

Utility Regulator's
report of the
investigation into the
Freeze/Thaw incident
2010/11

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Executive summary

Background

This report is the outcome of the Utility Regulator's investigation into NI Water's handling of the freeze/thaw incident of December 2010-January 2011. The incident resulted in around 450,000 consumers in 215,000 properties across Northern Ireland having their water supplies interrupted during adverse weather conditions.

On 2 March 2011, the Board of the Utility Regulator carefully considered this report and fully endorsed both its findings and its conclusions. The Board has requested the Executive team of the Utility Regulator to consider whether any of the conclusions reflect breaches of the conditions of the licence of NI Water, or the company's duties under statute, that may be ongoing or likely to occur in the future. Where such actual or potential breaches exist, the Executive team has been directed to ensure that either:

- the company agrees (and gives suitable undertakings to carry out) to provisions in the freeze/thaw recovery plan which is designed to ensure that they are stopped or prevented from taking place in future: or
- where necessary that proposals for enforcement action by the Utility Regulator are brought to the Board to be pursued in accordance with statutory due process.

The Board has also asked that the conclusions within this report are taken forward through a freeze thaw recovery plan.

Temperatures in December 2010 in Northern Ireland were the coldest for 100 years. Indeed, the two most recent winters have been exceptionally cold. This evidence of recent colder winters in Northern Ireland raises the prospect that preparations must be made for the possibility of similar adverse weather events in future. Consequently, many of the ensuing report conclusions are focused on mitigating against these effects and improving the consumer experience for the people of Northern Ireland.

Key findings

The report findings are summarised below. However, the headlines are as follows.

- The winter weather was exceptional (1 in 100 year event in established records), but with a changing climate could recur in the near future.
- Around 80% of the additional water demand caused by the freeze thaw leaked from domestic and business water pipes. The remainder was lost from NI Water's network.
- The water mains in Northern Ireland are relatively new compared with other parts of the UK, and performed as well as could be expected. There is no need for an immediate change in the mains infrastructure investment levels.
- NI Water was not prepared for a crisis of this magnitude and in particular there was a failure of the company's executive leadership.
- The company's execution of emergency planning was deficient, particularly in respect of communication with consumers.
- Front line operational teams worked effectively in very challenging weather conditions.

The investigation produced 51 conclusions which are included in the detailed report. For the purpose of this executive summary we provide an overview of these more detailed conclusions.

The cause and extent of the supply problems

There was a cold snap in early December and to respond to the conditions the company was in an elevated state of alert. This was still the case on 17 December when the heavy snow started. The low temperatures were unprecedented, the most severe in the past 100 years. But what was even more unexpected was the very rapid thaw, which started on 26 December.

As a result of a number of mains fracturing, the company elevated the emergency status to their highest category (a Category 1 incident). At this stage, the approach under their Major Incident Plan (MIP) was to:

- address the operational aspects by repairing the fractures;

- leave consumers to repair any bursts in their pipes; and
- increase the volume put into supply to compensate for losses from mains or consumers' pipes.

The Incident Management team met on the morning of 27 December and, by evening, a decision was made to introduce limited restriction of supplies (commonly known as rotation of supplies) to conserve local water supplies, particularly for a hospital. It was not until the next day that the company realised that more widespread rotation of supplies was going to be necessary. Significant volumes of water were being lost from consumers' pipes, demand for water was outstripping supply and water stocks were running low. Very swift operational action had to be taken to conserve water by cutting off supplies to large numbers of consumers. The company was not prepared for this; there was an immediate operational crisis and a need to communicate effectively with consumers.

The incident came to a close on 6 January 2011. At this point, consumers had fixed their pipes and the NI Water water mains had been repaired. The company was able to manage water demand within the distribution system rather than by using rotation of supplies.

At the peak NI Water increased water production to almost maximum capacity of its treatment works. However as the thaw developed, demand exceeded the maximum capacity of NI Water's treatment works by 20% which was why service reservoir levels depleted so quickly.

Our analysis indicates that at least 80% of the increased demand resulted from usage or bursts on consumers' properties. Commercial properties were closed during the holiday period and bursts went unnoticed and ran for longer. Survey evidence estimates that there were bursts on more than 40,000 consumers' properties (domestic and non-domestic).

Overall, our investigation found that NI Water's assets performed well during the incident despite difficult operating conditions and frost damage to some plants.

The investigation concluded that water mains in Northern Ireland are not at a greater risk of bursting than those elsewhere in the UK. Key findings supporting this conclusion include:

- the average age of water mains in Northern Ireland is 29 years, compared with an average of 45 years in the rest of the UK; and
- the burst rate per length of main (one measure of asset condition) is lower in Northern Ireland than the average in Great Britain.

This evidence supports the view that the freeze thaw incident was not exacerbated by any lack of investment in water mains.

Conclusions

NI Water's mains performed as well as could be expected under the harsh conditions by comparison with other water mains in the rest of the UK. Therefore, there is no need for an immediate change in mains infrastructure investment levels. However, there is a need for some further capital investment focused on improved flexibility of mains operation and better monitoring. There is also a need to think about the future investment needs arising from water resources management and a changing climate.

Detailed conclusions with respect to the cause and extent of supply problems can be found in Chapter 4 of the detailed report.

Contingency planning and implementation

NI Water's Major Incident Plan (MIP) was found to be broadly similar to those of other water companies. During our investigation we found strong operational ownership of the plan. However, implementation of the plan during the incident exposed a lack of corporate ownership and consumer focus.

Not all of the consumer service lessons from the 2009/10 freeze/thaw had been addressed. This compounded the customer communications failure in the MIP's application. A low priority had also been given to customer service initiatives and the company's executive team was not sufficiently focused on customer communications for the provisions of the MIP to be properly implemented.

NI Water's approach to the incident was more reactive than pro-active. The 'shadow' or standby team on alert could have taken additional pre-emptive actions if 'what if' scenarios had been fully explored. This would have helped mitigate the impact on consumers. The company was also reluctant to accept assistance from external sources. The MIP had not been adequately stress-tested to deal with an incident of this scale.

The company's executive team did not formally meet as a team or attend the HQ major incident centre at an early stage. The Director of Customer Service Delivery was however present at the incident from the 26 December onwards. It should also be noted that the significant efforts of the operational workforce ensured that the mains were promptly repaired.

Subsequent to the incident NI Water's MIP has been independently assessed. This assessment concluded that the MIP 'generally follows the conclusions of Chapter 5 (Emergency Planning) of HM Government's document Emergency Preparedness' (Guidance on Part 1 of the Civil Contingencies Act, 2004), and is consistent with the incident management plans in other water companies. It noted however that the highest category team (termed Gold), fulfilled both strategic and tactical tasks and supported the proposal that for an incident of this size there should be explicit provision for the mobilisation of the company's executive team. We would support that analysis.

Conclusions

NI Water must recognise that it is possible that a freeze/thaw event on this scale could happen again. The company's executive team needs to understand what its strategic role is in crisis management and it is recommended that this is defined within the Plan. The MIP must be regularly reviewed and stress-tested. The consumer perspective should also be considered. This is the case not only for similar events but for all emergencies.

In addition, other conclusions are made regarding the case for developing contingency plans for rotation of supplies, and for a review of access to live information from the field to the customer contact centre during an incident. It is also important to identify potential additional sources of assistance which can be mobilised during an incident. Consideration should be given to the development of a Northern Ireland, and perhaps all-Ireland, mutual aid programme.

Detailed conclusions with respect to contingency planning and implementation can be found in Chapter 5 of the detailed report.

Communications with consumers

Our investigation clearly indicates that communications by NI Water to consumers was very ineffective. A separate report on consumer matters has also been prepared by the Consumer Council¹

Key findings from the Utility Regulator's survey of consumers include the following facts:

- 13% of respondents were aware of NI Water's winter campaign advising people to protect their pipework during the cold weather;
- 78% of respondents, whose supply was interrupted, said there was no information to tell them why their water supply had failed;
- 51% of those who spoke to NI Water were either very dissatisfied or dissatisfied with the level of information they received;
- 37% of those who tried to contact NI Water said their calls were not answered.

A fundamental shortfall in customer communications throughout the handling of this incident seems to stem from a lack of ownership and knowledge of the outsourced customer call centre operations. This resulted in weak internal management and accountability for related customer services. This should not have been the case.

¹ Consumer Council Northern Ireland 'Left high and dry: A Consumer Council report on consumers' stories and experiences of the water crisis', February 2011.

There does not seem to have been any specific consideration of resources and technical requirements to address a surge in calls arising from a major incident.

Operational issues drove major incident team decisions, and initial rotation of supplies commenced on the night of 27 December without any notification being given to affected consumers. Further and more widespread rotation of supplies was commenced on the morning of 28 December, within 30 minutes of taking the decision. This left the communications team little or no time for proactive consumer communication.

There were shortfalls in the processes for making adequate and accurate information accessible to consumers. The website, designed as a public relations tool, could not cope with the volume of 'hits' as consumers were directed to it for information. During the incident there was no existing mechanism for converting available operational postcode information for properties affected by rotations into a format suitable for the website.

