual proactive winter readiness communication campaign was already running (started November 2017).
- We increased stocks of bottled water and ensured suppliers increased their resources prior to the incident.
- We stopped all non-essential work to ensure key assets would be fully operable.
- We were able to actively monitor and manage our networks in real time as and when incidents arose, with additional stocks of water produced in anticipation.
- We had additional contact centre and field staff in place to deal with expected peak in calls.
- We increased manning of our alternative supply vehicles to enable water to be pumped directly into the network.
- We were able to identify, communicate and support customers, in particular Priority Services customers.
- We had effective governance and escalation routes through the company and to key external stakeholders

Summary of Ofwat feedback on UUWs performance in the 2018 freeze-thaw:

- *Despite severe weather conditions in the region, leading to increased bursts on the network, the effectiveness of **United Utilities' preparations and the nature of the company's response meant that it was able maintain relatively normal levels of service to customers** (and the majority of those that did experience supply interruptions had supply restored with a 4 hour period).*
- *It is also evident that United Utilities' planning ahead of the event (based on learning from previous events) meant that the company had built up sufficient reserves of water to deal with the anticipated spike in demand and additional field staff and call centre staff were in place to maintain both customer contact and mains repair response times at levels comparable to normal operations. We also note that the company had taken steps to increase the manning of the company's Alternative Supply Vehicles to enable water to be pumped directly into the network and had increased the availability of bottled water to over 80,000 bottles in case of a large scale interruption.*
- *Other features of United Utilities' planning and response that were noteworthy were the use of technology and telemetry to monitor the performance of the network and quickly identify any problems; the company's proactive winter readiness campaign to try to prevent customer side bursts and; the efforts taken to identify customers in a vulnerable situation before, and during, the incident.*

Lessons learned from the 2018 freeze-thaw

The key lessons that we implemented following the 2018 freeze-thaw were in two areas; lessons that affected the way that UUW managed these type of events and lessons relating to the way that UUW could collaborate more effectively with other affected parties.

Lessons related to UUW operational practices

Following the 2018 freeze-thaw we updated our contingency and emergency plans to accommodate lessons learned and reflect feedback both internally and from Ofwat, Water UK and other companies.

The event led us to review and further improve our approach incident management, with new rotas being established covering 'supporting' roles associated with aspects such as bottled water and local resilience forums and revised training was developed covering areas such as task team leadership and incident management.

We undertook a review of our overall incident management procedures, which included how we assess and classify incidents and clarified the advice and guidance given to different responding personnel. In addition we undertook more detailed department-by-department review of our severe weather guidance and our approach to planning and response to different weather scenarios.

We implemented a severe weather warning matrix, using predefined requirements that were aligned with and informed by Met Office warnings.

Lessons related to collaboration

We shared our experience of all aspects of the freeze-thaw and took on board the lessons learned from other companies and from Water UK. We also participated in workshops to share best practice with a number of the southern water companies.

We continued to be active participants in specialist forums such as the leakage network meeting, share technical data with UKWIR and other companies and began participating in industry open data groups.

3A.2 Subsequent enhancements to U UW's capabilities

In addition to the lessons learned as a result of the 2018 freeze-thaw, we have also continued to improve our capabilities to plan and prepare for incidents. The key improvements that we have made are set out below:

Early identification of potential issues:

Following the 2018 event we collaborated with the UK Met Office on modelling to identify main causal factors of freeze-thaw events. Each morning we receive a file from the Met Office that is input to our corporate data systems resulting in a daily dashboard and report that shows the forecast for the subsequent 14 days.

Another output of this work is a forecasting tool that highlights the risk (high, moderate or low/none) of freeze-thaw conditions at an individual demand monitoring zone (DMZ) level. This is incorporated into our pre-defined weather warning matrix that we use to trigger detailed preparation when there is a risk of significant weather related event. We implemented the forecasting tool in winter 2020.

Collaboration and Open data

Since February 2018, we have been sharing priority services data with Electricity North West (ENW) and have shared over 120,000 data items to date. This work has directly driven the registration of over 30,000 new customers to the priority services register.

Increased asset intelligence:

We have continued to build on our systems thinking approach to further enhance the proactive management of the systems and assets we operate. In 2018 we developed tools to closely monitor and predict levels in service reservoirs based on rates of change. We further improved this capability to monitor storage and resilience at a DMZ level, along with other key system level metrics such as rolling day demand, storage and production.

We have also incorporated our winter readiness activities into our central work management systems.

Improved incident response and management:

In addition to the improvements that were made to our contingency planning and incident management processes following the 2018 event, we have continued to refine our approach and have specifically focused on developing the training for leaders who will be involved in incident and event response.

In late 2019 we took delivery of the last of our 48 Alternative Supply Vehicles (ASV). At any time, we will have some of these vehicles off the road for maintenance and chlorination. As such we established processes with our in-house fleet maintenance team to maximise availability at times when demand for ASV is likely to be greatest. These arrangements were used effectively in the 2022 freeze-thaw.

In 2021 we established a new role as part of our Water System Management team within our Integrated Planning department with the purpose of planning, scheduling and coordinating large outages across our systems. This role helps us to plan outage requirements through the year avoiding higher risk periods where possible or ensuring contingencies are considered (such as back out plans etc.) if the higher risk periods cannot be avoided.

In 2022 we expanded the coverage of our on call capability to include non-operational senior leaders that we have trained in supporting with activities like local resilience forum liaison and bottled water provision.

In 2022, following a review of our bottled water approach and building on experience from prior events, we put in place new arrangements with third parties to provide us with a minimum of 200 pallets of bottled water, if and when required. This provided us with increased resilience for both direct delivery to vulnerable customers and for 'pop up' distribution centres.

3A.3 How we planned and prepared for the 2022 freeze-thaw

This section reviews how we planned and prepared for the 2022 freeze-thaw event in the following areas:

- contingency planning,
- early identification and establishment of the incident management team,
- generic preparations for Winter, and
- mobilisation for the freeze-thaw.

a) Contingency planning

We had updated our contingency plans to reflect the learnings from the 2018 freeze-thaw and subsequent relevant learnings, including the peak demands events experienced during “Covid” and during the extreme hot and dry weather of 2022.

Our approach to incident response is based on the Joint Emergency Service Interoperability Programme (JESIP) principles. Using the JESIP model we have formalised our framework for incident working based around interoperable task teams. The training for our incident leaders is centred on operating within this framework and recognises the potential impacts of and issues with managing longer running responses, such as weather-related events, including flooding and high temperatures.

In 2021 we had updated the training for all our leaders with more emphasis on handovers to ensure continuity throughout duration of the incident. This additional training enabled smooth transitions from incident team member to incident team member throughout the event.

b) Early identification and establishment of the incident management team

We operate a five scale incident escalation matrix. The lowest level routine activity would be classed at the lowest level – “Event.” Incident classification then escalates through Type 1, Type 2, Type 3 and Type 4 events. Type 4 events are the most significant, rare, events that require full companywide coordination.

As events progress through the levels the seniority of the incident manager also escalates, with Type 4 incidents reporting to an Executive Incident Management Group made up of the incident manager, a senior operations director, and members of the Executive team.

The information obtained from the UK Met Office freeze-thaw forecasting tool was incorporated into our pre-defined weather warning matrix, which highlighted the high risk of freeze-thaw conditions.

This analysis allowed us to trigger our detailed preparatory work and we opened the preparatory phase of our incident on Monday 5 December. This was thirteen days before the thaw. In accordance with our incident escalation matrix, the initial preparations for the 2022 freeze-thaw were initially managed as a Type 2 incident.

We then managed the incident through the escalating levels of our incident escalation matrix, with the incident being escalated to a Type 3 incident on 14 December.

As the event progressed and the incident team continued to review its reasonable worst case scenarios the response was again escalated on a precautionary basis to a Type 4 on Sunday 18 December. Details of how this event was managed as a type 4 incident are set out in Section 2B.3.

c) Annual preparations for winter

We had already implemented our 'Winterisation of Assets' plan, which identifies and secures high risk assets. The plan had been enhanced to address risk areas identified through previous freeze-thaws, although (as explained out on Section 3B) new risk areas became apparent as a result of the extreme weather in 2022.

Our annual proactive winter readiness communication campaign was already running, having started in November 2022.

d) Mobilisation for the freeze-thaw

In preparation for the freeze-thaw, we aimed to maximise the efficiency and availability of our ASVs. To do this we worked with our transport services department to increase their support throughout this time and to ensure that we could have the maximum number of vehicles available to be on the road in the event that they needed to move and inject water into areas where supplies were at risk. The transport services department provided mobile mechanics and ensured 24hr support performing front line maintenance at our depots or at the roadside.

The Regional Response Team resourced up our driving staff from 30 staff per shift to 40 drivers per shift. In order to do this, we used additional driver agencies who were trained and signed off in advance of the incident. We also resourced up our Controllers (staff who operate the vehicles and pump into the network) to ensure we had 12 controllers on every shift. The ASV reserves were also mobilised. These are U UW employees, located around the business who have an HGV entitlement and are competent and signed off to work in a driving or controller capacity.

In addition, we also mobilised our partners (Caecillian) who provided 24hr additional injector cover, and employed van drivers to transport HGV drivers or fuel/Ad Blue to the required working locations.

Additional pallets of bottled water were ordered and stored at our Bickerstaffe site, which is a central location close to the M6. Additional bottled water station equipment (enough for 12 stations) was ordered and sites for bottled water stations were identified and prepared.

We also notified our supplier of bottled water (Water Direct) of our requirements of them, with full vehicles being sent to wait in areas, where our planning suggested that bottled water stations may be required. In addition U UW employees were asked to volunteer to work on the stations and a 24hr rota was put in place.

As was the case in 2018, we pre-emptively stopped or expedited all non-essential work to ensure that key production assets would be as fully operable as possible. We expanded the numbers in our contact centre by utilising additional contact centre agents from the billing area of the business as well as field staff to deal with the anticipated peak in calls

The system enhancements that we had made, together with learning from the extreme temperature event in July 2022, allowed us to use real time information to undertake scenario analysis, in the preparation phase, to carefully manage storage levels across the network and maximise resilience.

3B - Approach to and management of the incident

3B.1 Review and lessons learned from the 2018 Freeze-thaw

How we performed during the 2018 freeze-thaw

In the 2018 freeze-thaw we were generally effective in implementing our plans and minimising the impact on customers.

- We escalated to a 'type 3' incident several days prior to the change in the weather to provide additional time to implement our contingency plans and to prepare for the event.
- We implemented a well-rehearsed plan that reflected lessons learned from recent incidents.
- The plan was led by the Central Operations Director, with twice daily update meetings held for the duration of the incident, including communications with key stakeholders
- The focus of the contingency plan was on:
 - increasing water production and storage volumes;
 - managing supplies within the network and between storage facilities;
 - communicating with customers and third parties; and
 - deploying alternative supply vehicles to pump water directly into the network and maintain supplies.
- We operated key processes on a 24/7 basis and organised additional resources through existing contracts with key third parties.
- We placed additional operational staff on standby and utilised additional resources from other teams to handle the increase in customer enquiries, work planning and alarm management.
- We were able to monitor network performance in real time, which meant that sources of leaks could be identified and responded to quickly. Our "Respond, Restore and Repair" strategy was used to minimise customer impact.
- Business continuity plans enabled the safe evacuation of the Whitehaven call centre, with transfer of services to Warrington, with no impact to customer service.

Summary of Ofwat feedback on U UW's performance in the 2018 freeze-thaw:

- ***United Utilities' incident management appears to have worked well with clear timelines on the implementation of the company's response plan and clear structures, responsibilities demonstrated and evidence that staff were aware of, and had been given adequate training, in relation to that plan.***
- ***We note that the decision to declare a Type 3 incident was taken on 28th of February to enable the company to implement plans to deal with a forecast spike in demand on the 1st of March. It is also evident that the previous measures taken by the company meant that it had sufficient resources in place to minimise the level of interruptions experienced by customers and had good visibility of the performance of the network to enable the company to identify, and respond quickly to, any problems.***
- ***The company's 'Respond, Restore and Repair' approach to supply interruptions appears to have been successful with no service reservoir running empty and water production being maintained throughout the incident. In addition, whilst a significant number of the leaks experienced were due to leaks on customer pipework or within business premises,***
- ***United Utilities' ability to monitor the network and its access to real time information on network performance, enabled it to identify the sources of leaks and respond and complete repairs quickly.***

Lessons learned from the 2018 freeze-thaw

The key lessons that we implemented following the 2018 freeze-thaw can be considered in five areas: partnership working; resilience; data and systems, alternative supply vehicles and third party working. These lessons are summarised below.

Partnership working

Following the 2018 incident we wanted to enhance the way that we prepare for and engage with our local resilience forum partners, transition from business as usual to an incident footing and better forecast severe weather events, in particular through better utilisation of Met Office data.

Resilience

Since the event, and partially in response to the extended period of dry weather during 2018, we also made further tactical investment in network connectivity schemes.

Data and Systems

As part of our 'Systems Thinking' approach we established processes to give clear ownership and accountability of data to underpin our operations, analysis and reporting. We also made improvements to both the quality and availability of our data. At the time, focus areas included GIS asset rules to improve linear asset data quality, domestic and commercial metering and leakage data to identify consumption trends and areas of risk during an incident.

We made further enhancements to several capabilities including network logging, automated pressure management and data driven service reservoir monitoring through the deployment of improved analysis tools.

We also made plans to further improve our systems to obtain an enhanced view of real time operational issues and more comprehensively incorporate customer impacts.

Alternative supply vehicles

Our alternative supplies policy was refined to take account of the most extreme events and we developed an enhanced approach to operational contingency planning for these events.

We revised our approach to providing customers with alternative supplies, by including the use of smaller overland supply vehicles, bowsers and bottled water. To support this we purchased a further 500 Arlington Combo tanks and 40,000 "camping" Arlington water carriers, enabling us to have a more flexible approach to different customer requirements.

We centralised the management and operation of our ASV fleet, introduced a new 24/7 logistics capability and trained additional personnel to operate the vehicles. Following the 2018 event we purchased more ASVs and increased the size of the fleet.

Third party working

Whilst our supply chain and procurement arrangements worked well during the 2018 freeze-thaw, we renegotiated our contracts with key third party suppliers to ensure all our suppliers could respond more effectively in an incident when required.