Most if not all of the customer service communication issues arising during the incident were foreseen (call centre staffing levels from 2009/10 incident) or foreseeable (the need to convert operational post code data into an accessible form for consumers).

Conclusions

Much more advice and support needs to be given to consumers to help them prepare better for harsher winters.

Success in a similar freeze thaw event in future will be measured by actual communication performance before and during the event. NI Water should review the management and contractual arrangements for its call centre. It should also review practices so that more up to date and preferably live information is available to the call centre during an incident, and that full use is made of modern technology to manage the satisfactory handling of large volumes of calls. This is viewed as a particularly critical area, so that consumers are dealt with in a more caring and effective way.

NI Water must not rely solely on the internet and must plan and prepare to add other methods of communication where appropriate. The use of a range of communication channels must include an integrated mix of contemporary and traditional methods.

It is essential that a particular effort is made to improve communication with critical care consumers and build the critical care register.

A crucial task is for the company to rebuild consumer confidence. An example would be for the company to communicate with its consumers regarding preventative action which can be taken in advance of next winter. .

Detailed conclusions with respect to communications can be found in Chapter 6 of this detailed report.

Governance, leadership and management

Governance systems were in place and assurances were provided to and accepted by the Board regarding the company's preparedness for the winter freeze thaw event.

The Chief Executive's relationship with his executive team was not strong and not helped by disciplinary issues. The company's executive team did not anticipate an incident which would have caused such a widespread failure in water supplies to consumers.

The experience of the 2009/10 freeze/thaw event may have led to complacency and the company's executive team failed to foresee the possibility of having to rotate supplies. This, together with a failure to focus on consumer communications resulted in a major incident becoming a crisis.

Companies can only realistically prepare for what they can foresee, and allowance needs to be made for this. However, this event was of very similar nature to that in 2009/10; differing mainly in scale. The company should have learned the lessons therefore and been better prepared.

The strong operational workforce was well managed and worked tirelessly over long periods in adverse weather conditions.

Conclusions

The company's leadership needs to review and assess the skills and experience required to manage a major water utility. This review should be reflected in any recruitment and restructuring. There must be an urgent focus on rebuilding the cohesion of the company's executive team.

The incident exposed serious failures in management. It is important to recognise these failings and deal with them. A major effort should also be put into providing stable direction and re-energising the entire workforce to ensure that the company can deliver a reliable water service to the people of Northern Ireland.

The overarching lesson is that there is the need for senior leadership of the company to refocus the culture from impersonal utility service to personal customer service.

Detailed conclusions with respect to governance, leadership and management can be found in Chapter 7 of the detailed report.

Future risk and mitigation

The water industry is exposed to a wide range of risks and must plan for these. Extreme climate conditions such as drought, freeze thaw events and flooding are amongst the risks which NI Water must plan for. In doing so it must manage the risk, and balance the costs and benefits of design standards to address extreme conditions. It must plan for a defined level of response and determine the action it will take.

Given that some 80% of the additional water lost as a consequence of this incident arose from consumers' own pipework, we set out a number of conclusions aimed at minimising the impact of a future event on this scale. Amongst these is an observation that the English and Welsh Water companies offer a free or subsidised supply pipe repair service to help control leakage.

It is noted that when a major incident arises, responsible organisations do everything in their power to manage and limit the impact of any service failure on its consumers. This, however, comes at a price. The estimated cost of this incident to NI Water was of the order of £7.5 million. This does not reflect the considerable costs that many individual households and commercial premises incurred. These costs should also be considered when assessing cost benefit analysis in the context of managing future risks.

Conclusions

In identifying the range of risks which NI Water must plan for we have set out a number of conclusions that include: the need to take account of best practice; the need to consult on the level of emergency response and accompanying costs that consumers expect and are willing to pay for; and the need to continue to develop its asset data and asset management systems to ensure that investment decisions are effectively and efficiently targeted.

A series of conclusions also identify how NI Water and indeed Northern Ireland can be better prepared for any future weather events. These include measures on how consumers can be better advised and supported in future.

**UTILITY REGULATOR FREEZE/THAW
INVESTIGATION DECEMBER
2010/JANUARY 2011**

FREEZE/THAW RECOVERY PLAN

This Freeze/Thaw Recovery Plan will be addressed by the Utility Regulator in conjunction with NI Water and the wider stakeholder group as appropriate.

FREEZE THAW RECOVERY PLAN		(UR INVESTIGATION)		
Action from Recommendations		Lead	Time frame	Date for Completion
1. EXTENT OF SUPPLY FAILURES				
1	<p><u>Fittings</u> NI Water should identify and assess the performance of key components affected by frost action and consider whether it can take action to prevent these difficulties arising in the future. For example the company reported failures on valves, exposed fittings etc. Before embarking on changes, the company should undertake a risk-based assessment to justify, target and prioritise the necessary investment.</p>	NIW	Short Term	
2	<p><u>Plant Items</u> NI Water should identify learning from the failure of plant through the incident and incorporate this into its design standards.</p>	NIW	Short Term	
3	<p><u>Service Reservoirs</u> NI Water should assess service reservoirs which have a higher inherent risk of supply failure and are likely to require tankered volumes of water to maintain supplies. The company should ensure that access and connection arrangements are adequate including provision of hard standing for parking tankers.</p>	NIW	Short Term	
4	<p><u>Mains isolation</u> NI Water should capture information on key valve locations including GPS reference and photographic information to ensure that critical information is stored centrally and can be communicated to field staff during an incident. The company should check that isolation plans are in place for its service reservoirs and develop more detailed plans for network isolation. The company should consider developing an isolation routine on its GIS system which would allow the valves necessary to isolate any section of the network to be identified quickly.</p>	NIW	Short Term and Ongoing	
5	<p><u>Call volume reports</u> The company should develop the call volume reports available to the Incident Command Team. Call visualisation and reports based on geographic areas might be difficult to interpret. The company should consider the production of reports of calls related to particular assets, such as service reservoirs or DMAs, which could provide early warning of developing situations related to the asset base to quickly focus on problem areas.</p>	NIW	Short Term	
6	<p><u>Telemetry</u> NI Water should consider developing pressure monitoring of the distribution network to provide real time pressure data as an early indicator of a reduction in service. The development of this approach should be based on an analysis of how the network might have responded to increased flows during the 2010/11 freeze thaw to demonstrate that it would produce valuable results to which the company could respond. Pressure management to assist leakage reduction is provided for within the PC10 Final Determination. The company should consider extending this to include pressure measurement on telemetry.</p>	NIW	Short Term and Ongoing	

FREEZE THAW RECOVERY PLAN		(UR INVESTIGATION)		
Action from Recommendations		Lead	Time frame	Date for Completion
7	<p>Access Routes</p> <p>The company should review its access routes to critical assets and make arrangements with Roads Service to request that routes are salted to maintain access under frozen conditions.</p>	NIW	Short Term	
8	<p>PPP Water Treatment Works</p> <p>NI Water should take the steps available to it under the PPP contract to ensure that any weaknesses in the PPP assets exposed by the freeze thaw event are rectified and that sufficient steps are taken to ensure that the full contracted plant capacity can be available when demand is at its peak.</p> <p>Once the company has taken the action recommended above, it should review the assumptions regarding PPP plant output in its draft Water Resources Management Plan to reflect the residual risk of reduced plant output at critical times.</p>	NIW	Short Term	
9	<p>Water Resources Management Plan</p> <p>NI Water should review its draft Water Resources Management Plan to include a critical period assessment covering peak winter demands. NI Water should work with other water service providers, policy makers and regulators in GB and RoI to assess the likely occurrence and impact of peak winter demand and develop a rational, risk based approach to this issue.</p>	NIW	To Inform Future Price Controls	
10	<p>Water Resources Management Plan</p> <p>NI Water should continue the work done under the draft Water Resources Management Plan to assess the hydraulic capacity of the existing and planned trunk mains drawing on the experience gained of operating at full capacity over a sustained period.</p> <p>NI Water should assess the resilience of the trunk main network drawing on lessons learnt from the freeze thaw incident in 2009/10 and 2010/11.</p> <p>The company should also work with policy makers, stakeholder and regulators to define appropriate levels of service in consultation with consumers.</p>	NIW	To Inform Future Price Controls	
11	<p>Service Reservoirs</p> <p>NI Water should review the capacity of its service reservoirs in detail to identify individual reservoirs which do not have sufficient capacity to reduce the risk of service failure to acceptable levels. The assessment should consider the risk and consequential impact of supply failure resulting in a clear statement of need. The assessment should take account of the resilience of the supply arrangements and an appropriate level of service informed by consumer views and developed in conjunction with policy makers and regulators.</p>	NIW	To Inform Future Price Controls	
12	<p>Water mains</p> <p>NI Water should complete an assessment for bursts which occurred during the freeze thaw to determine whether a planned programme of mains replacement could have prevented the bursts which occurred during the incident and then take account of this in its future proposals for mains rehabilitation.</p>	NIW	To Inform Next Price Control	