3B.2 Subsequent enhancements to UUs capabilities

In our 2020-2025 business plan, we set out our approach to risk assess and develop plans to provide resilient supplies to customers. The foundation for these improvements is our Systems Thinking approach.

In PR19 we developed an innovative performance commitment, **E06-CF: Systems Thinking capability** which measures the extent of advancements in our System Thinking capability against a maturity matrix that was developed with external leaders and was assured and benchmarked against companies outside the water sector.

Systems thinking involves learning about the interaction of the individual components of a system, understanding the system as a whole and using this to identify patterns and predict performance. We use telemetry data from our assets, along with knowledge about the wider environment in which we work and digital advances such as artificial intelligence to understand the broader systems perspective, predict where issues may arise and make decisions.

As reported in our [2021-22 Annual Performance report](#), Accenture has formally assessed that we have successfully delivered our plan to achieve level 2 maturity across all eight capabilities. This improved maturity directly supports day to day operations but also our ability to manage events like the 2022 freeze-thaw.

Increased asset intelligence:

In 2018 we set out that we sought to obtain an enhanced view of real time operational issues and more comprehensively incorporate customer impacts. We achieved this by developing and Implementing Salesforce (INS), which provides systems to support management of the end to end customer relationship. This new system allows us to much more effectively understand the impact of operational performance on individual customer service and allows us to proactively communicate with customers and respond in a much more informed way when customers contact us.

During 2022 we also developed a 'Catchment to Customer' project, which has delivered new insight into regional consumption and demand through the development of machine learning models for demand, consumption and losses. This insight has been used to improve our customer communications, to reduce per capita consumption and to encourage water efficiency.

We have also sought to maximise the value and usage of the data that we are collecting. For example we are now obtaining substantial volumes of data through Automated Meter Reading data (AMR), with this information being provided on a near real time basis to analysts within the business.

The Uuw Insight & Analytics team has also developed a number of dashboards/ visualisations to combine and consolidate the information from various sources and support the management of incidents and operations.

3B.3 How we performed in the 2022 freeze-thaw

This section reviews how we performed during the 2022 freeze-thaw event. It is structured as follows:

- (a) Incident management
- (b) Implementation of the contingency plan
- (c) Nature of the water supply network in the North West
- (d) Leakage – impact and management
- (e) Demand – impact and management
- (f) Localised issues – management and response
- (g) Data and system enhancements
- (h) Lancaster and Morecambe
- (i) Mutual Aid
- (j) Unique impacts of the 2022 freeze-thaw

a) Incident management

The 2022 Freeze-thaw began on 6 December, when air temperatures fell below freezing point. Temperatures remained at or below freezing point for ten days reaching a low of -12°C on 15 December. Temperatures remained below freezing until 17 December when temperatures began to rise very rapidly.

Incident management procedures had been invoked on 5 December and was initially managed as a Type 2 incident. The event was escalated to a Type 3 incident and then a Type 4 incident on Sunday 18 December when air temperatures reached 8°C.

In line with our Emergency Planning and Incident Management process the Executive Incident Management Group (EIMG) convened. The group was chaired by the Water, Wastewater and Digital Services Director. Members included the Chief Executive Officer, the Customer and People Director, the Corporate Affairs Director and the Strategy, Policy and Regulation Director.

The EIMG met twice daily receiving situation reports and providing direction on key operational decisions as necessary. Senior operational staff regularly attended and participated in the meetings, including the Head of Central Operations, the Chief Scientific Officer and the Head of Media, Brand and Communications. The EIMG authorised and oversaw briefings to stakeholders including Defra, regulators, Water UK, the local resilience forum and provided regular updates to the main Board.

The EIMG also discussed bespoke briefings and communications with local stakeholders such as local authorities and MPs, depending upon the specific, localised situation at the time. The EIMG also approved changes to the key metrics being monitored through the EIMG such that the key dashboard utilised evolved to take account of the maturity of the incident over time. These metrics informed decisions taken by the EIMG about how to prioritise and deploy the company's resources in response to the incident.

As the likelihood of the reasonable worst case planning scenario reduced and de-escalation triggers were met the group was formally stood down on Thursday 22 December and the response reclassified as a Type 3.

The incident team remained in place over the Christmas period, meeting twice daily, to oversee the recovery and in readiness to respond to any secondary issues resulting from the freeze-thaw event. The incident was formally closed on 3 January 2023.

b) Implementing the contingency plan

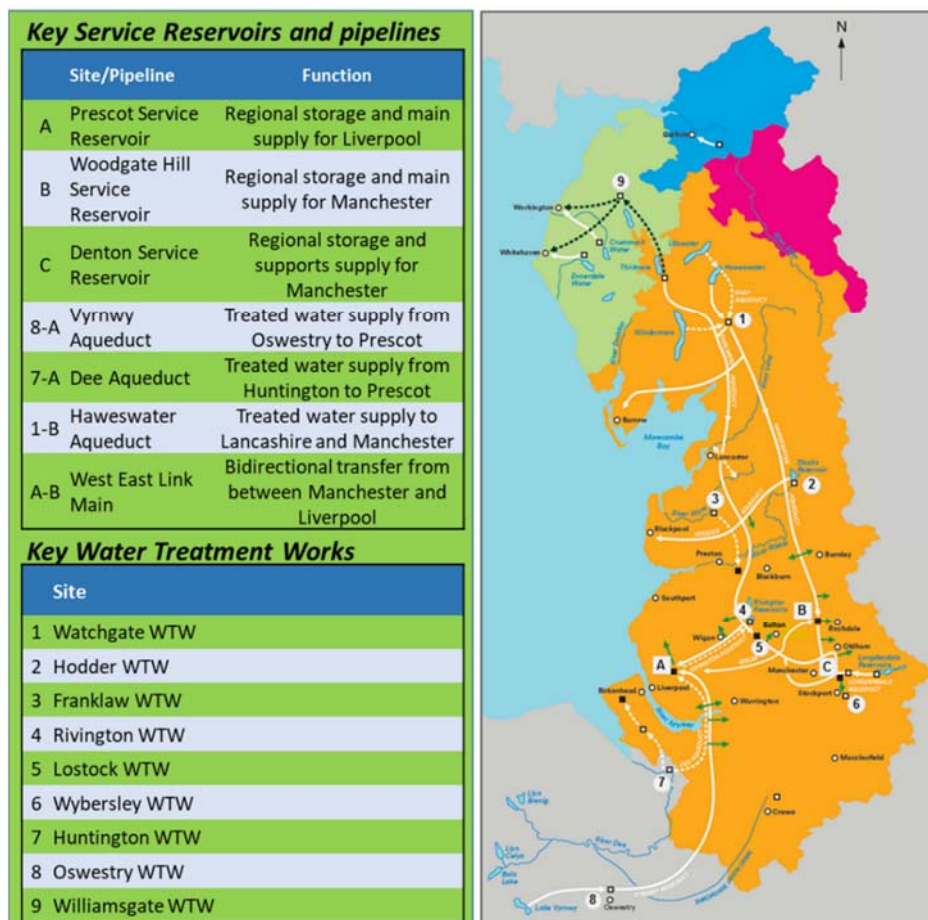
Due to the incident management arrangements that we had put into place, we were well prepared for the freeze-thaw and when it arose we were able to effectively implement a well-rehearsed plan. This plan reflected lessons learned from recent incidents, with the focus of the contingency plan being on:

- increasing water production and storage volumes;
- managing supplies within the network and between storage facilities;
- operating key processes on a 24/7 basis;
- deploying alternative supply vehicles to pump water directly into the network to maintain supplies;
- organising additional resources through existing contracts with third parties to ramp up workloads and respond to incidents;
- placing additional operational staff on standby to support work planning, alarm management and field support work; and,
- mobilising our customer incident team, utilising additional resources from other teams to handle the increase in customer enquiries and provide real-time updates to customers and third parties.

c) Nature of the water supply network in the North West

The freeze-thaw had a number of impacts on our operations. To help to clarify these impacts and explain why we responded in the way that we did, we have provided an overview of the supply network in the North West and set out how we are able to manage flows within this network from our integrated control centre.

Figure 5 - United Utilities regional water system



As shown in Figure 5 in the North West we operate 4 distinct supply areas: 3 relatively small individual zones in Cumbria (one solely non-potable) and one large 'integrated zone' (the Integrated Resource Zone or IRZ for short). The IRZ provides the supply to 2.7 million of the 3 million properties we serve.

The IRZ is made up of 32 Demand Monitoring Zones (DMZs) that are connected to each other via our regional system of aqueducts and large diameter trunk mains (LDTMs).

Four principle sources and major aqueducts supply over 50% of the water to the IRZ:

- (1) Treated water via the Haweswater Aqueduct, sourced from Haweswater reservoir in the central Lake District and treated at our Watchgate WTW near Kendal.
- (2) Raw water via the Thirlmere Aqueduct, sourced from Thirlmere reservoir in the central Lake District and treated at various water treatment works along the length of aqueduct.
- (3) Treated water via the Vyrnwy Aqueduct sourced from Lake Vyrnwy in Wales and treated at Oswestry WTW in Shropshire.
- (4) Treated water via the Dee Aqueduct, sourced from the River Dee at Chester and treated at our Huntington WTW in Chester.

The Haweswater and Thirlmere Aqueducts terminate at Manchester where they supply large storage reservoirs at Woodgate Hill and Lostock, before feeding the LDTM system around Greater Manchester (the Manchester Ring Main, MRM).

The Vyrnwy and Dee aqueducts terminate at a large storage reservoir in the Prescot area of Liverpool and supply the Liverpool city region through a series of trunk mains.

The reservoirs at Woodgate Hill and Prescot are connected by a bi-directional LDTM (the West-East Link Main, WELM) that enables flow to be transferred back and forth across the IRZ.

Whilst the 32 DMZs in the IRZ are interconnected, there is a variation between them in terms of the volume of water that can be sourced from the regional system to augment and support local sources.

Balancing the flows and operation of these interconnected systems is managed on a daily basis from our Integrated Control Centre (ICC). The ICC utilises and actively manages information on a source to tap basis, with a specific focus on demand forecasts, water resource availability, water treatment works availability, maintenance/outage requirements and network capacity as well as live system status, provided via a network of sensors and monitors.

As a consequence of the interconnected nature of the IRZ we measure demand and production volumes at various levels across the region and apply a regional, strategic lens, focusing on:

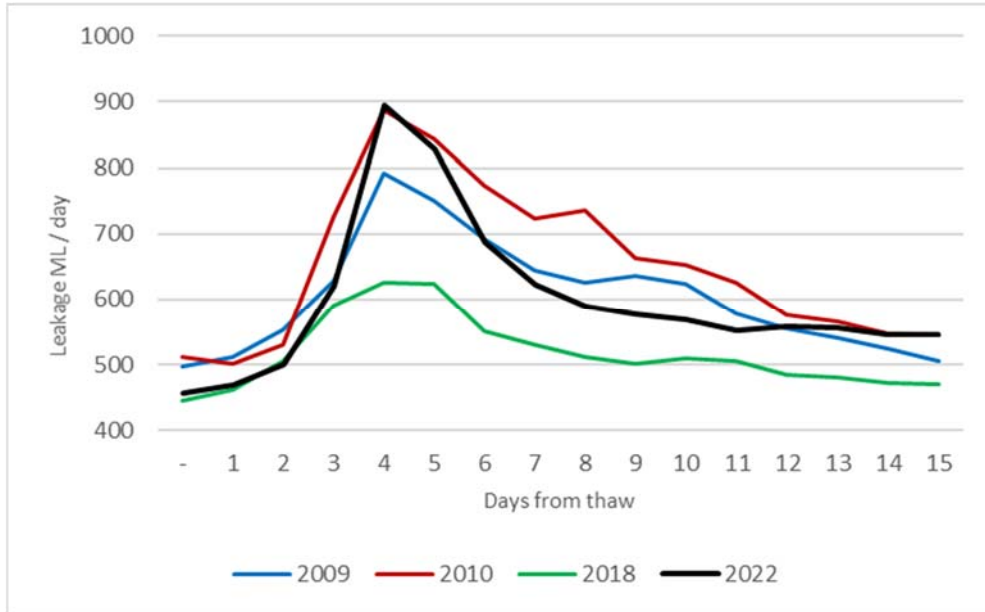
- Demand and demand forecasts across the whole IRZ
- Production across the whole IRZ
- Production headroom across our key WTW – the spare capacity that can be accessed to increase production above the demand forecast
- Key 'resilience' storage – the storage above normal operating minimum that provides a buffer for inaccuracies in forecast, changes in operation such a WTW shut down and sudden changes in demand. This storage is provided at three service reservoirs in the IRZ; Woodgate Hill, Prescot and the reservoir at Denton (part of the Manchester ring main)
- Total storage across the IRZ
- Total volume of water held in service reservoirs.

d) Leakage – impact and short and longer term management

The extended period of freezing temperatures, followed by the speed and scale of the subsequent thaw resulted in a significant increase in leakage from our water network and from bursts in customer supply pipes and leaks from private plumbing (both domestic and commercial, internal and external.)

Figure 6 - Recent freeze-thaw events – leakage

Figure 6 shows the spike in leakage and subsequent recovery for each of the 4 recent freeze-thaw incidents.