FREEZE THAW RECOVERY PLAN		(UR INVESTIGATION)		
Action from Recommendations		Lead	Time frame	Date for Completion
13	<p><u>Water mains</u> NI Water should develop its water mains quality programme in conjunction with the DWI so that the extent of the quality programme is defined and a rate of addressing current quality shortfalls agreed. On the basis of the limited investigation to date this may have the consequential benefit of reducing mains bursts (generally occurring on old cast and spun iron mains) during freeze thaw events if mains replacement or structural relining options are implemented.</p>	NIW	To Inform Next Price Control	
14	<p><u>Water mains</u> NI Water should investigate the bursts that occurred through the winter of 2009/10 and 2010/11 to develop its understanding of the mechanisms that cause pipe failure which might inform its future asset management procedures. The factors which should be considered in this assessment will include mains age, mains material, air temperature, soil temperature, water temperature and soil type.</p>	NIW	To Inform Next Price Control	
15	<p><u>Cost Benefit</u> NI Water and other stakeholders should recognise that extreme weather conditions can have an impact on the performance of plant. For example: biological and chemical processes become inhibited as temperatures fall, and low temperatures increase pipe bursts. It would be expensive to design plant to secure performance in all circumstances. Attempting to do so can result in plant which is so large that it is detrimental to normal operation. Policy makers and regulators should consider their requirements for the company to design for all circumstances and ensure that design standards, consents, licences and regulatory action take account of the costs and benefits of investing to deliver full compliance in all circumstances.</p>	NIW	Longer Term	
Action from Recommendations		Lead	Timeframe	Date for Completion
2. CONTINGENCY PLANNING AND IMPLEMENTATION				
16	<p><u>Company's executive team role</u> NI Water should review the efficiency of its planning arrangements for an event of this scale. In doing so the company should consider whether existing arrangements allow the Gold team to maintain an appropriate strategic focus or whether plans need to be amended to formalise arrangements for strategic support from the company's executive team.</p>	NIW	Short Term	
17	<p><u>Testing of MIP Response</u> NI Water should review its processes for testing the incident management response in light of the recent incident. As part of this review the company should consider the use of more frequent focused exercises to test specific elements of the plan in addition to large-scale exercises. These exercises should make use of both desk top and staged exercises; use of 'unwarned' testing; and use of industry experts to help develop scenarios to fully test the plan.</p>	NIW	Short Term and Ongoing	

FREEZE THAW RECOVERY PLAN		(UR INVESTIGATION)		
Action from Recommendations		Lead	Time frame	Date for Completion
18	<p><u>Independent Audits</u> NI Water should ensure that more frequent independent audits of the emergency plans are undertaken. This is a requirement in the rest of the UK, whereby annual audits of compliance against Security and Emergency Measures Direction (SEMD) are undertaken by certified auditors on an annual basis. We would encourage the Department for Regional Development to require this in any guidance it issues to accompany the Preservation of Services and Civil Emergency Measures Direction. We would also recommend that this guidance requires the company to undertake an annual review of its plan and clearly defines the company's obligations. These should include those relating to alternative supplies and the need to work with other bodies to secure information about vulnerable customers.</p>	NIW	Short Term	
19	<p><u>Co-Location of Centres</u> NI Water should review the benefit and priority for co-locating the telemetry, Work Control and Incident Management centres to facilitate greater interaction between them. PC10 provided for the costs of this work, and if the company considers this to be a significant issue it is encouraged to prioritise this aspect of its plans. We note however that this is not the practice in all companies and should not be a reason for any shortfall in service.</p>	NIW	Short - Medium Term	
20	<p><u>Information Flow</u> NI Water should review the operational practice associated with reverting to the manual dispatch of jobs during incidents. This mode of operation affects the ability to provide 'real time' feedback on the progress of jobs from the field to the incident team and to the call centre. This impacts on the company's ability to respond to customers effectively during an incident. The company should consider how more up to date information can be provided to the call centre.</p>	NIW	Short Term and Ongoing	
21	<p><u>MIP – rotation of supplies contingency plan</u> NI Water should develop the appropriate contingency plans to address the future possibility of the need to rotate supplies. It should include the development of an appropriate customer communication strategy. The company should also consider using network modelling to inform operational procedures so that accurate information on the timing of supply interruptions can be relayed to consumers.</p>	NIW	Short Term	
22	<p><u>Emergency isolation of supplies</u> NI Water should conduct an audit of whether its powers to isolate consumer supplies during an emergency are adequate. In light of the outcome of that audit DRD should consider whether it should make new regulations under the order or amend the order so as to ensure the company has adequate powers to respond to such events.</p>	NIW	Short Term	
23	<p><u>Alternative Supplies</u> NI Water should review its approach to alternative supplies in light of the experience and knowledge gained during this event. This should include a review of the distribution of alternative supplies for events where the affected consumers are widely dispersed among consumers still on supply. It should also review its arrangements for obtaining increased volumes of bottled water in emergency situations.</p>	NIW	Short Term	

FREEZE THAW RECOVERY PLAN		(UR INVESTIGATION)		
Action from Recommendations		Lead	Time frame	Date for Completion
24	<p>Mutual Aid</p> <p>NI Water should identify potential additional sources of assistance which can be mobilised during an incident. The Utility Regulator also thinks there would be merit in establishing a Northern Ireland Utilities Mutual Aid Programme in which all utilities could participate. The Utility Regulator will give further thought to the development of a NI Utilities Forum which could also facilitate wider risk management and investment discussions. It should also consider other sources of assistance, including the Republic of Ireland as well as the Water UK Mutual Aid scheme.</p>	NIW	Short Term	
25	<p>Civil Contingencies Group NI</p> <p>NI Water should consider how it can best utilise the resources of the Civil Contingencies Group (NI) in widespread incidents such as that experienced. It is also recommended that lessons from the current incident are defined, brought to the CCG for consideration and addressed for the benefit and assurance of all stakeholders and citizens of Northern Ireland. It is also recommended that NI Water is included as a specified body under regulation 57(4) of the Civil Contingencies Act 2004 (Contingency Planning) Regulations 2005.</p>	NIW	Short Term	
Action from Recommendations		Lead	Timeframe	Date for Completion
3. COMMUNICATIONS				
26	<p>Protect your pipes – Winter Campaign</p> <p>NI Water should further develop its annual campaign on 'protecting your pipes' to increase consumers' awareness of it and the importance of protecting their water pipes and other fittings from frost. More people may view the 'Protecting your pipes this winter' video if it was available for viewing directly from the niwater.com website and not via a link to YouTube. Other means of access to this information must be developed for those who do not have website facilities.</p>	NIW	Short Term	
27	<p>Protect your pipes – helpful information</p> <p>NI Water should review its information on approved plumbers to ensure that this is up to date and relevant to NI. They may also wish to explore the feasibility of providing access to a home insurance and emergency repair service provider to match all other GB water utilities. The company should also consider how it can establish a personal contact with all consumers and in doing so draw their attention to the new information on protecting pipes, plumbers, home insurance and critical care.</p>	NIW	Short Term	
28	<p>Call Centre</p> <p>NI Water should ensure that it has a full understanding of its telephony system including use of Interactive Voice Response (IVR). NI Water should consider ring fencing separate emergency and priority lines, for example hospitals and MLAs, so that urgent calls are not lost in a situation where call lines are busy or overwhelmed. NI Water should consider ring fencing separate capacity for outbound lines so communicating with customers or the wider business is not hindered when call lines are overwhelmed.</p>	NIW	Short Term	

FREEZE THAW RECOVERY PLAN		(UR INVESTIGATION)		
Action from Recommendations		Lead	Time frame	Date for Completion
29	<p><u>Call Centre</u> NI Water should develop a template so that adequate telephony management information is provided to the Incident Team so that informed decisions can be made and guidance offered. Information should include total calls offered at network, calls at switch, abandoned calls, numbers of engaged tones, average wait, longest wait, IVR performance, last update of IVR, numbers of calls taken split by category, numbers of resources available, call forecasts and resource gaps. Where appropriate, information should be provided per line e.g. Waterline, Leakline, MLA line. All managers should be briefed on the importance of this information and the intelligence that can be extracted from it.</p>	NIW	Short Term	
30	<p><u>Call Centre</u> NI Water should conduct a review of its call overflow facilities both internally and externally. Regular reviews of call forecasts should be made in an incident situation. Resource planning must be started and in place well before the start of an anticipated event, such as a freeze thaw. An understanding of the potential resource requirements and shortfalls should be gained to ensure that sufficient resources are in place. Formal standby arrangements must be considered to ensure that resources can be mobilised as needed. A formal commitment should be sought from employees, and there should be less reliance on goodwill.</p>	NIW	Short Term	
31	<p><u>Call Centre</u> NI Water should review its outsourced contract, including business continuity plans, for the Call Centre and ensure performance levels and tolerances reflect the possible needs that may arise during an incident. Agreement should be made on work priorities (for example, SLA performance, customer experience, priority of work types and work volumes).</p>	NIW	Short Term	
32	<p><u>Call Centre</u> The Company should consider the benefits of double skilling its workforce to provide extra and more flexible resources in the event of major incidents.</p>	NIW	Medium Term	
33	<p><u>Stakeholders</u> In relation to getting messages out to consumers NI Water should consider the use of proactive customer contact methods to help inform key customers about supply interruptions and other emergencies (for example, SMS texting etc). NI Water should also consider using stakeholders and other parties (such as UFU, MLAs and community groups) more to assist with getting messages out. NI Water needs to improve stakeholder management processes and procedures to restore confidence and trust.</p>	NIW	Short Term	
34	<p><u>Consistency and Updating of Information</u> NI Water should review the various means with which it communicates with its customer base, matching different customer needs to the particular tools employed. An examination of good practice by other similar companies should inform this review. NI Water should also review the language it uses to communicate with consumers to ensure that it is consumer-friendly and not operationally focused. To ensure that consistent and accurate messages are relayed to consumers, NI Water should put in place updating procedures for all consumer contact points (such as the website, call centre, media).</p>	NIW	Short Term	