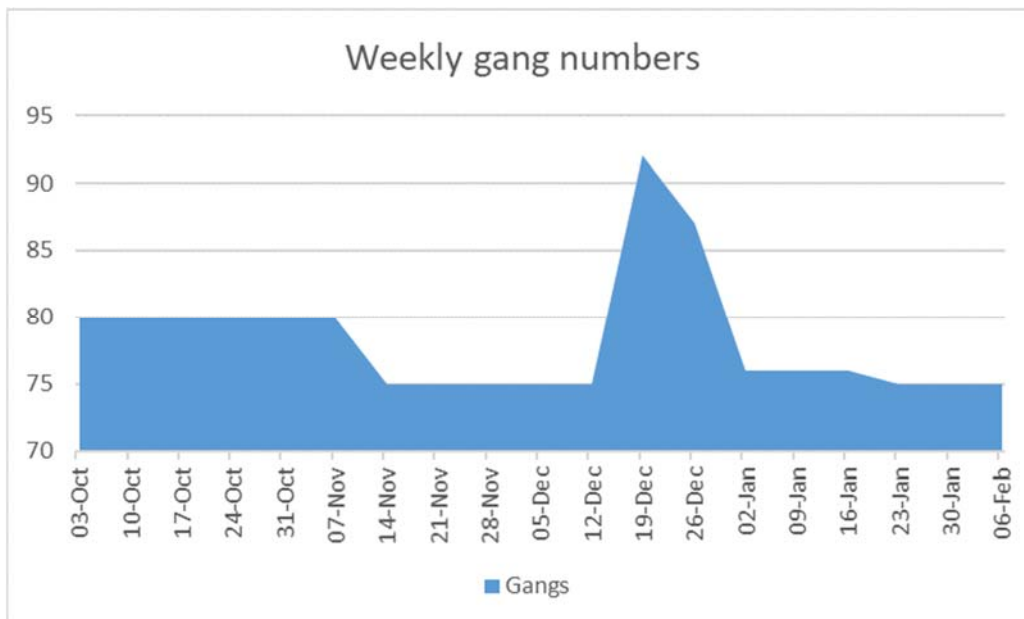


The spike in leakage in 2022 was comparable to the 2010 event and significantly greater than the 2018 event.

It also shows that the recovery from this spike was quicker than the previous comparable events and demonstrates that the 2022 incident was more severe for U UW than the 2018 event, but that a more rapid recovery was achieved.

To address the additional leakage levels, we utilised the new contracts that we had put in place with our operational partners to secure the resources required to increase the number of leak repair gangs.

Figure 7 - Number of leak repair gangs October 2022 – Jan 2023



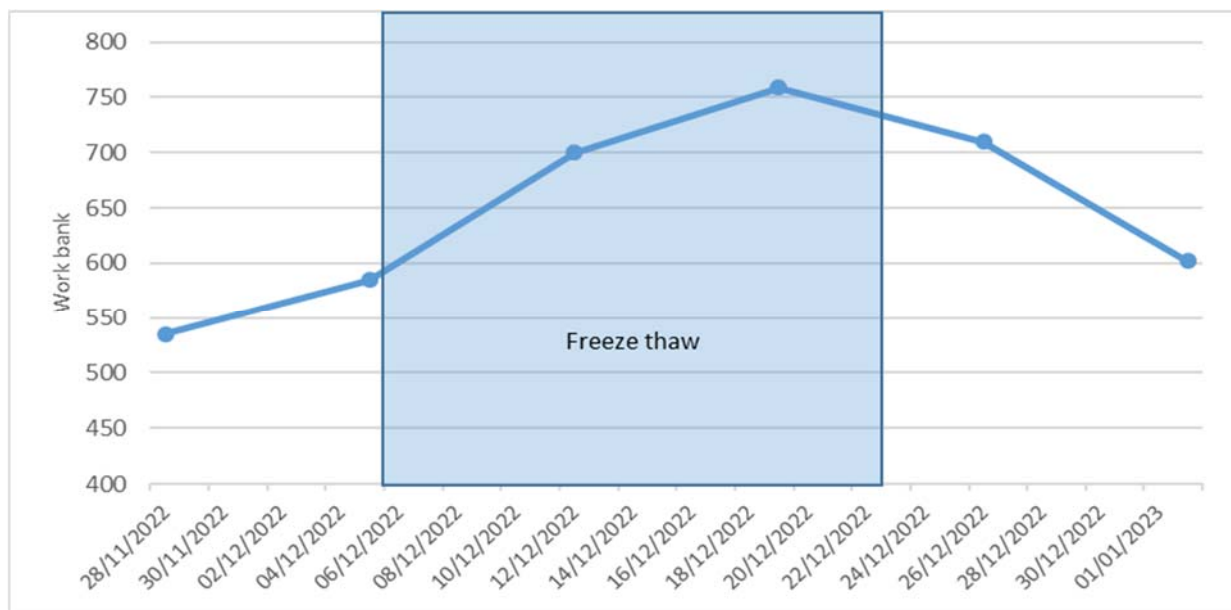
Our typical number of leak repair gangs runs at around 60 to 65. However 2022 was exceptionally dry and in line with our drought plan, we increased the number of leak repair gangs to 80, for much of the summer.

Figure 7 shows that as the pressures of the dry weather reduced, we still retained the increased resources until the end of October and continued to operate 75 gangs throughout November and early December. The number of gangs ramped up further to 92 repair gangs, in anticipation of the leakage breakout that would occur when the thaw occurred.

Figure 8 shows the leakage work bank. It shows the upturn in the number of leaks as the temperatures drop during the “freeze” phase of the incident but also impact of expanding the number of leakage gangs working during the incident and the sharp reduction in the number of leaks in the workbank by the end of December.

Whilst this shows that we had higher than normal numbers of repair gangs available and that our response to leaks on our network was quick this does not fully explain the rate of initial demand decrease observed in the first 24-48 hours following the thaw. It is widely accepted that these extreme temperature events have a substantial effect on private pipework, with bursts often occurring on internal plumbing. The sharp initial demand increase is therefore attributable to both impacts on our network and the degree of response of customers/property owners to rectify internal plumbing bursts; leakage on both will have contributed towards the increase in demand and therefore impacts on supply performance and supply disruptions during and after the incident. Some private side leaks can be very substantial in volume and have significant network effects even whilst being undetected by the property owner responsible for the pipework and plumbing.

Figure 8 – Leakage workbank



Whilst a large proportion of the demand increase following the rapid thaw was recovered through the increased number of water network repairs and the resolution of private leaks by customers, there is also a longer-lasting impact of the freeze-thaw.

Natural Rate of Rise (NRR) is the rate at which leaks break out and the rate of flow from each of those leaks. Large-scale freeze-thaw events result in the breakout of new leaks and bursts which are often visible at ground level. These events also have another more subtle impact in that they increase background leakage as a consequence of widespread, but less severe, infrastructure damage.

The freeze-thaw and subsequent damage to the water network is therefore likely to have resulted in an increase in the NRR, which will require an increased volume of leak repairs to be completed to simply maintain leakage levels. This effect will be felt across the remainder of AMP7 and into AMP8 and will be quantified through ongoing leakage reporting.

Background leakage is a more complex challenge to address than fixing large leaks and bursts. To help to address this issue we are involved in a number of projects that are designed to better understand background leakage and look at appropriate methods to reduce total losses.

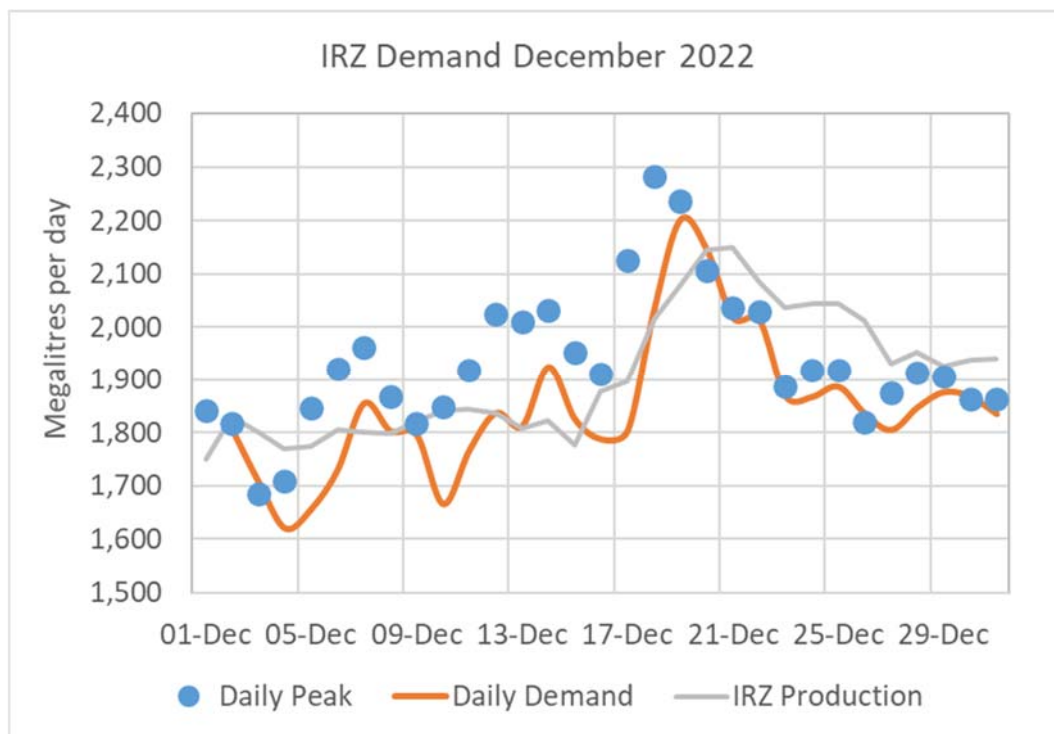
e) Demand - impact and management

The increase in leakage generated a widespread ‘peak demand’ event whereby overall demand rapidly increased across the system. Whilst leaks are being located and repaired, the main management response to the increase in demand is to increase production.

More localised and severe impacts arise because increases in demand are not uniform across the region. This effect is controlled by dynamically managing the integrated resource zone system to optimise and balance flows and storage levels within the individual DMZs. Where necessary, ASVs are deployed and, if supplies are interrupted, providing bottled water.

The extended period of cold weather in December 2022, along with the scale and rate of temperature increase led to a demand increase far in excess of that experienced in the 2018 event.

Figure 9 – IRZ Demand and Production December 2022



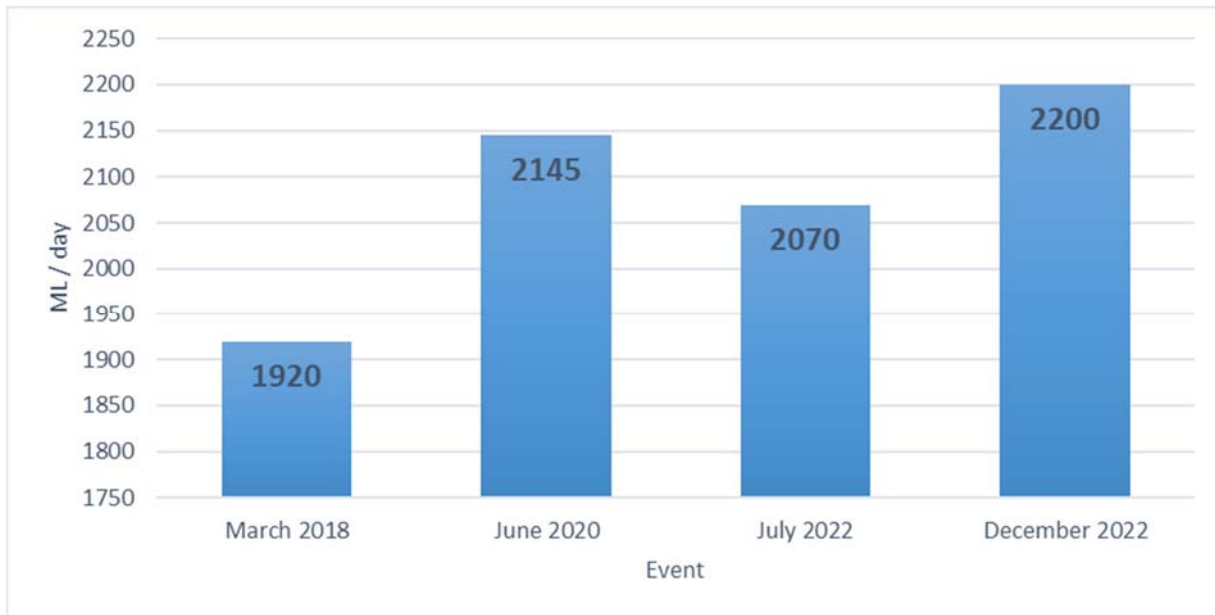
Daily demand (mean rolling day demand measured from 7am to 7am) across the Integrated Resource Zone (our largest water supply zone, serving over 2.9m customers) in the 12 days prior to the air temperatures rising above freezing was 1,815 ML/day vs a typical December average of 1,750 ML/day.

On Monday 19 December daily demand (for the 24 hours prior to 7am) reached a peak of 2,200 ML/day (with a peak instantaneous demand of 2,282 ML/day occurring at 12.30pm on Sunday 18 December).

For comparison, the daily demand peak experienced in 2018 was 1,920 ML/day. As such the peak demand in 2022 was 280 ML/day (16%) higher than the peak demand experienced in 2018.

The peak daily demand of 2,200 ML/day is the highest recorded freeze-thaw related high demand. In addition to being in excess of the demand experienced in 2018 this demand exceeded the peaks experienced in the warm temperatures during the first Covid-19 lockdown of 2020 and in the high temperatures of July 2022.

Figure 10 – Recent peak demand events



A key difference between summer (warm temperature) high demand and freeze-thaw high demand is the rate of the increase in demand. In high temperature events the tendency is for steady day by day progressive increases. However, in freeze-thaw events the demand increase is much more rapid. In December 2022 we experienced an exceptional rate of increase of some 300 ML/day (20% of normal December demand) in 48 hours.

Preparations for these type of events include maximising resilience by using storage through the network and increasing production at WTWs. In practice, it is not possible to have all production capacity running at maximum, prior to these events, as production needs to align with demand. Therefore, responding to rapid increases in demand presents a significant challenge, because many water treatment works, for chemistry and water quality management reasons, are limited in the rate at which they can increase their flows.

Figure 10 shows the lag between demand increase and production and that there were times during the incident where demand – fuelled by increased leakage – exceeded production. The additional resilience required to manage this lag was provided through storage across the network in service reservoirs.

In preparation for the 2022 event we built up the supply of water within this network of service reservoirs. As demand began to increase over the course of the 2022 event our total storage decreased by 900 megalitres, with over 100 of our service reservoirs across the region reaching their “low” monitoring status.

As production volumes steadily increased and demand reduced as a consequence of leakage repairs and repairs to private pipework, service reservoir levels stabilised, before fully recovering as production again outstripped demand.

Normal operational levels in the integrated resource zone and demand monitoring zones were restored within 4 days (between 18 and 22 December), with a small number of service reservoirs taking slightly longer to reach their normal operating range.

f) Localised issues – management and response

In addition to managing the regional impacts of the freeze-thaw we also needed to respond to and manage more severe localised impacts, when and where they arose.

In advance of the incident we had increased the size of our alternative supply vehicle (ASV) fleet. ASVs are large tankers which can carry and transport up to 30,000 litres of water each. We had 48 ASVs available for the 2022 incident, compared to 31 in 2018. We also had smaller overland supply vehicles and bowsers available for use.

In advance of the 2022 event we implemented the processes that we had put in place with our fleet maintenance team, to ensure that we had the required staff available to operate these vehicles and transfer and pump water across the region where supplies were running low. This enabled us to make a record 40 vehicles simultaneously available for use.

Due to the widespread scale of the impacts during the 2022 freeze-thaw we targeted the use of our ASV fleet on supporting sensitive non-household customers (such as schools, hospitals and prisons) and on ensuring that key strategic mains could remain operable. As a consequence of this we were unable to retain flows to some of the outlying sections of the network. These were identified and we took steps to support these areas using bottled water and activate priority services support.

The commercial arrangements that we had established to secure bottled water supplies worked well. This bottled water was used for both direct delivery to vulnerable customers and for 'pop up' bulk distribution centres. Our stocks of bottled water were increased in advance of the event and we were able to sustain supplies throughout the event, including during the impacts in the Lancaster and Morecambe area discussed below.

As the event progressed we also repurposed the pressure management actions in our dry weather/drought response plans to remotely control main pressures using our fleet of remotely operable pressure management valve controllers, which cover over 700 discrete pressure areas (DPAs). This process enabled us to quickly make modest adjustments and optimise pressures to reduce the risk of leakage breakout and control demand whilst our teams responded to leaks and customers responded to burst pipework.

g) Data and system enhancements

The improvements that we have made to our monitoring systems enabled us to track system status in real time as the event developed. This meant that sources of leaks could be identified and responded to quickly with our "Respond, Restore and Repair" strategy being used to minimise customer impacts.

Enhancements made to our telemetry systems first used to support an event response during the 2022 hot weather event in the summer enabled us to monitor total storage across the network at a DMZ level. This allowed us to identify potential strategic and regional risks and to make system level changes within our integrated supply zone. We moved water and refilled network storage where it was most needed, prioritised the local contingency plans that we needed to draw on and dynamically prepared for potential "worst case" scenarios.

Improvements have also been made to the way that we monitor levels within our individual service reservoirs. This reduced the tactical risk to service and allowed us to make more informed decisions about preparedness for any necessary localised response.

Freeze-thaw events are dynamic in nature and whilst we endeavour to prepare as much as possible, there is always a need to quickly identify issues, make an informed assessment of potential options and determine and implement the optimum way forward. The system enhancements that we had made had further improved our capability to understand the causes, impacts and potential options to address problems that arose, by using real time information, to undertake scenario analysis and guide and prepare a response.

Our expert network modelling team were an integral part of our response team. This in-house team worked in parallel with the operational specialists in our ICC, to feed real time status information into their system and network models to provide detailed scenario analysis and directly support operational decision making.

In addition to the information we obtain by monitoring our assets, customers also provide us with an additional, valuable, source of intelligence about what is happening across our networks. In 2019 we implemented a new,

end to end integrated, customer and work management system on the Salesforce platform, which we call the Integrated Network Net System (INS). In addition to being very effective at managing and tracking the jobs for individual or groups of customers from call to resolution, this system also enables us to quickly understand the range and nature of contacts in a specific area. This insight means that we can combine the network and customer management elements of our responses and actively monitor the impacts.

The increased availability of information from AMR readings also had a direct impact, by allowing average daily consumption to be rapidly analysed to compare pre and post thaw levels and identify properties that were likely to have developed customer side leakage. Where this was having a significant impact on the network, we sent out teams to investigate and, in some cases, repair leaks on private property, in conjunction with the owner.

h) Lancaster and Morecambe

A feature of our integrated supply zone is that it is made up of a number of individual demand monitoring zones (DMZs). Some of these are multisource, meaning supply can be provided by a mix of source inputs depending on resource availability, production availability and network configuration.

Each DMZ is unique with some having more flexibility and options than others. A small number of DMZ predominantly rely on local sources to maintain the majority of their supply with only a relatively small percentage of the supply being augmented by the regional system.

The Lancaster DMZ covers the city of Lancaster and the town of Morecambe. There are 39,783 properties in this area. The DMZ is supplied by two sources. Lancaster Water Treatment Works treats water from three local impounding reservoirs whilst Lancaster TA Water Treatment Works treats water from the integrated regional system. In normal operation typical production flows at these sites would be 29 ML/day and 6-6/5 ML/day respectively.

Lancaster WTW uses granular activated carbon (GAC) in its treatment process, which requires periodic regeneration. At a site like Lancaster WTW this activity requires a temporary reduction in capacity as a filter is removed from service. Given the supply arrangements in the area we take steps to reduce the period of flow reduction by:

- (1) Planning works to coincide with lower demand periods, typically October/November
- (2) Speeding up the process by replacing the existing media with pre- conditioned media, rather than simply removing, regenerating and returning the media (the removed media is taken away for regeneration and reuse elsewhere).

In line with this plan, the media at Lancaster WTW was replaced in October. However, when the filter was returned to service a fault was observed that could have affected the water quality. The fault related to filter nozzles underneath the filter bed and required the media to be removed to repair the damage. It was decided that the best option would be replace all 5,000 nozzles and ensure that the fault was fully addressed, rather than potentially losing time trying to investigate, identify and address the specific nature of the fault. This approach also provided the best means of avoiding any risks to water quality.

The initial forecast completion date for this work was January 2023, although due to the inherent risks of working in the winter months, we worked with our specialist suppliers to accelerate completion of this work into December. As the risk of freeze-thaw emerged further efforts were made to accelerate these works. The target date to restore the works to full capacity was brought forward to 19 December.

The impact of the freeze-thaw, however, commenced over the weekend of 17 and 18 December leading to a spike in demand across the North West. The timing of the increase therefore occurred during the temporary restriction in capacity at Lancaster WTW which, for a 48 hour period, resulted in a supply shortfall to the area.

Whilst our planning and response to the freeze-thaw event was managed as an overall incident, in line with our Emergency Planning and Response procedures, the specific event in the Lancaster and Morecambe area was managed as a separate 'sub-incident' by one of our Operations Directors.

To seek to manage this situation we had filled our service reservoirs in the area, with the response to the Lancaster incident following our existing loss of water supply incident plans. These plans included establishing a multi-agency coordinating group to oversee our response through the Lancashire Local Resilience Forum, the use of our Alternative Supply Vehicle (ASV) fleet, bulk water collection stations, provision of bottled water direct to cover 1,800 priority service customers, 23 care homes and 2 households known to have dialysis patients as well as regular communications to customers and updates to key local stakeholders (including MPs and media).

Additional leakage gangs were mobilised in the area, who also repaired a number of private and sizeable customer side leaks at commercial premises.

This work provided resilience to the shortfall until the evening of the 18 December, at which point the service reservoirs reached critically low levels.

To both protect supplies into Heysham Power Station and local hospitals and to ensure that levels in service reservoirs and key trunk mains did not reduce to levels that could have resulted in water quality impacts, we took the decision to restrict supplies into parts of the Morecombe area. This resulted in c16,000 household customers being off supply.

The work at Lancaster WTW was completed early on the 19th December, with production levels increased to record levels. This allowed service levels to be refilled and supplies to be restored during the hours that followed.

i) Mutual Aid

Through the mutual aid protocols and Water UK, we were communicating with other water companies throughout the incident. We did not need to rely on mutual aid. However, we were unable to support mutual aid requests for tankers from other companies as all our tankers were deployed.

j) Unique impacts of the 2022 freeze-thaw

The length and depth of the cold period in 2022 had some unforeseen and previously un-experienced effects on some of our production capacity:

- Production processes froze at a number of sites that have not experienced problems in previous spells of very cold temperatures. This restricted throughput at these works in the initial stages of the demand increase.
- The water temperature in the river Dee, the source water for one of our major water treatment works (Huntington) in Chester reached 1°C. This reduced the efficacy on the coagulant (Alum) which is used in the clarification stage at the works. This meant that for the period, until the air temperature and hence river water temperature increased, the throughput at the works needed to be reduced to protect drinking water quality.

We are exploring options to better protect the processes that were affected by the cold and will update our cold weather preparedness planning accordingly. We have also explored the issues at Huntington, with our technical teams looking at a range of alternatives to make the treatment process more resilient, including considering practices used by other water companies in colder climates such as Scandinavia.

3C - Communication with customers and other stakeholders

3C.1 Review and lessons learned from the 2018 Freeze-thaw

How we performed during the 2018 freeze-thaw

During the 2018 freeze-thaw our established plans allowed effective communication to – and receipt of communications from – customers, via a range of channels. We noted that the sector as a whole – including UUW – had scope for some improvement in communications with non-household customers and their retailers.

Household customers

- We had already activated our ‘Winterwise’ information and advice campaign in November 2017. This campaign included:
 - ‘how to’ advice on our website, with interactive content suitable for use across social media channels;
 - material to use with other organisations supporting some of our more vulnerable customers; and
 - an on-going radio advertising schedule and ‘pop-up’ shop events at key towns across the North West.
- We mobilised our customer incident team, which uses GIS data, to provide real-time updates to customers impacted by the events using a number of channels.
- We communicated with local resilience forums, councils and the emergency services before, during, and after the incident, to ensure that they were able to prepare for, and minimise, the impact of disruption.
- We used proactive and targeted messaging for different customer segments and stakeholders, including non-household customers, taking lessons learned from previous incidents.
- We mobilised additional resources from across the business to handle the increase in customer enquiries.

Non-household customers

- All sensitive non-household customers (schools, hospitals prisons etc.) were flagged on our GIS system.
- We had a dedicated portal and support team to communicate with retailers and had come out top for dealing with emergencies in a recent Water Retail Magazine survey.

Summary of Ofwat feedback on UUs performance in the 2018 freeze-thaw:

- ***It is encouraging to see that United Utilities was proactive in communications with customers and used a range of different channels to raise awareness, provide advice on preparing for the expected cold weather and to update customers during the incident.***
- ***The company appears to have taken on board lessons learned from other incidents and from research with different segments of affected customers to understand their expectations and what went well and what the company could do better to meet their needs. This has resulted in a number of improvements in the way the company communicates with its customers and other stakeholders to ensure that messaging is targeted for different customer segments.***
- ***Engagement with business customers and retailers has also been identified as an area for improvement across the sector. We understand that United Utilities has specific processes in place for communicating with retailers, with a dedicated support team and portal, but the process did not need to be triggered for this incident. Nevertheless, given the scale of the leaks on business premises that many companies experienced, all companies need to consider whether their current communications strategy is appropriately targeted.***
- ***Early and ongoing engagement and collaboration with Local Resilience Forums (LRFs), local councils, NHS Cumbria etc, formed an essential part of United Utilities’ planning for, and response to, the incident.***

Lessons learned from the 2018 freeze-thaw

The key lessons learned from the 2018 event related to proactive communications, collaborating with other companies and predominantly focussed on non-household customers, which was recognised as being an area where sector wide improvement were required.

Proactive communications

Our annual 'Winter wise' information and advice campaigns incorporated the lessons learned from the 2018 freeze-thaw. These placed a greater focus on multi-agency public awareness, raising events to encourage personal preparedness throughout the winter.

Collaborating with other companies

We recognise fully the value of undertaking detailed reviews and learning and sharing lessons when events do occur. Following the 'Beast from the East' event, we worked with other water companies and Water UK to co-ordinate seasonal messaging and to share messaging. For example, we produced a dry weather leaflet for businesses which was proactively shared with others across the sector.

Non-household customers

In 2018 we already had processes and procedures in place for managing communications with non-household customers in both normal and emergency situations. Proactive communications with non-household customers and retailers was also embedded within our incident response procedures.

However, following the 2018 freeze-thaw, we recognised that communication with these customers and retailers is something that the sector needed to focus on.

We already had interactive tools and dashboards to identify the impact of a water sufficiency event on sensitive non-household customers. A data quality review was undertaken following the 2018 freeze-thaw and as a consequence, we improved the classification of premises. We also collected emergency contact details for all tier 1 to tier 4 sensitive non-household customers so that we can contact them directly in future.

Feedback from retailers during the extended period of dry weather in 2018, was that our communications were good.

We also responded to Ofwat's decision to approve CPW010 "Sharing of NHH Customer Contact Details in Emergency or Unplanned Events" by defining our approach to collecting emergency contact details for all non-household customers. We also took learning from other wholesalers to ensure that we are able to communicate proactively with retailers, to provide reassurance that an issue or incident will not adversely impact their customers. A template for developing bilateral contingency plans with retailers was also agreed.

3C.2 Subsequent enhancements to U UW's capabilities

Since 2018 we have reviewed the way that we work with local resilience forums and embedded and formalised these improved ways of working into our emergency plans.

We have incorporated business customer information, where we have it, such as email and text contacts, into our proactive customer communications tool, which means when any given postcode area is affected, we can automatically identify who may be impacted from a household and non-household perspective and directly message those customers with the relevant information and advice.

We have increased the maturity and segmentation capability within our social media channels to allow us to more effectively localise and target customers. We can now target specific postcodes, or even lifestyles to help us identify customers who may be obviously vulnerable or maybe a business owner, for example, in a particular area.

We have also enhanced the capability of our website to be able to personalise certain information directly presented to customers from a certain postcode location – so those customers may see specific information relevant for their area, rather than North West wide information.

In 2019 we implemented a new, end to end integrated, customer and work management system on the Salesforce platform, which we call the Integrated Network Net System (INS).

We have also implemented the new INS Report a Problem (RAP) system, this is a self-serve channel where customers can seek online help and advice relating to their water services

3C.3 How we performed in the 2022 freeze-thaw

This section reviews our approach to communication during the 2022 freeze-thaw, in the following areas:

- (a) Mobilising additional resources to handle the increase in customer enquiries.
- (b) Mobilising our customer incident team, to provide real-time updates.
- (c) Working with local resilience forums, councils and the emergency services.
- (d) A three level communications strategy
- (e) Media and stakeholder engagement
- (f) Non-household customer communications
- (g) Customer satisfaction and perception

a) Customer enquiries.