FREEZE THAW RECOVERY PLAN		(UR INVESTIGATION)		
Action from Recommendations		Lead	Time frame	Date for Completion
35	<p>Website</p> <p>NI Water should review the website's purpose, content and functionality. As part of the review the company should explore options for making available at short notice critical information during major incidents. It should also review all of the literature and other information that is on the website to ensure that any guidance provided is helpful. This is not currently the case, for example, for contact information for SNIPEF approved plumbers. A particularly important aspect of any website is its currency, and NI Water should ensure that it has effective processes in place for regular updates.</p>	NIW	Medium Term	
36	<p>Critical Care</p> <p>NI Water should review its website to ensure that the Critical Care Register information is both consistent and accessible. NI Water must ensure that similar to NIE that it provides clear information to its critical care customers on the service it will provide during a major incident and during any planned interruption to supply. NI Water must aim to have a fully developed critical care register which is comparable to the list utilised by NI Electricity. NI Water should in common with other utility companies in Northern Ireland refresh its critical care register on a monthly basis.</p>	NIW	Short Term	
Action from Recommendations		Lead	Timeframe	Date for Completion
4. GOVERNANCE AND LEADERSHIP				
37	<p>Company's executive team roles</p> <p>NI Water should define formal roles for Executive Team members within the Major Incident Plan. The Executive Team should also take greater ownership of the MIP to ensure that its corporate importance is recognised, that the shortfall in customer services expertise is addressed, and that the Executive Team engage in MIP mock exercises and challenge its effective operation and the company's preparedness.</p>	NIW		
38	<p>Risk register</p> <p>The process of preparing and challenging the risk register generated by the Executive and reviewed by the Audit Committee and Board should be flexible and responsive enough to identify and highlight risks and their mitigation as they arise.</p>	NIW		
39	<p>Skill sets and experience</p> <p>The company should review and assess the skill sets and experiences in its Executive leadership. This should be considered for the specific context of NI Water and its requirements, not merely by a benchmarking exercise which while informing may miss the crucial need for experienced corporate water industry knowledge. There needs to be a strong customer service focus as well as an ongoing focus on delivering efficiencies and improving services.</p>	NIW		
40	<p>Director role</p> <p>NI Water should re-evaluate the Director of Customers Services role in the context of the MIP and consider if too much is expected from one individual (operations, engineering, customer relations, media planning and business recovery).</p>	NIW		

FREEZE THAW RECOVERY PLAN		(UR INVESTIGATION)		
Action from Recommendations		Lead	Time frame	Date for Completion
41	Call centre management There is an issue of management regarding the Call Centre which must be addressed. This conclusion should be cross referenced with conclusions 28 to 32.	NIW		
42	Morale The company should now take steps to re-energise a dispirited workforce.	NIW		
43	Board membership Consideration should be given to the appropriate balance of Executive and Non Executives on the Board with reference to other water utilities.	NIW		
45	Consumer focus The company must make additional effort to refocus its culture of impersonal utility service to personal customer service.	NIW		
Action from Recommendations		Lead	Timeframe	Date for Completion
5. FUTURE RISKS AND RESILIENCE MEASURES				
46	Inform Future Price Controls NI Water should undertake a wider review of its risk management processes to ensure that each risk mitigation measure is properly considered and takes account of industry best practice. We will ask the company to identify improvements it considers necessary and consult its consumers on its proposals to improve service. This would be done so as to inform subsequent price controls.	NIW	To Inform Next Price Control	
47	Inform Future Price Controls NI Water should consult widely with other stakeholders and consumers on: <ul style="list-style-type: none"> • The level of emergency response the company should provide. This will consider the type and quantity of emergency water supplies to be provided and when this should be triggered. • The levels of service the community expects the company to deliver and the frequency at which a reduced level of service would be acceptable. • The cost the community is willing the pay to mitigate risk. 	NIW	To Inform Next Price Control	
48	Inform Future Price Controls NI Water should continue to develop its asset data and asset management systems and engage with consumers to support clear medium term investment programmes. In the short term the company should identify and address local weaknesses in asset performance exposed by this incident.	NIW	To Inform Next Price Control	
49	Inform Future Price Controls NI Water should continue to review its design standards in light of information from the UK Climate Change Programme. The company should also keep under review its progress in adapting to climate change using a formal framework such as that set out in the Royal Commission for Environmental Pollution's report of 2010 on adapting institutions to climate change.	NIW	To Inform Next Price Control	
6. IDENTIFY UNDERLYING ISSUES WITH DOMESTIC CONSUMERS PIPEWORK				

FREEZE THAW RECOVERY PLAN		(UR INVESTIGATION)		
Action from Recommendations		Lead	Time frame	Date for Completion
50	<p>Service Pipes</p> <p>There is an opportunity to learn from the rapid increase in demand during the freeze-thaw incident. The company should undertake a more detailed assessment of demand taking account of detailed information such as DMA flow data, service reservoir outflow, service reservoir data and information on water loss on consumer premises. It is possible that there are key lessons to be drawn on the type and age of property which suffered most during the incident. Other stakeholders, such as the NI Housing Executive may wish to collaborate with NI Water in this work. The outcome would be improved advice to owners and occupiers on steps they might take to prevent pipe bursts in the future.</p>	NIW	Short Term	
51	<p>Service Pipes</p> <p>There were frequent cases of the service pipe from the company water main to the consumers' premises freezing during the incident resulting in a loss of supply. Some frozen service pipes burst when frozen and leaked during the thaw. NI Water should collate such data as is available on the type of service pipe (depth, length, diameter, material) which froze or burst during the incident to identify any lessons learnt which would inform the management of service pipes in the future.</p>	NIW	Short Term	
52	<p>Service Pipes</p> <p>Current regulations specify that supply pipes should be installed to at least 750 mm cover. In part this provides protection against freezing. There is the possibility that this protection will be eroded as consumers amend ground levels to alter access to and hard-standing around properties. The responsible authority should check that cover to supply pipes will be maintained when granting permission for work involving amendments to access or paving around properties.</p>	NIW	Short Term	
53	<p>Service Pipes</p> <p>NI Water is not responsible for the supply pipe from a property boundary and it does not carry out repairs on supply pipes. Other companies in GB offer a free or subsidised supply pipe repair service to help control leakage. In light of the incident NI Water, in conjunction with policy makers and regulators, should review the benefits of a free or subsidised repair service. The company should also review its policy on repairing consumers' supply pipes during a freeze-thaw when the need to reduce demand becomes the clear strategic objective. Any move to repair consumers' supply pipes during a freeze-thaw incident should remain at the discretion of the company which will need to retain the flexibility to prioritise its resources to best effect.</p>	NIW	Short Term	
Action from Recommendations		Lead	Timeframe	Date for Completion
7. ACTIONS FOR BROADER CONSIDERATION IN THE LONGER TERM				
54	<p>The Utility Regulator noted the commentary of the incidence of extreme weather conditions. The Utility Regulator agrees with the Minister for Regional Development that climate change will be a more significant factor in future; as weather systems become more energetic they will become more unpredictable. The Utility Regulator urges the board of NI Water and DRD to reconsider the ten questions on adaptation defined by the Royal Commission on Environmental Pollution in March 2010 in its Report on Adapting Institutions to Climate Change.</p>	UR	Longer Term	

FREEZE THAW RECOVERY PLAN		(UR INVESTIGATION)		
Action from Recommendations		Lead	Time frame	Date for Completion
55	<p>The Utility Regulator agrees that there needs to be greater and widespread alertness to risks arising from weather whatever they may be. The Met Office has a colour coded weather alert system, no severe weather; be aware; be prepared, take action. NI Waters Major Incident Plan should be linked to these statuses with clarity around what actions will be taken at each status above 'no severe weather'. If a general alert system somewhat akin to the Government security alert warning system could be developed from this which could be shared with all stakeholders, including the Minister and Department, there would be merit insofar that everyone would be aware of what response actions would be in place. However, there might be merit in extending this alert status warning with respect to other utility services. The Met Office status needs more detailed examination to establish if it can embrace these ideas. There has not been sufficient time in the Review to establish the practical details of such a scheme and the Utility Regulator will pursue this. However the Utility Regulator will wait before it takes such an initiative, to establish with key stakeholders, whether such an idea would be welcomed and could have wider application to other public services such as transport.</p>	UR	Longer Term	
56	<p>The Utility Regulator also supported the idea that there a wider issue of understanding what investment and management horizons for the risks of weather events should be used in future. The Utility Regulator considers that a dialogue across the utilities it regulates will be necessary, but also agreed that a wider debate about asset protection across all public services and the cost consequences would be of benefit. The Utility Regulator would be pleased to work with key stakeholders in facilitating these discussions and conclusions</p>	UR	Longer Term	
57	<p>The Utility Regulator noted the value of local co-operation in the crisis and the help given by Scottish Water. However the Utility Regulator agrees that there would be merit in there being a Northern Ireland Utilities Mutual Aid Programme, in which the utilities - for which the Utility Regulator has economic regulatory responsibility - would participate. Such a Programme could be incorporated into a NI Utilities Forum. This Forum could be a focal point for the Mutual Aid Programme and for contributing to discussions on risk management in asset investment for example. The Utility Regulator will take this idea forward with the utilities to determine the practicalities and benefit of such a notion. However, the Utility Regulator recognizes that this Forum could also act as a central point of intersection with Local Authorities in Northern Ireland and other stakeholders. Following this, consideration should be given to exploring this concept with utilities in the Republic of Ireland. The Utility Regulator will establish which course of action to take beyond any statutory responsibility in this matter, when it has the views of other stakeholders.</p>	UR	Longer Term	

Chapter 1: Introduction

Background to the investigation

- 1.1. In the winter of 2009/10 from 17 December to 6 January, there was widespread disruption of services arising from adverse weather conditions. Following this event the Utility Regulator asked NI Water to report on how it had performed. In particular, the company was asked to set out lessons learnt together with proposals to update and, where necessary, improve systems and processes to mitigate possible impacts on consumers in future.
- 1.2. Following receipt of this report, the Utility Regulator wrote to NI Water on 15 June 2010 seeking assurances that the company had learnt the lessons from 2009/10. This included dealing with high levels of calls under the company's contingency planning. The Utility Regulator specifically requested NI Water's written assurances by 31 October to ensure that measures were in place before the winter of 2010/11.
- 1.3. NI Water responded on 21 October 2010, stating that 'key actions are being put in train through Customer Service Delivery Directorate in advance of the Christmas and New Year holiday period'. These included 'communications with other agencies, call-handling and ramping up arrangements and customer communications'.
- 1.4. As a result of freezing weather and an anticipated thaw between 9 and 12 December 2010, NI Water activated its MIP to address an increase in water demand and water main bursts. There were some interruptions to supply, all of which were restored by 13 December when the incident was stood down. However, given the forecast weather the major incident team remained on alert.
- 1.5. As predicted by the Met Office, on 17 December Northern Ireland was overwhelmed by very heavy snow and very low temperatures. Warmer weather was predicted to start on 26 December.
- 1.6. On 23 December, NI Water issued a letter to stakeholders assuring them that it had 'incident management teams ready to respond to a further anticipated upsurge in calls from consumers affected by burst water mains, leaking domestic service pipes and consequent high demand on water resources'. The letter also identified that the company expected that the thaw would start around 26 December.
- 1.7. Whilst the thaw did come on 26 December, its onset was much more rapid than expected, with a rise in temperature of 15°C on the first day. Water demand soared as a consequence of consumers' burst pipes and burst water mains. As a result, demand exceeded supply and NI Water introduced the rotation of water supplies from 27 December 2010 until 6 January 2011. NI Water's communications with consumers throughout this period was inadequate. There were very limited

resources in the call centre, little if any warning of the rotation of supplies and a malfunctioning website. Consumers who succeeded in making contact found information to be poor and inaccurate.

- 1.8. At a multi-agency teleconference on 28 December, NI Water was offered assistance by Belfast City Council in terms of premises from which bottled water could be distributed as well as offers of assistance in relation to call handling. Both of these offers were initially turned down by NI Water. These offers of assistance were accepted on 29 December. Confidence in NI Water was waning and with public concerns growing, the Civil Contingencies Group (NI) was convened at noon on 30 December 2010.
- 1.9. As a result of the disruption and massive public interest the Minister of Regional Development became involved. He contacted the Scottish Executive and arranged for the supply of bottled water on 30 December. Prior to this his Department had also been involved in giving their approval under the Preservation of Services Directive for NI Water to introduce rotation of supplies.
- 1.10. Because of the magnitude of the event the Utility Regulator determined that it would conduct an investigation. The purpose of the investigation was to:
 - establish the causes of the loss of water supply in Northern Ireland during the adverse weather conditions experienced in late December 2010 and early January 2011;
 - examine the performance of NI Water in planning for and reacting to this event;
 - consider whether NI Water had contravened any licence condition or other statutory requirement; and
 - make conclusions to militate against any recurrence.
- 1.11. The Executive Committee of the Assembly agreed on 6 January that this review would also satisfy its determination to find out what happened.

Approach to the investigation

- 1.12. A project team was set up within the Utility Regulator Water Directorate and operational teams were tasked to investigate four areas of scrutiny:
- the cause and extent of supply problems;
 - contingency planning and implementation;
 - internal and external communication; and
 - governance, leadership and management.
- 1.13. Each operational team was staffed with internal Utility Regulator employees, supplemented by external experts. Operational teams included staff seconded from the following water companies: Severn Trent Water, United Utilities and Welsh Water. Emergency Planning Solutions Consultants also assisted in this work.
- 1.14. An experienced and expert Oversight Committee was established to provide advice to the Utility Regulator's investigation team. As well as representatives from the Utility Regulator, the Oversight Committee included independent experienced experts from utility backgrounds who had relevant and practical knowledge of dealing with the many issues which arise with major incident. The Oversight Committee brought broad strategic advice and guidance to our investigation and met on four occasions during the investigation (13 and 28 January and 14 and 21 February 2011). The Oversight Committee played a purely advisory role in the process and was not involved in drafting the report or its conclusions which throughout remained the responsibility of the Utility Regulator Board and executive.
- 1.15. During the course of the investigation the Utility Regulator undertook 12 interviews and 22 meetings with representatives from NI Water and other stakeholders. It also reviewed approximately 200 information responses from NI Water, together with a wide range of related documents. Given the impact of the loss of supplies on consumers, the Utility Regulator considered it important to seek their views and experiences and therefore commissioned questions on an omnibus survey of 1,000 consumers. The results were filtered to deal with the experiences and views of those adults with responsibility for dealing with utilities (number=872 adults).
- 1.16. The Utility Regulator has produced a number of detailed papers during the course of this investigation. Given the short period within which the investigation was conducted, we wish to continue our audit and check processes on these papers before their publication later this month.

Outline of the report

- 1.17. The following chapters of this report set out the findings and conclusions from the detailed investigation.
- 1.18. Chapter 2 relates the findings drawn from an omnibus survey of 1,000 consumers that were randomly selected across 80 electoral wards in Northern Ireland. It also relates the views of a limited number of other stakeholders. Within the timescale for production of this report, it was unfortunately not possible to conduct more extensive research into stakeholders' views.
- 1.19. Chapter 3 describes the causes of the supply failures. It details the prevailing weather conditions and what gave rise to the increase in demand for water resulting in the need for rotation of supplies.
- 1.20. Chapters 4 to 7 deal with each of the detailed areas of the investigation, presenting findings and analysis on NI Water's performance during the incident. Where appropriate we have benchmarked to other utility sectors including those in GB and the Republic of Ireland. In each of the four chapters we note our observations and summarise our key findings and conclusions.
- 1.21. Chapter 8 explores the wide ranging technical and external risks, including extreme weather conditions, which the water industry faces. It then outlines any underlying issues relating to problems with consumers' pipework for further investigation.
- 1.22. The appendices comprise: a glossary of terms, answers to the questions posed in the investigation's Terms of Reference, and answers to questions raised.

Chapter 2: Consumers' and stakeholders' views

Introduction

- 2.1. The freeze thaw incident over the period December 2010-January 2011 resulted in around 450,000 consumers in some 215,000 properties across Northern Ireland having their water supply interrupted at sometime. For some this was a short overnight interruption. For others, their supplies were interrupted for long periods causing severe difficulties. Given the impact of the loss of supply on consumers we considered it important to seek their views and experiences².
- 2.2 We collected views in two ways. Firstly we commissioned a set of questions in an omnibus survey (a survey based on questioning a random sample of 1,000 people across 80 electoral wards, throughout Northern Ireland). Secondly, we collated views from a range of stakeholders. This included those who we met (that is, certain representative organisations) and those who contacted us directly to communicate their views.
- 2.3 The combination of survey data and the more qualitative information provides the basis for our understanding of consumers' experience during the freeze thaw incident.
- 2.4 We have also taken note of the CCNI report, 'Left high and dry' (published in February 2011), which outlines consumers' stories and experiences of the freeze thaw incident.