The 2022 freeze-thaw generated a significant increase in customer enquiries. We usually offer 1,000 calls a day to call handlers (agents), however, between 14th December and 24th December this increased to an average 3,100 calls a day.

Figure 11 – Monthly calls offered



During December 2022 we received our highest contact volumes in over five years, with 53,783 calls offered to call handlers.

Figure 11 above shows the number of calls offered to call agents each month each since 2018 (note that data for April and May 2020 are not available.) This shows that the 2022 event generated substantially more calls than any other event during this time and over 5,000 more calls than the 48,412 we received during the 2018 freeze-thaw.

In addition to the calls offered to and handled by agents, to speed up and simplify the customer contact experience, we have implemented a number of systems that allow us to directly service messages or to service messages using robotics.

Figure 12 - Calls handled by message



As shown in Figure 12 above, 9,762 contacts were handled in this way in December 2022, with 8,834 contacts handled by these messages between 14 and 24 December.

We have also implemented the new INS Report a Problem (RAP) system. This is a self-serve channel where customers can seek online help and advice relating to their water services. It acts as a guided self-help tool, which enables customers to diagnose and potentially solve their issue. If the problem cannot be solved directly, the system can ensure that the problem is created as a job within our customer workflow tool (INS) and therefore an appointment/or response is made for the customer. By way of example, this tool provides information about what might be causing an issue with no water or poor pressure and in the context of freeze-thaw provided advice about how to do with issues linked to private supply problems or how to tell whether the issue was customer side and then advice on how to resolve or get the right help.

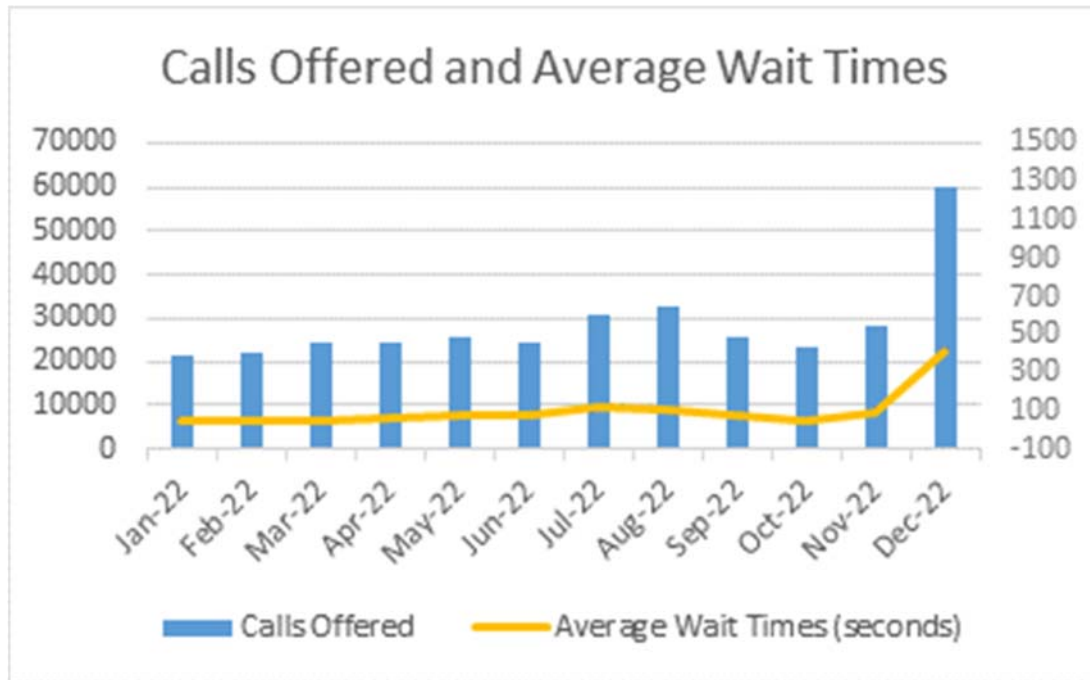
In normal circumstances this system works well, although on 16th December we turned the system off for three days as it was directly scheduling field resources to frozen private pipes. Having made system changes we were able to make the system available to allow customers to report online again from 19th December.

Despite the work which had been undertaken to automate the process for handling incoming communications, we recognise that in events of this nature the majority of customers still want to speak to a human call handler.

As a result we had anticipated the increase in customer contacts and had ramped up the number of agents in the call centre utilising wider UJW resources from our billing teams. This increased the number of staff available to speak to customers on service issues from 26 to 126 at peak times.

Despite the improvements that we had made in automation and the increase in available call agents, the scale of the increase in call numbers did result in an increase in average call wait times during December to 443 seconds, compared to 91 seconds over the rest of the year.

Figure 13 - Calls offered and average wait times (monthly)



b) Mobilising our customer incident team, to provide real-time updates.

As was the case in 2018, we mobilised our customer incident team to provide real-time updates to customers impacted by the events and used a number of different channels.

In 2019 we enhanced the capabilities of this team by implementing the new, end to end integrated, customer and work management system on the Salesforce platform, which we call the Integrated Network Net System (INS). This system enabled us to quickly understand the range and nature of contacts in a specific area and meant that we were able to effectively combine the operational and customer management elements of our responses and provide more informed real time responses and updates to customers.

c) Working with local resilience forums, councils and the emergency services

As was the case in 2018, early and ongoing engagement and collaboration with Local Resilience Forums (LRFs), local councils and emergency service personnel formed an essential part of our planning for, and response to, the incident.

Since 2018 we have continued to liaise with LRFs and to embed and formalise these ways of working into our emergency plans. In 2022 we expanded the coverage of our on call capability to include non-operational senior leaders that we have trained in supporting with activities like LRF liaison and bottled water provision.

In the 2022 event we were in active liaison with LRFs, councils, local health services and charities throughout the incident to ensure that our work with these groups could be effectively co-ordinated. This helped us to identify and provide assistance to customers and ensured that these groups were also able to prepare for, and minimise, the impact of disruption. Given the continued development of relationships between U UW (Emergency Planning and Priority Services teams) and LRF partners this liaison operates on an informal basis, with contact made as necessary. In the 2022 event specific actions included:

- Early liaison with partners to highlight vulnerable persons whom had contacted U UW about issues we were unable to rectify (eg lack of heating due to boiler issues in extreme cold)
- Liaison with local highways colleagues and teams to support maintenance of access to key sites (eg to support chemical delivery to water treatment works) with activities such as gritting

- Preparatory consultation with local authorities to identify suitable locations for bottled water stations should the need arise in areas at risk

We jointly established and chaired a multi-agency coordinating group to oversee our response to the specific issues in Lancaster and Morecambe, through the Lancashire Local Resilience Forum and were on calls to local resilience forums every day during the event. In total the coordination group met seven times during the event. In addition Vulnerable Persons and Communications sub-groups were established under the umbrella of the overall coordinating group. These sub-groups were made up of practitioners focusing on the detail of their specific knowledge area with benefits including:

- The vulnerable persons group identified the need to provide bottled water to two hotels housing asylum seekers following the closure of a facility in southern England. This is a transient population not normally in this location and not registered with our priority services register, as the accommodation is a commercial provider
- The communications group ensured that there was a thorough understanding of all key stakeholder needs and a clear and consistent set of messages back out these stakeholders from all coordination group members

d) A three level communications strategy

Our website now has enhanced capability to be able to personalise certain information directly presented to customers from a certain postcode location – so those customers may see specific information relevant for their area, rather than North West wide information. The increased maturity and segmentation capability within social media channels also means we can better localise and target customers through those mediums, so we can target specific postcodes, or even lifestyles which help us identify customers who may be obviously vulnerable or maybe a business owner, for example, in a particular area. To support the freeze-thaw response we implemented a three level communication strategy:

- (i) An initial and generic “winter preparedness” communications strategy
- (ii) A more targeted strategy in preparation for and response to the freeze-thaw event
- (iii) A detailed communications and support strategy, for the Lancaster and Morecambe areas.

Summaries and examples from each of these three levels of campaign are set out below:

Regional radio

Our radio advertising campaign reached **35% of all adults** living in the North West, who on average heard the ad 7 times. Overall the campaign achieved around **16m** opportunities to hear the ad and continued to run through December and January. We activated the radio at the time the cold snap began to hit, offering advice on how to deal with frozen and burst pipes, and covered all key North West stations, including Cumbria FM, Radio City, GHR Liverpool, Hits Radio Manchester and Lancashire, Silk, Dee, Smooth NW, Heart NW, Heart North Lancashire and Cumbria.

Figure 14 - Outside tap covers



To offer additional help, we gave away around 10,000 outside tap covers which were ordered through our Get Water Fit platform and supports customers to save on water and energy bills.

Winter preparedness communications strategy

Our integrated marketing campaign approach helped to reach more customers and increased the number of times that they heard the message. We used a mix of channel types, as follows:

Prior to the freeze-thaw event, we emailed around **1.2m customers** with winter pipe protection advice. This included proactive be prepared messaging and then this was followed up with further messaging to provide help and advice on how to deal with a frozen and burst pipe.

Email 1 - winter pipe protection advice



Hello,

As you may have heard, there's a cold snap on its way, so we wanted to let you know how to protect your home from frozen and burst pipes during the freezing weather.

When water freezes, it expands, putting more pressure on pipes and joints which can cause them to split or pull apart. As the water in the pipe thaws, water pours through the damaged pipe and could cause damage to your home.

Most bursts caused by frozen pipes are avoidable, simply follow our three simple steps to avoid the hassle and expense of burst pipes, especially so near to Christmas.



Find your stop tap

First of all be prepared and know where your stop tap is so you can turn your water off in an emergency.

It's a little tap that's usually under the kitchen sink, but we've seen houses where it's in the downstairs loo, garage and even in a cupboard under the stairs!

It's important as this will help reduce water damage to your home if a pipe bursts.

Email 1 - winter pipe protection advice



Insulate your pipes in cold places

Insulate water pipes with lagging to prevent them from freezing. Make sure that pipes in cold places, such as the loft, garage and outside are protected. Insulating hot water pipes will also prevent heat from escaping and help save money on your energy bills.

Ask at your DIY store for the best type of insulation to use, pipe lagging isn't expensive and if you have an outside tap in the garden, it's worth having a tap cover to protect that from freezing too.



We have a limited amount of FREE outside tap jackets to order if you sign up or log on to Get Water Fit using the link below.

[GET WATER FIT](#)

If your water pipes aren't already insulated and you can't do it yourself you may need to ask for some help. If you're renting your home, you should contact your landlord for advice, if you own your home and don't have help available, you may need to contact a registered plumber to check the pipes to make sure they're properly insulated. If you don't know a plumber, you could go to watersafe.org.uk for trusted plumbers in your area.

Click the link below for more help and advice on protecting your home this winter.

Email-1--winter-pipe-protection-advice-¶

COLD-WEATHER-ADVICE

A-little-extra-help-with-Priority-Services¶

As the temperature drops, please look after yourself, family and friends especially those who may be vulnerable during the cold weather. ¶

We have support for those who need it most, this could be due to age, ill health, disability, mental health conditions, financial worries or language barrier. ¶

Registering for our Priority Services means you'll benefit from a range of additional services so we can respond quickly to your specific needs. ¶

REGISTER-FOR-PRIORITY-SERVICES

Take care, ¶

United Utilities Water Team¶

PS: just to let you know we're getting ready for the cold weather too and are working around the clock to continue to monitor our pipes for leaks and have increased the number of teams we have out and about finding and fixing them. We're also grateful for your support in [reporting leaks](#) whenever you see them. ¶



Social media

More than **900,000** people in the North West have seen or interacted with our winter wise social media campaigns.

Our content was displayed in social media feeds over **1.8m** times and over 1.4m people viewed our advice-led video content.

Figure 15 - Examples of social media messages

United Utilities
Published by Lauren Maughan · 20 December 2022 ·

As you are aware, the impact of the freeze and now thaw has been affecting your water supply in your area.

We have established bottled water stations in these locations:

- Matthias Street Car Park, Matthias Street, Morecambe, LA4 5JR
- Morecambe Festival Market car park, Marine Road, Morecambe, LA4 4DW
- Morecambe FC 'The Mazuma Stadium', Christie Way, Westgate, Morecambe, LA4 4TB

Our sincere apologies for the inconvenience this will obviously cause you. It is not an action taken lightly and we'll be proactively contacting customers with compensation. For further updates take a look at our website: <https://bit.ly/3hxcpxn>

Bottled water stations

Matthias Street Car Park, Matthias Street, Morecambe, LA4 5JR

Morecambe Festival Market Car Park, Marine Road, Morecambe, LA4 4DW

The Mazuma Stadium, Christie Way, Westgate, Morecambe, LA4 4TB

United Utilities
Water for the North West

United Utilities
Published by Lauren Maughan · 23 November 2022 ·

Burst pipes are not only expensive to repair, but it could close your business if it causes a lot of damage and you're not able to stay open.

It's especially important to make sure all your exposed pipes are lagged if you close over the Christmas period so you don't come back to a flooded business in the New Year.

Follow our simple top tips to protect your business this winter:

Is your business winter ready?

United Utilities
Water for the North West

United Utilities
Published by Lauren Maughan · 6 December 2022 ·

Brrr, it's freezing out there! ❄️ Get your home wrapped up this winter. Pipes inside and outside your home can get very cold too and even freeze causing the pipe to burst and leak. To help you enjoy a carefree winter, follow our advice to lag your pipes: <https://bit.ly/3VP4p9g>

Temperatures are dropping...

United Utilities
Water for the North West

UNITEDUTILITIES.COM
Avoid a burst pipe
Learn more

United Utilities
Published by Lauren Maughan · 9 February 2022 ·

When it comes to the cold winter months, we're not the only ones prone to feeling the chill. Pipes inside and outside your home can get very cold too and even freeze causing the pipe to burst and leak. To help you enjoy a carefree winter, follow our top tips to lag your pipes!

Head to our website where we'll show you how to get your home winter ready: <https://bit.ly/30z05Cf>

Cut your lagging to size

Step 1
0:02 / 0:15

UNITEDUTILITIES.COM
Follow our top tips to lag your pipes
Learn more

We used separate messages to target businesses and households and more than 210,000 business owners saw our advice on social media. We also directly targeted local communities. For example, a Morecambe-focused post had a reach of 22,537 on Facebook

Website

Our website <https://www.unitedutilities.com/help-and-support/winter/> offers simple advice on protection from frozen and burst water pipes and achieved high volumes of visits, particularly during the freezing weather in December.