Overview of the incident

- 2.5 Before reporting the findings of the survey and the views of stakeholders this section provides an overview of the incident and the impacts on consumers.

17 - 26 December 2010

- 2.6 With sub-zero temperatures from 17 December to 25/26 December, many consumers were without water due to their own pipes freezing. NI Water's call centre received more than 1,000 calls on 20 December, which escalated to just over 3,000 on 21 December. The daily call level remained above the 3,000 level, and then dipped substantially to 1,617 calls on Christmas Day.
- 2.7 Temperatures rose significantly on 26 December, and frozen pipes on consumers' properties began to thaw. The number of calls into NI Water's call centre then increased six-fold – to just over 6,000 callers

² NI Water's performance in protecting critical and vulnerable customers is examined in Chapter 6.

on the day. At this stage, NI Water had only 14 operatives answering phone calls and 80% of calls went unanswered.

- 2.8 Overall, during this period, while the number of consumers calling into NI Water increased, the number of call handlers within the call centre decreased.

27 - 30 December 2010

- 2.9 On 27 December NI Water initiated the rotation of supplies to more than 6,000 properties. There was no prior notification to those affected. A press statement was released indicating areas affected by interruptions and consumers were referred to the NI Water website for information. Call volumes reached 266,579 on this day, with 29 operatives answering phone calls. The call centre quickly became overwhelmed and many consumers experienced severe difficulties getting through.
- 2.10 By the morning of 28 December the company realised that its operational strategy was being overwhelmed by the rising losses of water from the system and it was necessary to introduce widespread supply rotations but without a commensurate change in its communication strategy.
- 2.11 On 28 December the call volume from consumers reached a high of 403,420. On the 27 and 28 December many callers only received an engaged tone or their call was not answered. As a result, many consumers called repeatedly in an attempt to obtain information and advice. On the 28 December, 33,000 people attempted to call the company at least once, an average of 12 calls per consumer. Of these less than 1% received an answer from a call handler.
- 2.12 The scale of increased demand for information from NI Water can be attributed to additional consumer bursts and the introduction of rotational supplies by NI Water without adequate warning and without the provision of accessible, accurate information.
- 2.13 The call volume from consumers decreased on 29 December – despite the near doubling of consumers on rotational supplies. By this time additional resources had been brought in to handle calls and more information was available. Some consumers may also have given up trying to contact NI Water.
- 2.14 From 27 December rotational supplies were being introduced (and lasted until 6 January). Increasing numbers of consumers were trying to access alternative supplies of water. Alternative water supplies became available from 29 December, mainly through local councils.

The consumer experience during the freeze thaw event

2.15 The investigation acknowledges the discomfort suffered by consumers. These events occurred at the end of a long period of discomfort during which consumers also suffered some roads being impassable, and worry about heating bills and condensing boilers overflows having frozen.

Overall extent of impact on consumers

2.16 Table 1 provides an indication of the extent to which the population of Northern Ireland was affected by the recent freeze thaw event.

Table 1: To what extent was your household affected by interruptions to water supply¹?

	%
Your pipes were frozen	10
You had a burst pipe in your house or property	6
NI Water stopped the supply to your property	24
Did not suffer any interruption to water supply	67

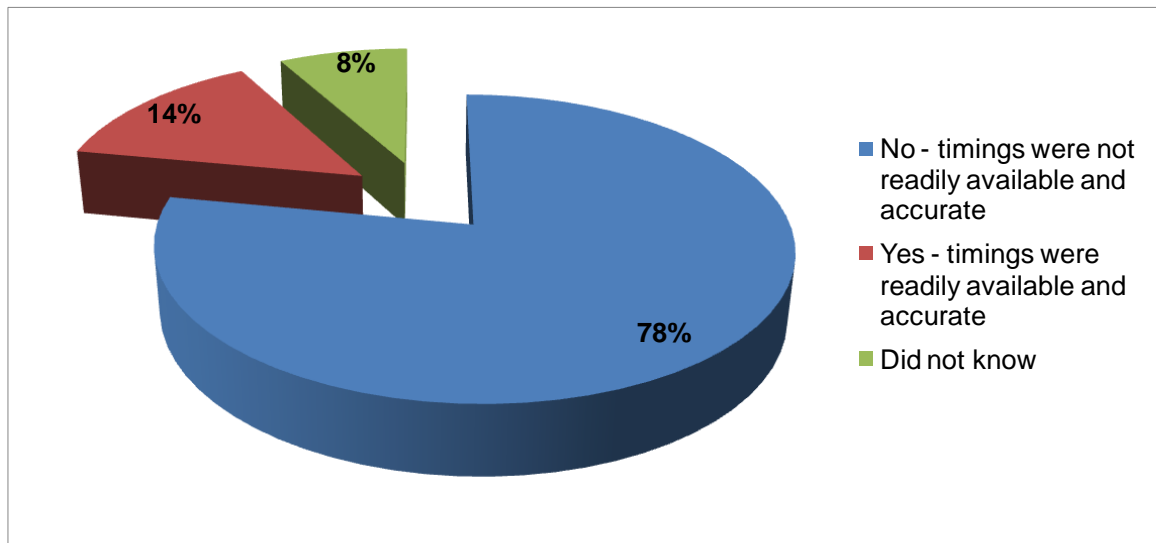
Note: ¹ Householders with responsibility for dealing with utilities were asked this question.
(n=872)

Consumer experience of planned water supply interruptions

2.17 Consumers were asked how they became aware of planned supply interruptions. The vast majority (87%) of those whose supply was interrupted said they 'turned the tap on to find no water'. The remaining respondents found out through word of mouth, local TV or the radio.

2.18 Figure 1 shows that 78% of respondents stated that the timings for the planned water supply interruptions were not readily available and accurate. Only 14% said the information was readily available and accurate.

Figure 1: Were the timings for planned water supply interruptions readily available and accurate?