More than 62,000 people viewed the winter advice pages on our website, with a spike in views from 15 December when the cold snap hit and splash notifications was enabled.

Figure 16 - Examples of website content

Prepare, Insulate, Protect, Easy

Insulating your water pipes will protect them from freezing, bursting and flooding your home.

A Step-by-Step Guide for Lagging your Pipes

Lagging – or insulating – pipes around your home is a simple DIY project. We've broken the process down into easy steps.

A Step-by-Step Guide: Lagging your Pipes

| | | | |
|--|---|--|---|
| <p>Check your pipes</p> <p>Check for exposed pipes inside and outside of your home which could be in cold areas, such as under the sink, near the boiler, in the loft, near the water tank, in the garage and outside taps.</p> | <p>What you'll need</p> <p>You'll need a tape measure, a marker pen, a utility knife (sharp scissors will also work), duct tape, insulation tape and/or cable ties. Tip: Ask at your local DIY shop for advice on the best type of insulation material.</p> | <p>Getting materials</p> <p>Measure the length and diameter of insulation you need, and make a note. Tip: Foam insulation is most commonly used, and is widely available from DIY stores. Fibre and wool insulation is also effective at reaching the heat in.</p> | <p>Measure and fit the insulation</p> <p>After measuring and cutting insulation to size, open it up at the pre-cut slit and wrap it around the pipe.</p> |
| <p>Secure the insulation</p> <p>Push the insulation against the pipe snugly so that both sides of the slit join together again.</p> | <p>For 90° bends</p> <p>Cut the insulation at 45° on each side to fit perfectly with the other joint.</p> | <p>For awkward bends and connections from the pipe</p> <p>Cut notches at 30° from the inside of the bend in the insulation and fit as required.</p> | <p>That's it!</p> <p>It's so easy to protect your closest friends. Time for a well-deserved cup of tea!</p> |

How can we help you today?

- Burst water pipe?**
Read our advice about what to do if you have a burst pipe >
- Manage your account online**
Take advantage of paperless billing >
- Pay your water bill**
Quickly and securely >
- Moving home**
Let us know your moving details >
- Issues with your water**
Check on the status of active issues >
- Support with your bill**
We can help if you're finding things difficult >

Burst water pipe?




Read our advice about what to do if you have a burst water pipe following the freezing weather.




[BURST PIPE ADVICE](#)

Protect your home this winter

What to do when pipes freeze, thaw and burst in the cold weather.

View our guides on insulating your pipes ready for the cold and advice on what to do in the case of a frozen or burst pipe.

| | | |
|---|---|--|
|  <h3>Burst pipe?</h3> <p>Follow our tips to help you get back up and running.</p> <p>BURST PIPES ADVICE</p> |  <h3>Frozen pipe?</h3> <p>If you have no water or your water pressure has dropped so there's only a trickle coming out of the tap, don't panic, you could have frozen pipes.</p> <p>FROZEN PIPES ADVICE</p> |  <h3>Prepare, insulate, protect</h3> <p>See our advice for how to protect your property for the cold weather.</p> <p>GUIDE TO INSULATING PIPES</p> |
|---|---|--|

| | | |
|--|---|--|
|  <h3>Call a plumber</h3> <p>Click the link to find more information on your local tradesmen</p> |  <h3>Get Water Fit!</h3> <p>Try our new water personalised water usage platform and save water, save money, save nature!</p> |  <h3>Advice for Businesses</h3> <p>See our advice to protect your business over the cold winter months</p> |
|--|---|--|

Burst water pipe?

With temperatures on the rise following the recent freezing weather, please be on the look-out for any leaks on the water pipes in your home or business. Any frozen pipes may leak or burst as they begin to thaw.

Burst and leaking pipes can cause damage to your home or business, so being prepared will help to reduce the impact of flooding from burst pipes, which can be extremely distressing as well as costly and time-consuming to repair.

If you do have a burst pipe, don't panic, follow our advice below:

- Find your stop tap, which is usually under the kitchen sink and turn it clockwise to turn off the water. Watch our video below for advice on how to find your stop tap.
- Turn off your heating, open all your taps to drain the system quickly.
- Soak up any escaping water with towels.
- Check with your home insurance company to see if you're covered for leaks and bursts or call a plumber.
- If you need to find a plumber in your area visit www.watersafe.org.uk
- If water has leaked near your electrics switch them off at the mains.

Please think about your family, friends and vulnerable neighbours and share this information with them too.

| | |
|--|--|
|  <p>How to find your stop tap</p> <p>Watch on  YouTube</p> | <h3>Find your stop tap and check that it works</h3> <p>Your stop tap controls the flow of water into your home. It's usually found under the kitchen sink, or sometimes in the cellar or garage. It's handy to know where it is so you can turn the water off quickly if your pipes freeze or burst.</p> <p>Found it? Make sure your stop tap is working. It's also worth checking if your household insurance covers burst pipes.</p> |
|--|--|

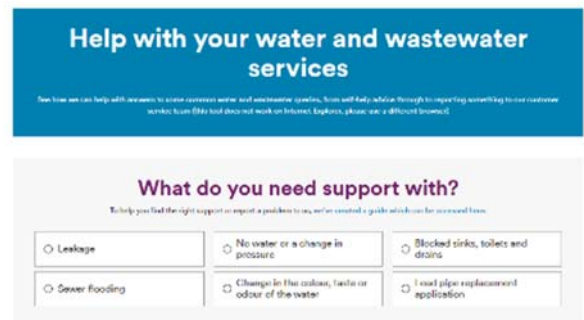
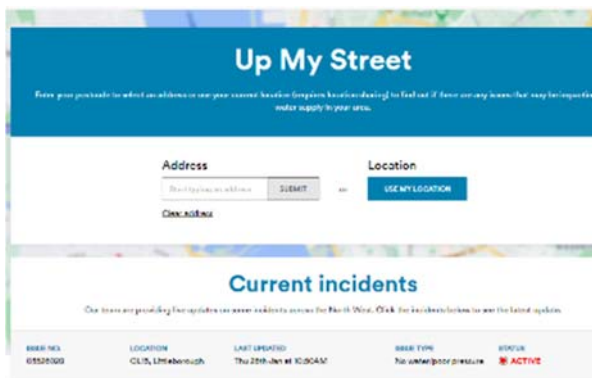
Online support and updates

“Report a Problem” and “Up My Street” areas on the website both performed well in serving up to date information and enabling customers to both understand what work was ongoing in their area and to obtain support if and where required.

Figure 17 - “Report a Problem” and “Up My Street” statistics and screenshots

| Report a Problem | | | | |
|------------------|-----------------------|-------------|--------------------------------------|-------------------------------------|
| | Total form completion | Self served | Salesforce clean water cases created | Salesforce wastewater cases created |
| December | 10,186 | 4114 | 4796 | 842 |
| November | 4775 | 1730 | 1929 | 849 |
| October | 3761 | 834 | 1941 | 726 |


| Up My Street | | | | |
|--------------|-------------------|------------|-----------------------------|-------------------------------|
| | Unique page views | Page views | Top 3 events | Unique uses of address search |
| December | 416,927 | 666,875 | Morecambe, North West, WA12 | 201,740 |
| November | 256,768 | 416,927 | Stockport, WA15, M13/14/15 | 75,431 |
| October | 80,954 | 126,368 | Stockport, OL7, M27 | 35,838 |



Specific communications in preparation for and to support the 2022 freeze-thaw event

In anticipation of the freeze-thaw event we sought to proactively provide information to support customers. This was achieved by posting information on our website and substantially ramping up our process of sending targeted proactive messages to potentially affected customers. Over 4 million proactive messages were sent in December 2022 through a variety of channels. Examples of the messaging that was undertaken to directly support the freeze-thaw are set out below:

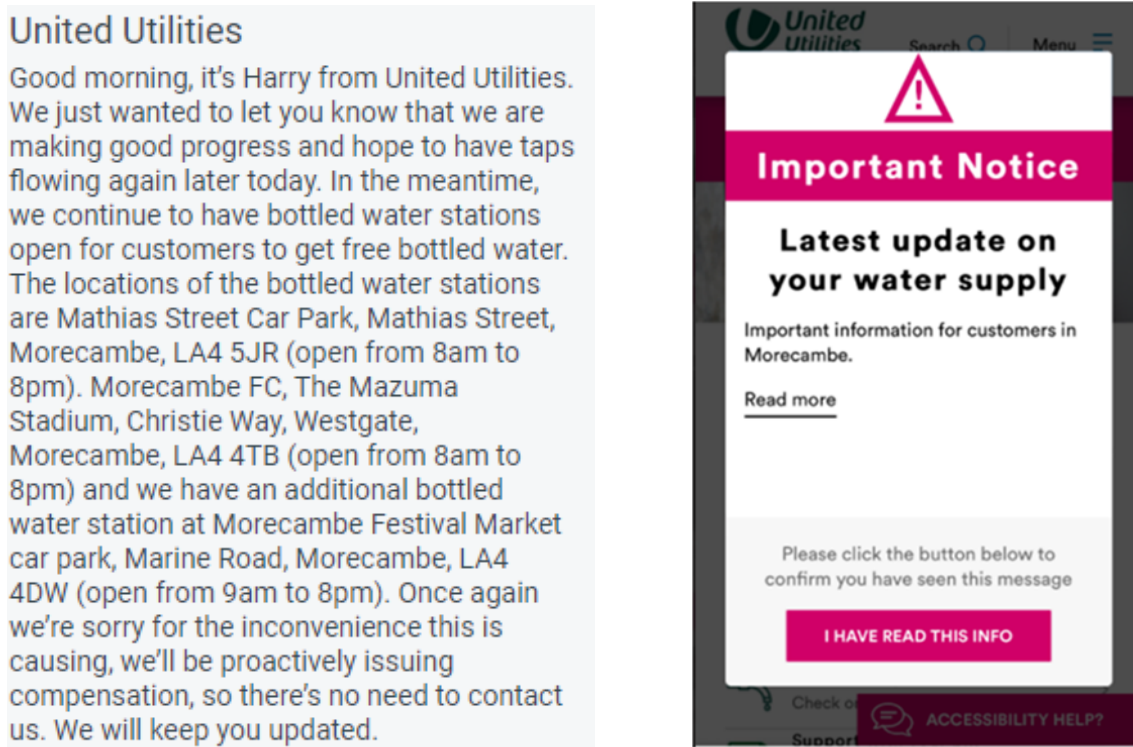
Figure 18 - Examples of proactive messaging

| | | |
|---|---|--|
| <p>Good afternoon it's Helaina from United Utilities. Due to freezing weather conditions, a number of our customers are experiencing no water or reduced pressure, caused by frozen pipes in their home. The weather is set to warm up over the weekend and any frozen pipes in your home will begin to thaw. When this happens, some of your pipes may leak or burst as a result of being frozen so it's worth taking some steps now to be prepared just in case this happens to you.</p> <ol style="list-style-type: none">1. As the temperature rises, check your pipes in any cold places such as the loft or garage - can you spot any water dripping from the pipe? | <ol style="list-style-type: none">2. Find your stop tap, which is usually under the kitchen sink and turn it clockwise to turn off the water.3. Turn off your heating, open all your taps to drain the system quickly.4. Soak up any escaping water with towels.5. Check with your home insurance company to see if you're covered for leaks and bursts or call a plumber.6. If you need to find a plumber in your area visit www.watersafe.org.uk7. If water has leaked near your electrics switch them off at the mains. <p>For more help and advice if you have a frozen or burst pipe head to www.unitedutilities.com/winterwise. Please think about your family, friends or any vulnerable neighbours and share this information with them too.</p> | <p>United Utilities</p> <p>Good morning, it's Harry from United Utilities. We just wanted to let you know that we are making good progress and hope to have taps flowing again later today. In the meantime, we continue to have bottled water stations open for customers to get free bottled water. The locations of the bottled water stations are Mathias Street Car Park, Mathias Street, Morecambe, LA4 5JR (open from 8am to 8pm), Morecambe FC, The Mazuma Stadium, Christie Way, Westgate, Morecambe, LA4 4TB (open from 8am to 8pm) and we have an additional bottled water station at Morecambe Festival Market car park, Marine Road, Morecambe, LA4 4DW (open from 9am to 8pm). Once again we're sorry for the inconvenience this is causing, we'll be proactively issuing compensation, so there's no need to contact us. We will keep you updated.</p> |
| <p>United Utilities</p> <p>Good morning, it's Danielle from United Utilities. We know that some customers are experiencing poor pressure and we're sorry for the inconvenience this will be causing. Our teams have worked throughout the night to resolve the issues which are affecting your water supplies. We are doing what we can to keep some water flowing to taps while we continue to get the problem fixed and everything back to normal for you. We hope to make further progress during the course of the day and will provide further updates.</p> |  | |

Targeted communications support for Lancaster and Morecambe

The increased maturity and segmentation capability within social media channels means that we were able to localise and target customers with specific messages relevant to their community. Social media support and updates were issued, using location specific posts alongside multiple broader advice and support messages for customers. As noted above, a post targeted at the Morecambe area had a reach of 22,537 on Facebook.