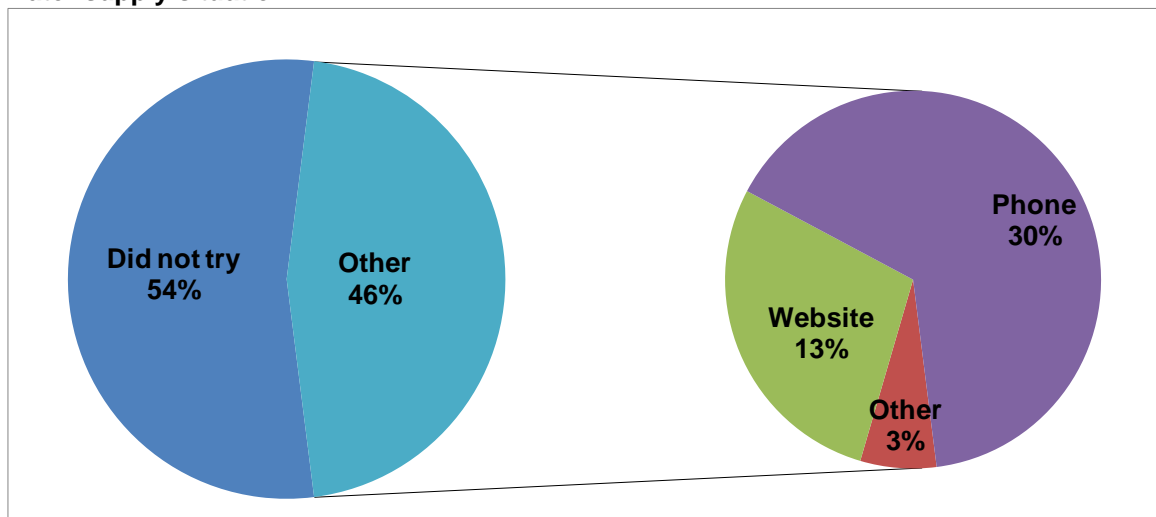


Consumer contact with NI Water

2.19 We asked these consumers if they had tried to get advice from NI Water regarding their loss of supply.

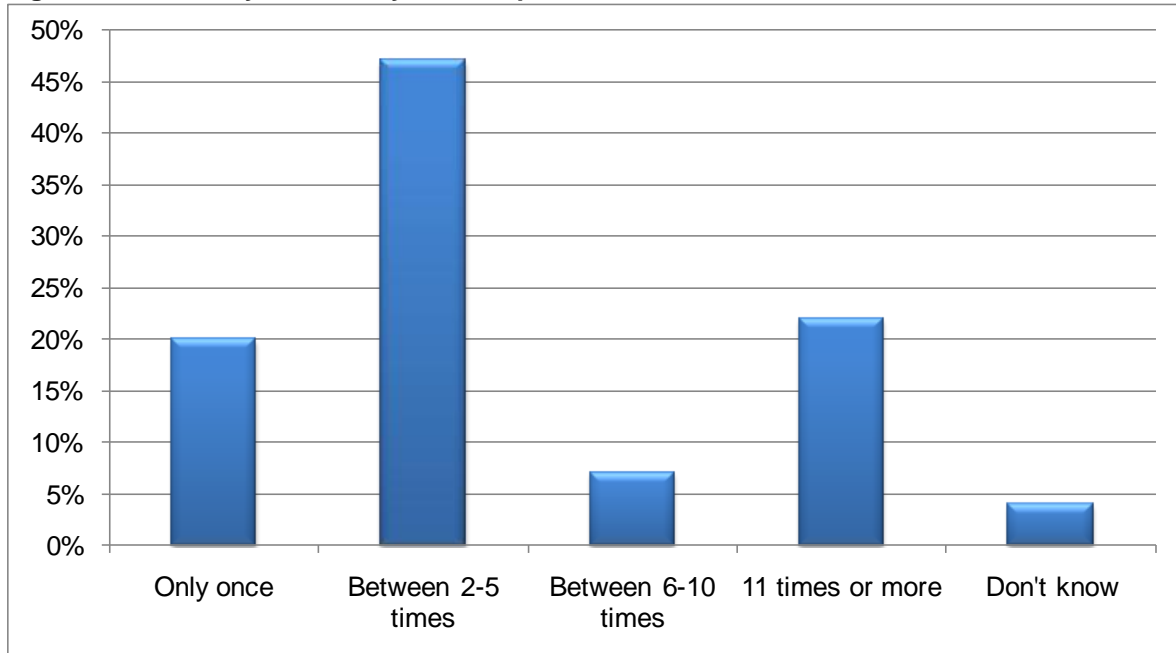
2.20 Over half of those in this category (54%) did not try to get information or advice from NI Water regarding the water supply situation (Figure 2).

Figure 2: Means used to try to get information or advice from NI Water regarding your water supply situation



2.21 Figure 3 shows that most people (76%) who phoned NI Water called more than once. 22% of those who phoned NI Water called more than 11 times.

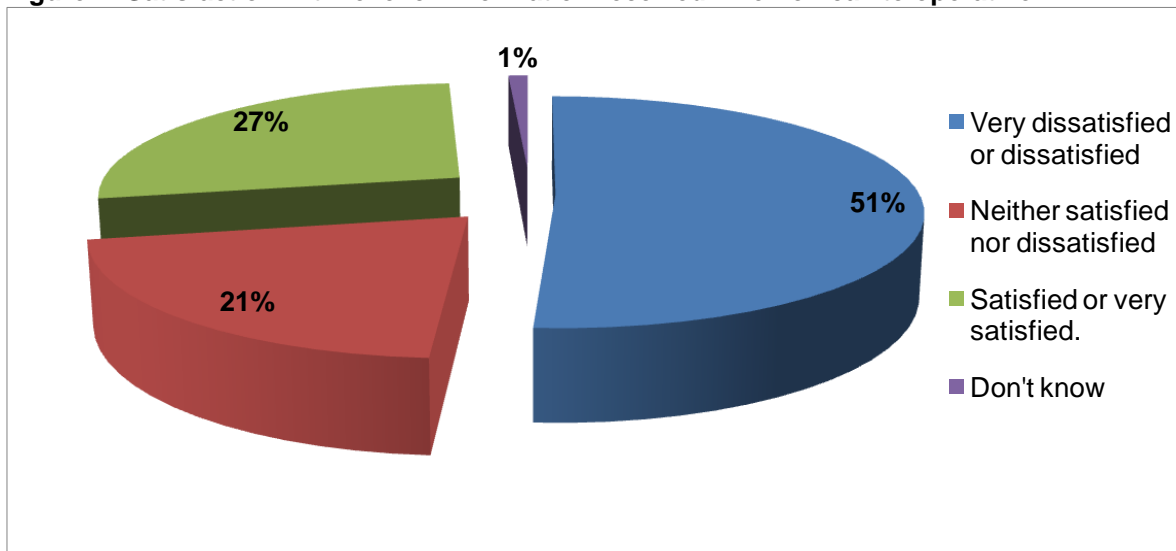
Figure 3: How many times did you attempt to contact NI Water?



2.22 Over a third of those contacting NI Water (37%) said their call(s) was/were not answered. 16% said their call was answered in less than 5 minutes, and 12% said they waited for 30 minutes or more before their call was answered. CCNI’s report, ‘Left high and dry’ notes one consumer had to wait 56 minutes before their call was answered.

2.23 The CCNI report also notes that ‘consumers were less than impressed by responses received’ (following telephone calls to NI Water). Our survey shows that over half of the respondents (51%) said they were very dissatisfied or dissatisfied with the level of information they received from an NI Water call operative (Figure 4).

Figure 4: Satisfaction with level of information received when on call to operative



Alternative water supply arrangements

2.24 When asked about the provision and accessibility of alternative water supplies, most of those affected (60%) said that no alternative supply arrangements were provided. However, 15% said NI Water provided bottled water (or made it available). A similar number said a water bowser was provided at a nearby location and a small number (7%) made use of facilities at a local leisure centre.

Lessons for NI Water

2.25 When asked to assess what NI Water could have done to be more helpful during the freeze thaw incident, those affected had a clear view. By far the most popular view was that 'NI Water should have provided more/accurate/advance information about the situation' (37% of those that responded). The next two most popular choices were 'could have repaired problems more quickly' and 'bottled water could have been supplied' – both identified by 6% of those questioned.

Wider stakeholder views

2.26 Within the timescale of the investigation it has not been possible to elicit feedback from extensive stakeholder groups. We did however engage with a range of stakeholders who we met, contacted us, or submitted views to us.

2.27 Several common themes emerged from stakeholders, which are summarised below.

- Many of the comments received echoed consumer views that NI Water could have been more effective at communication generally, and better at issuing advance notice of water rotation specifically.
- There was general frustration by stakeholders around being able to contact NI Water during the freeze thaw incident. One representative body also indicated that it had previously engaged with NI Water with an offer to provide a channel of communication to its members, but this was not used during the recent crisis. This example of poor stakeholder relations is also corroborated by a similar comment in CCNI's report.
- On a related point, one stakeholder body expressed the view that NI Water did not avail itself of the opportunities for external assistance until the event was well advanced. At this point, the impact of such assistance was less effective.
- Several key stakeholders reported the absence of incident status update reports as a major deficiency in NI Water's response.

Chapter 3: The cause of the water supply failure

Key findings

- The cause of the water supply failure was the extreme weather which resulted in sub-zero temperatures for a period of eight days. This caused consumers' pipes to freeze then burst when the thaw came. It also caused a three-fold increase in burst water mains.
- In Northern Ireland December 2010 was the coldest month in the past 100 years. The water supply network and consumers' own pipework had not previously been tested to such extremes of temperature.
- In general, NI Water's assets performed well during the incident. This was despite difficult operating conditions and frost damage to some plant. This was not a major contributor to the supply failure.
- A rapid increase in water demand as the thaw developed, largely due to burst pipes, meant demand exceeded the maximum capacity of NI Water's treatment works by 20%.
- The available evidence indicates that at least 80% of the additional short-term water demand on the peak day of the thaw was caused by losses of water from consumers' premises. It is likely that this is a conservative estimate.
- In some areas NI Water was not able to meet the rapid short-term increase in demand by increasing supply or from local storage in service reservoirs. Service reservoirs in these areas began to fall. In some areas reservoirs emptied and in others NI Water introduced rotation of supplies to conserve resources. This resulted in many consumers having their supplies interrupted.

Introduction

- 3.1 This chapter examines three elements that are important considerations in relation to the freeze thaw incident:
- the severe weather conditions experienced across Northern Ireland;
 - the performance of NI Water's water supply network; and

- the increased demand for water during the freeze-thaw.

The weather conditions

- 3.2 The underlying cause of the interruption to water supplies was the widespread freezing conditions that developed from 17 December, followed by the rapid thaw that set in from midnight on 25 December. These conditions tested the water supply system and plumbing to an unparalleled degree.
- 3.3 December 2010 was the coldest December on record in the UK. In Northern Ireland it was the coldest month in the past 100 years. While December was the coldest month in 100 years, it does not follow that the same conditions cannot occur next winter or in the near future.

How does December 2010 compare with previous cold periods in Northern Ireland?

- 3.4 We used temperature data from Armagh, which goes back to 1865, to set the low temperatures in December 2010 in the context of long-term historic weather data. Similar events have occurred in Northern Ireland in the past but not in the last 100 years.