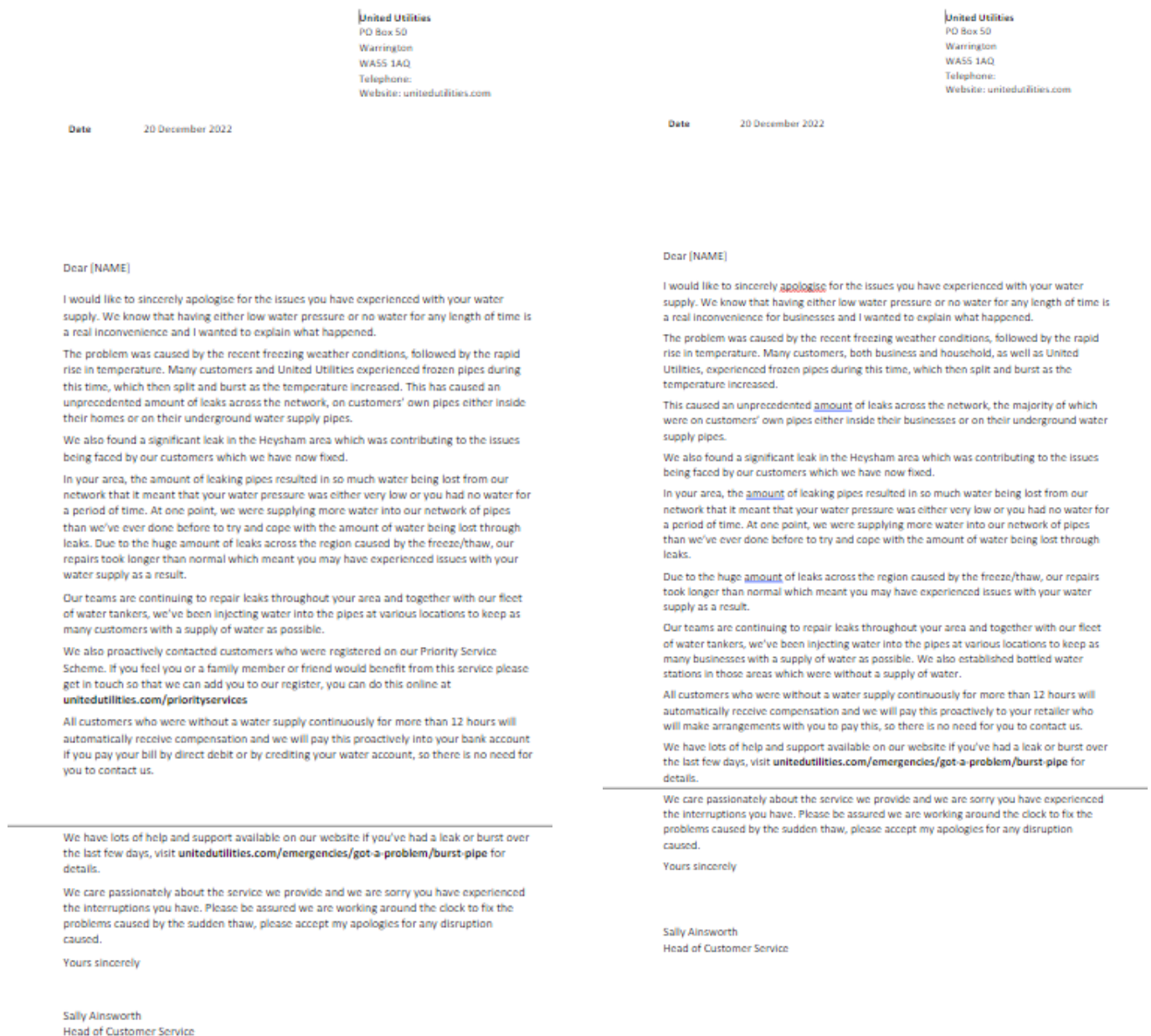
Figure 19 - Examples of targeted communications for customers in Lancaster and Morecambe



Local residents got multiple messages over the course of the incident to keep them informed on its status, in total 265,479 text messages were sent to customers in the area to communicate latest updates and support available. This includes messages sent to household and non-household customers. 74,490 people viewed our incident updates across the website, with splash notifications targeted at post code regions and live incident updates for Morecambe and Lancaster areas.

We made over **7,000 bottled water deliveries** to customers registered on our priority services list across Lancaster and Morecambe. Deliveries happened across Saturday, Sunday and Monday evenings. Meanwhile, apology letters were issued promptly to support concerned customers.

Figure 20 - Apology letters sent to impacted customers



e) Media and stakeholder engagement

Throughout the main period of impact, local and regional media outlets were in regular contact requesting updates on the situation. Some national publications also contacted us or covered the local issue as part of articles on the wider impact of freeze-thaw across the UK.

Our initial press release was issued to the North West media on 8 December and focussed on what customers could do to protect their pipes in the predicted cold weather. As the likely scale of the event became more apparent, the coverage of our press releases expanded to include customer contacts and advice on broader topics.

We also carried out a number of broadcast interviews with local radio stations and BBC North West Tonight on 15 and 16 December.

During and immediately after the event, we continued to provide interviews to local radio and television. Throughout the main period of impact, local and regional media publications were also in regular contact, requesting updates on the situation. Some national publications also contacted us or covered the local issue as part of articles on the wider impact of freeze-thaw across the UK.

As the risk to supplies in the Lancaster and Morecambe area became clearer, we issued more targeted press releases, with media requests moving on to details on the bottled water stations, and our support for Priority Services customers. As supplies came back on, we continued to respond to media enquiries, with a new focus on compensation.

In addition to supporting the media, regular updates were provided to key national and regional stakeholders. Overarching updates were provided to Ofwat, CCW, Defra, DWI and to all North West MPs. More targeted updates and further detail was also provided to Local Resilience Forums and to MPs or key councillors where there were more specific issues affecting their constituents, such as in the Lancaster and Morecambe area.

Initial updates were provided to Ofwat, CCW and all North West MPs on 16th December. These updates were designed to highlight that the sustained sub-zero temperatures had already resulted in significant increases in calls to our contact centre, often relating to frozen plumbing inside customers' homes or businesses. The updates also highlighted that further issues could arise when the temperatures started to rise over the weekend. The notes explained what advice we were providing to customers and what work we had undertaken to prepare for the potential freeze-thaw event.

During the event regular updates continued to be provided, which were designed to set out the current nature and scale of the event, what we were doing to support customers and other stakeholders, how we were managing the situation in terms of production and leakage levels and to highlight potential future risk areas.

The final specific update provided to Defra, Ofwat, CCW and the DWI was at 14:20 on 23rd December. This note highlighted that production levels remained strong and leakage was reducing which had meant that we had seen a daily 0.2 billion litre improvement in our regional storage levels, which were continuing to improve. The update also stated that we only had one remaining event which was a business as usual event impacting a small number of customers in Manchester.

The note emphasised that our senior leadership team were continuing to coordinate the incident response at an Executive level and would remain on cover through the Christmas holiday period. It also confirmed that we still had additional resources in place and contingency plans on standby if they needed to be activated.

The note concluded that we expected to move to 'yellow' status tomorrow as part of PIM reporting process and that we were proposing to cease daily reporting and move to reporting by exception if the situation changed.

f) Non Household customer communications

In 2018 we had a dedicated portal and support team to communicate with retailers and had recently achieved the top rating for dealing with emergencies in a Water Retail Magazine survey.

Following the 2018 event a data quality review was undertaken and as a consequence, we improved the classification of premises and collected emergency contact details for all tier 1 to tier 4 sensitive non-household customers, so that we could contact them directly in future.

We have continued to work with all retailers to increase the amount of NHH customer contact information we hold, although there remain significant gaps in the information we hold directly and we therefore continue to need retailers to assist us with communications. The business customer information that we have, such as email and text contacts, has now been built into our proactive customer communications tool. This meant that when a postcode area was identified as being affected by the freeze-thaw, we were able to automatically identify the (household and) non-household customers affected and directly message those customers with the relevant information and advice.

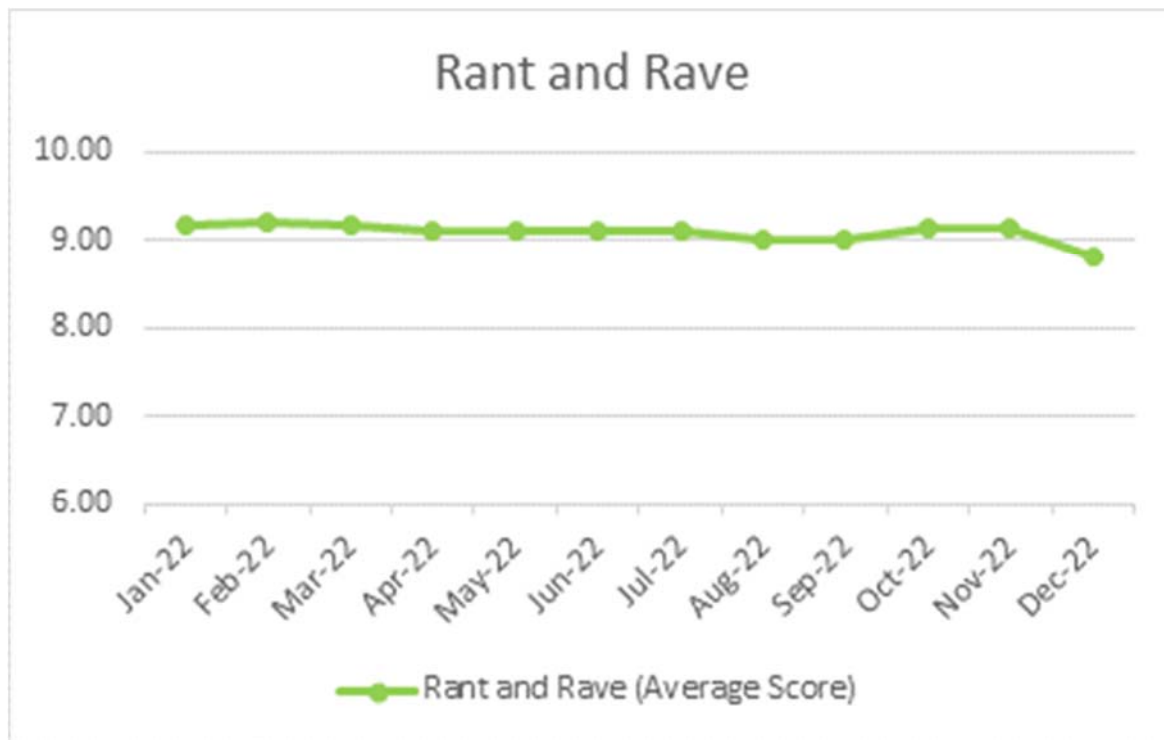
The improved data and systems meant that we had better visibility of sensitive non-household customers (such as schools, hospitals, prisons etc.) and were able to be more proactive in our communication with them. We were also able to use Automated Meter Reading data to identify possible customer side leaks. We then visited these customers and affected repairs. This proved a very worthwhile exercise.

We also had regular liaison with NAVs to check if they were experiencing any bulk supply issues. This liaison confirmed that none of our bulk supplies were affected, but the liaison was very welcome from the NAVs.

g) Customer satisfaction and perception

We seek to understand the qualitative impact of our performance and communications, through a number of means. These processes are designed to ensure that we can identify any potential issues and to allow us to continually improve. One of our key performance measures for customer satisfaction is “Rant and Rave”.

Figure 21 - Rant and Rave customer satisfaction scores for 2022



For each customer contact we receive, we send a text asking the customer to rate how satisfied they are with the service. In December we received feedback from 5,259 customers, rating our service at 8.80.

As can be seen from Figure 21, although there was a dip in score in December the processes that we had put in place to prepare for, manage and communicate to customers throughout the event meant that the dip was relatively modest despite the service disruptions that some customers were experiencing.

We believe that this results both from customers being patient and understanding about the difficult circumstances we were operating in as well as the additional efforts we were making to sustain and recover service and communicate with customers proactively.

3D Identification and support for vulnerable customers

3D1 Review and lessons learned from the 2018 freeze-thaw

How we performed during the 2018 freeze-thaw

Ahead of the 2018 freeze-thaw incident we had significantly increased the number of customers on our Priority Services register and during the incident we provided them with proactive communications and support.

- In the 2018 event we had delivered regional partnership working to co-create new support for customers struggling to pay, through the creation of the Independent Affordability and Vulnerability Panel and initiatives such as the North West Affordability Summit.
- As a result of effective promotion and raising awareness, the number of customers on our Priority Services register had more than doubled in recent years to over 50,000.
- Our customer incident team used GIS data to identify Priority Services customers within affected postcodes.
- We communicated proactively to Priority Services customers using the 'Go-Pro' tool to send updates via text, email and voice blasts.
- Responses were tailored to individual needs with rapid assistance when an incident occurred.
- We checked proactively with customers that they were back on supply.
- We were able to maintain our business-as-usual service to these customers, who received bottled water deliveries and two to three phone calls a day to ensure they were satisfied, until the situation was back to normal for them.
- We were in active liaison with local resilience forums, councils, local health services and charities to identify and provide assistance to customers.

Summary of Ofwat feedback on UUs performance in the 2018 freeze-thaw:

- *We are encouraged by the steps that **United Utilities has already taken to identify customers that may need additional assistance** and as a result has succeeded in increasing take-up of the service by 140 per cent and now has more than 50,000 customers on its Priority Service Register.*
- *We also recognise that, during the incident, **United Utilities was actively liaising with LRFs, councils, local health services and charities to identify and provide assistance to customers who might need additional support** and after the incident, the company was proactive in checking that customers were back on supply.*
- *The evidence the company has provided, indicates that it has **sought to build on lessons learned from previous incidents, to engage with customers to understand and respond to their needs and to improve the company's ability to target its response and provide rapid assistance when an incident occurs.***

Lessons learned from the 2018 freeze-thaw

Working with the electricity sector

We actively shared data with Electricity North West to pool knowledge and share best practice, which has allowed us to minimise customer impact during events.

We enhanced our incident management procedures, specifically for weather related incidents, to provide a joint response and support where we can. Our response includes the delivery of alternative supplies, customer support hubs and sharing of information between companies if vulnerability is identified.

Working with other partners

We have reviewed our current ways of working as part of our normal post incident review process and made further enhancements:

The incident emphasised the importance of connecting with the third sector and the effective tailoring of messages. This learning has been applied during all subsequent events where we have engaged with, and tailored our messages for, the third sector.

We set up a dedicated bottled water delivery service to ensure that vulnerable customers can be supported if they are affected by loss of supply events.

We worked with the independent Affordability and Vulnerability Panel to review our proposals and challenge us to improve our services.

3D.2 Subsequent enhancements to UUs capabilities

As part of the PR24 process a common, industry wide, performance commitment was developed, which measures the percentage of households that are on companies Priority Service Registers as well as attempted and actual contacts that companies have had with these customers.

This measure is designed to help to increase the number of customers in vulnerable circumstances that receive the most appropriate service to their needs and to ensure that companies are incentivised to keep the register up to date.

We have performed well across all three criteria, with 5.9% of customers being registered at the end of 2021/22 compared to a performance commitment target of 4.8%. This increased the number of vulnerable customers that we were able to contact and provide support to during the 2022 freeze-thaw.

Other enhancements

We obtained verification to British Standards 18477:2010, which specifies the critical procedures to ensure inclusive services are available and accessible to all consumers equally, regardless of their personal circumstances. The work we did to achieve this verification meant that we were better prepared and able to deliver an effective and inclusive service for customers in vulnerable circumstances who were affected by the 2022 freeze-thaw.

Data sharing - Since February 2018, weekly priority services data sharing has taken place between United Utilities and Electricity North West (ENW), with over 120,000 data items having been shared to date.

We have also shared data more widely through the North West Utilities Together Group, which comprises of United Utilities, Electricity North West, Cadent Gas and Northern Gas Networks. This group jointly promotes their priority services registers, water/money efficiency messages and joint water and energy audits for vulnerable customers. This work increased the number of customers that we were able to contact and support during the freeze-thaw.

System development – We have also developed technology platforms to enhance data transfer, for example with the creation of a Priority Services Portal, which is currently being trialled by Citizens Advice Manchester (CAM). CAM can register customers to the new portal and the data is then automatically passed to recipients on a daily basis. The new platform has both simplified the process for CAM to register customers and has helped to increase the number of customers that we can support during incidents such as freeze-thaws.

We have also collaborated with and shared data on the Resilience Direct civil contingency platform, which has also helped to identify additional vulnerable customers.

3D.3 How we performed in the 2022 freeze-thaw

At the time of the 2018 freeze-thaw over 50,000 customers were on our Priority Services register. As a result of effective promotion and raising awareness alongside the established data sharing of Priority Services customers with Electricity North West, the Priority Services Register has reached almost 9% of our customer base – totalling over 282,000 customers in January – with a further 4,000 customers registering for the scheme during the freeze-thaw.

Our ongoing verification to British Standards 18477:2010 for customer inclusivity, ensured we followed correct guidelines for an inclusive service for customers living in vulnerable circumstances.

Our “Winterwise” information and advice campaign had been enhanced to include additional ‘how to’ advice on our website, with interactive content suitable for use across social media channels and specifically to include material to use with other organisations supporting some of our more vulnerable customers.

Priority Service customers who were impacted by loss of supply due to an Incident were identified using GIS data. We communicated regularly and proactively with these customers by text, email and voice blasts. Responses were tailored to individual needs with rapid assistance provided where this was identified as being required. We also made “checking in” type calls (warm calls) to our most vulnerable customers including our Dialysis customers, to make sure they were ok and identify whether they needed any additional support or bottled water etc.

Through our connection with the NW Utilities Together group, we ensured we had the correct relevant information if customers had questions about their energy bills through the freeze-thaw.

As we had done in previous incidents we also mobilised our dedicated bottled water delivery services to ensure that vulnerable customers could be supported if they were affected by loss of supply. This process is now well established and is managed by a customer team within the integrated control centre (ICC) who have systems and reports in place to identify and communicate out the relevant information. The contract we now have in place with Water Direct also includes specific arrangements for them to courier bottled water to priority services customers upon request. These changes that we had made to our bottled water arrangements contributed to our overall resilience throughout the incident and ensured that we were able to provide regular bottled water deliveries to Priority Services customers and care homes impacted by the incident.

We focussed on regional partnership working to provide ongoing support for our most vulnerable customers. As such we were in active liaison with local resilience forums and the third sector, including fire & rescue services, councils, local health services, charities and voluntary organisations to identify and provide assistance to customers - e.g. providing assistance to hotels in the Morecambe area that were housing migrants.

We provided additional help to our most vulnerable customers who contacted us if they had no support at home and were struggling with private issues (frozen internal pipework) by arranging bottled water and sharing their details with their local council for further support. Our priority services team of agents further followed up these calls to proactively check that customers were back on supply.

4. Compensation for impacted customers

This section reviews the processes for paying compensation that we adopted in 2018 and in 2022. It then sets out the numbers of impacted customers and the number and sets out the number, value and timescale of these payments.

4a. Review of the compensation payment process

How we performed during the 2018 freeze-thaw

In the 2018 freeze-thaw incident we were effective in identifying customers that had been impacted and we implemented lessons learned from previous incidents to ensure that payments to customers were made in a timely manner.

- As a consequence of the effective integration of our integrated control centre and our customer contact centre, we were able to identify accurately properties impacted by water supply interruptions and poor pressure.
- Payments were made quickly and to our enhanced GSS levels, which are in excess of statutory GSS payments.
- Where possible, payments were made directly to customers' bank accounts or credit applied to the account if the customer was in debt.

Summary of Ofwat feedback on UUs performance in the 2018 freeze-thaw:

- *United Utilities made a number of GSS payments as a result of the incident. These included payments to customers who were impacted by no water for periods of greater than 12 hours and 24 hours respectively, as well as customers whose planned appointments had to be rescheduled. These payments were in excess of statutory GSS payments and were made direct to the customer's bank account; via auto cheque or via a credit for customers' whose accounts were in debt.*

How we performed during the 2022 freeze-thaw

In the 2018 event the GSS compensation value was £20, which we considered to be insufficient and as a consequence we always paid £25. As a consequence of the review of GSS payments, following the 2018 event, GSS payments were raised to £30 for every 12 continuous hours that customers were impacted by no water. We have used this value since the change was introduced.

We still make discretionary (enhanced GSS) payments to customers whose supplies briefly returned (e.g. when demand reduced i.e. overnight) but they were then without supply the following morning. Although these payments are not strictly required under GSS, we make these payment to recognise that the customers had not observed the benefit of the return to supply.

Since the 2018 event we have continued to develop our approach to allow us to make compensation payments the quickest way possible to our customers.

We continue to use BACs where we have customer bank account details, cheques where we don't have this information and we credit the water account where a customer has arrears on their water charges.

Where a property is empty we write to the address to ask them to contact us. Where we can get a response, we then process a payment. Table 1 below shows the number and proportion of the 20,368 compensation payments that were made by each of these three routes, for the customers in Morecambe and Lancaster and those elsewhere.

Table 1 - Compensation payment by type

| Area | BACS | Cheque | Credit | BACS % | Cheque % | Credit % |
|----------------------------|--------|--------|--------|--------|----------|----------|
| Morecambe/Lancaster | 11,219 | 3,313 | 1,356 | 71% | 21% | 9% |
| Other Freeze-thaw | 3,087 | 1,273 | 120 | 69% | 28% | 3% |
| Overall | 14,306 | 4,586 | 1,476 | 70% | 23% | 7% |

4b. Customers off supply

The impacts of the event in terms of customer supply are most effectively assessed in two categories: the specific impact in the Lancaster and Morecambe area and the impact in the wider U UW region.

The total number of customers off supply for more than 12 hours was 22,464. This comprised 20,368 household customers and 2,119 non household customers.

17,808 customers were off supply for more than 12 hours in the Lancaster and Morecambe area. This comprised 15,888 household customers and 1,920 non household customers

Elsewhere in the U UW region, 4,656 customers were off supply for more than 12 hours. This comprised 4,480 household customers and 176 non household customers.

The numbers of affected household customers and the length of time taken to return these customers to supply is set out in Table 2 below.

Table 2 - Number of household customers off supply for more than 12 hours

| Area | <24 hrs | <36 hrs | <48 hrs | <60 hrs | >60 hrs | Total |
|----------------------------|---------|---------|---------|---------|---------|--------|
| Morecambe/Lancaster | 193 | 7,960 | 6,989 | 746 | | 15,888 |
| Other Freeze-thaw | 3,535 | 928 | | | 17 | 4,480 |
| Overall | 3,728 | 8,888 | 6,989 | 746 | 17 | 20,368 |

The numbers of affected non-household customers and the length of time taken to return these customers to supply is set out in Table 3 below:

Table 3 - Number of non-household customers off supply for more than 12 hours

| Area | <24 hrs | <36 hrs | <48 hrs | <60 hrs | >60 hrs | Total |
|----------------------------|---------|---------|---------|---------|---------|-------|
| Morecambe/Lancaster | 1 | 792 | 839 | 294 | 0 | 1,926 |
| Other Freeze-thaw | 150 | 40 | | 0 | 0 | 193 |
| Overall | 151 | 832 | 842 | 294 | 0 | 2,119 |

4c. Compensation payments (number, value and timescales)

Household customers

As a result of the freeze-thaw, we made both GSS and discretionary payments for household customers. In accordance with the GSS guidelines, each household customer was paid £30 for every 12 continuous hours they were impacted by no water.

In addition if customers' supplies briefly returned (e.g. when demand reduced overnight) but they were then without supply the following morning, we paid a discretionary payment to recognise that the customers had not observed the benefit of the return to supply.

In total 20,368 customers received compensation. 15,916 customers received a GSS payment only and 4,452 customers received both a GSS and a discretionary payment. The total payment to household properties was £1,414,880 in GSS payments and a further £276,000 in Discretionary payments.

Non household customers

In accordance with the GSS guidelines, each non-household customer was paid £75 for every 12 continuous hours they were impacted by no water. The total payments to non-household properties was £413,775. For non-household customers payments are made to retailers who then should make the payment to the customer.

Timing of payments

For payments made by UUW:

- 79% of customers were paid within 15 working days of being impacted by the incident;
- 53% of customers were paid within 10 working days; and,
- 94.4% of customers within 20 working days.

For the remaining 5.6% of customers, we needed to undertake a more detailed review of the region wide pressure information to ensure that we were able to identify all the customers who had been impacted by the event.

In practice most of these customers may not have been aware of the event or would still have had some supply, although not to the required pressure, with only 2.6% of these customers contacting us directly. When paid, all of these customers received an additional £20 late payment penalty reflecting the delay in payment.

In addition, we wrote to all the affected properties in Lancaster and Morecambe. Where we had email addresses, emails were sent on 22nd December and where we didn't have email addresses, letters were sent by first class post. The letter provided an apology for having no water, and explained that we would provide compensation proactively, so there was no need for the customers to do anything.

5. Lessons learned

This document demonstrates that we learned and implemented lessons from the 2018 freeze-thaw. It also sets out the additional enhancements that we have made to our processes and systems, following the 2018 event and shows how these supported our response to the 2022 freeze-thaw.

UW has processes in place that ensure that lessons learned reviews are routinely undertaken and improvements are implemented, with UU Corporate Audit undertaking routine audits of our Emergency Planning and Incident Management processes. The outcome of these reviews and any actions are reported to the UW Board.

In the case of the 2022 freeze-thaw, we have undertaken a structured debrief of the event at task team level, with each of the task team leaders bringing their team member feedback to an overarching Director-led strategic review. Specific local actions and more generic strategic actions have been identified via this process and are now being collated to establish owners and timelines for completion. We are also looking to review lessons learned elsewhere across the industry and learn from best practice elsewhere.

We will also undertake an independent review of UW's incident management processes and arrangements, to test UWs practice during the event against current best practice. We are currently going through the procurement and commissioning process for this work, which we hope to complete by the end of April 2023.

Following the conclusion of the independent review, we will incorporate any material findings or recommendations into this report and publish the updated report on our website.

The key strategic lessons that we have learned from the incident in December 2022 are summarised below.

Planning and Preparation

- Whilst we routinely communicate with customers to encourage them to prepare for winter events and increase these communications when an event is forecast we are aware that not all of our efforts will reach all of our communities. In parallel to our communications our LRF partners also seek to prepare communities' for winter conditions. We have plans in place to explore with our LRF partners how we can collaborate more effectively on winter preparedness communications.
- We were able to expand our contact centre call handlers utilising contact centre agents from the billing area of the business. Whilst this was effective for providing customers with an update, they did not have direct access to the operational system. This meant that contacts were recorded on a separate system before being migrated to the main operational system. We are exploring system improvements to enable us to scale up our telephony teams and provide direct access to the operational systems for future incidents.

Management of the incident

- The steps we took to make full use of pressure management through Pressure Management Valve controllers is not a formal part of our predefined response plan. We are reviewing the efficacy and benefit of the steps we took with a view to making this a formal, documented and standard action in future events.
- We are continuing to develop our monitoring capabilities and our teams have started to consider how we can further systemise our activity. This will seek to "join up" information from our assets and customers into one single view to give a holistic view of the DMZ in one place.
- Accurate definition and localisation of the components of demand peaks in real-time is dependent on distribution input, district-metered area and customer-side metering. Our current regional customer meter penetration of 47% is a significant constraint in establishing a detailed and robust system water balance in real-time. Increased meter penetration would help support our response to future, similar events.
- During the freeze-thaw incident we utilised innovative water balance analytics. We plan to develop these systems further, to help to rationalise the demand components and target recovery activities more appropriately.
- We are part of an ongoing collaborative industry project ("Paradigm") aimed at developing advanced analytics to dissociate water demand into the relevant components. Alongside future plans to increase customer meter

coverage using smart meters in the future we expect this will further improve our targeted response to future regional demand-related incidents and business as usual activities.

- Our technical teams are exploring options to improve the cold weather resilience of the treatment process at our Huntington WTW.
- Investigations are ongoing to understand why assets and processes that have not previously frozen in exceptionally cold weather did freeze in 2022. Once understood we will update our winter resilience and preparedness plans for these units.

Communication with customers and other stakeholders

- The business customer information that we had built into our proactive customer communications tool proved effective in identifying non-household customers and directly messaging them with relevant information and advice. We will seek to enhance this data to ensure that the coverage and depth of contact details for non-household customers are as robust and complete as they can be.
- The tool and reporting we developed to identify possible customer side leaks using AMR data is being incorporated into our business as usual processes. Future increases in smart meter penetration will enable us utilise this tool and data more widely - at present we only have c20% AMR meter coverage for non households.

Identification and support for vulnerable customers

- We are undertaking additional reviews of our processes to ensure that they comply with the requirements of the new British Standards ISO22458:2022 relating to customer vulnerabilities.
- The benefits of data sharing with Electricity North West (ENW) were apparent throughout the freeze-thaw. We are working to extend the sharing arrangements with other electricity distribution network operators in our area and to continue to enhance the effectiveness of the North West Utilities Together Group.
- We also plan to fully roll out the Priority Services Portal, following the completion of the trial of the portal with Citizens Advice Manchester and to continue to share data on the Resilience Direct civil contingency platform.

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