Table 2: Key temperatures for Armagh weather station

	December 2010	Previous low	
		Value	Year
Average minimum temperature for any month	-3.8°C	-4.2°C	1895
Minimum temperature on any day	-11.9°C	-12.8°C -15.0°C	1947 1895
Lowest maximum temperature on any day	-8.0°C	-5.6°C	1867
Number of consecutive days temperatures did not rise above zero	8 days	13 days	1881
Average minimum temperature over five days	-10.4°C	-10.8°C	1895

How did the 2010/11 incident compare with the 2009/10 freeze thaw?

- 3.5 Figures 5 and 6 compare the daily maximum and minimum temperature range in Belfast during the 2009/10 and 2010/11 freeze thaws.

Figure 5: Daily maximum and minimum temperature range in Belfast 2009/10

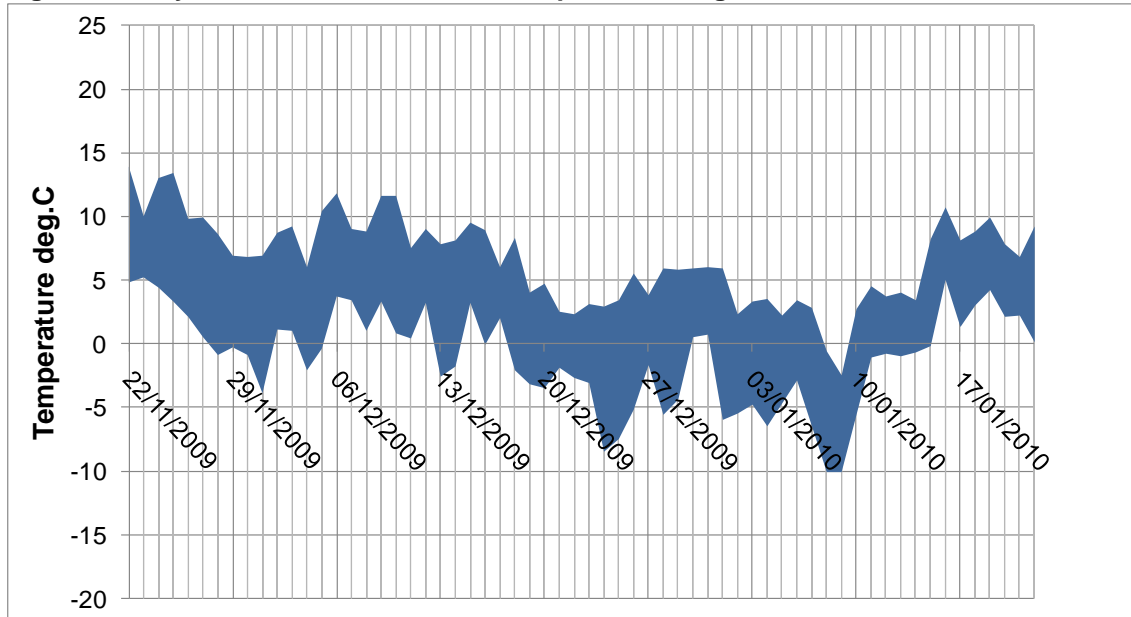
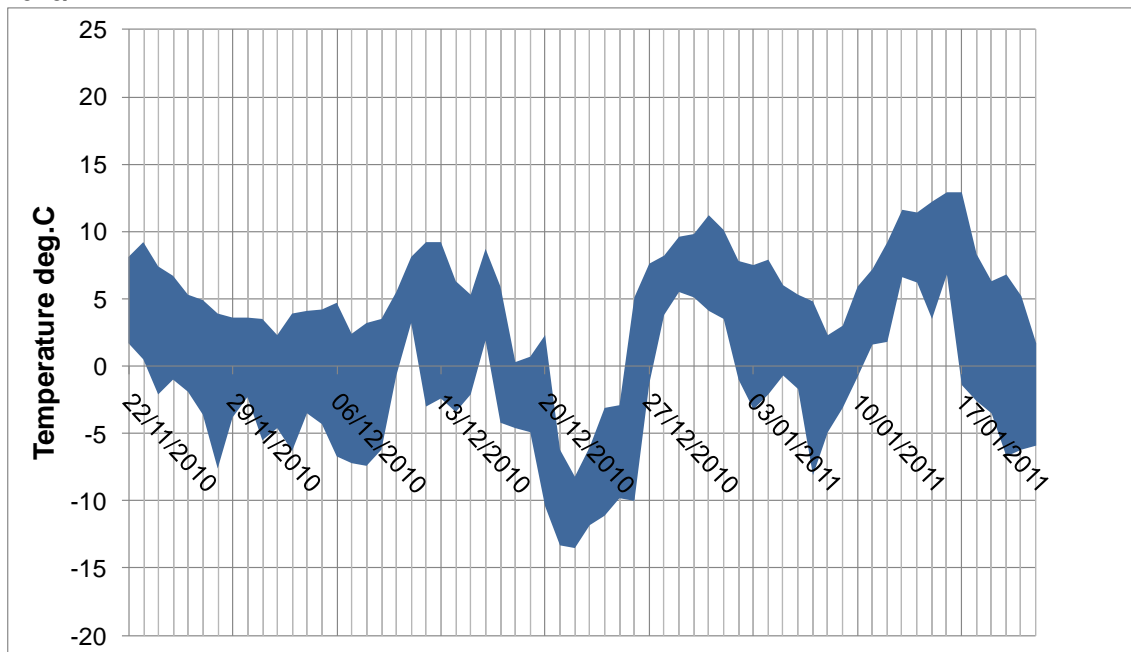


Figure 6: Daily maximum and minimum temperature range in Belfast 2010/11

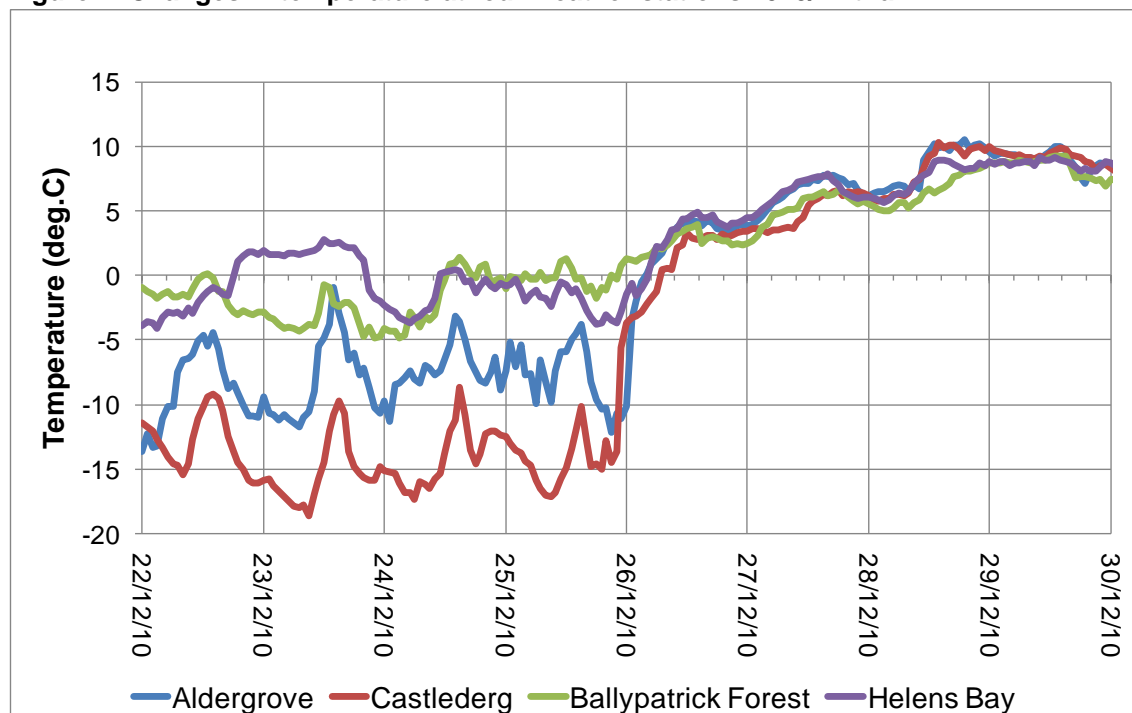


3.6 The figures show that the clear difference between the freeze thaw in 2009/10 and that in 2010/11 is the number of days that temperatures did not rise above freezing. Under these conditions the freeze begins to permeate pipes and equipment and there is no opportunity for recovery during the day. There was insufficient data to draw a definitive conclusion. However, the evidence suggests that the number of days the temperature remains below freezing is the simplest indicator of the impact of the subsequent thaw on water services.

How rapid and widespread was the thaw?

- 3.7 The thaw began around midnight on Christmas Day as a warm front moved in from the Atlantic. Changes in temperatures at that time are shown in Figure 7.
- 3.8 For all practical purposes the thaw occurred simultaneously across Northern Ireland. At Aldergrove, temperatures rose 15°C on the first day of the thaw and rose 20°C in three days. For Armagh, the movement in temperatures during the thaw over one, two and three days is the highest since records began in 1865.

Figure 7: Changes in temperature at four weather stations 2010/11 thaw

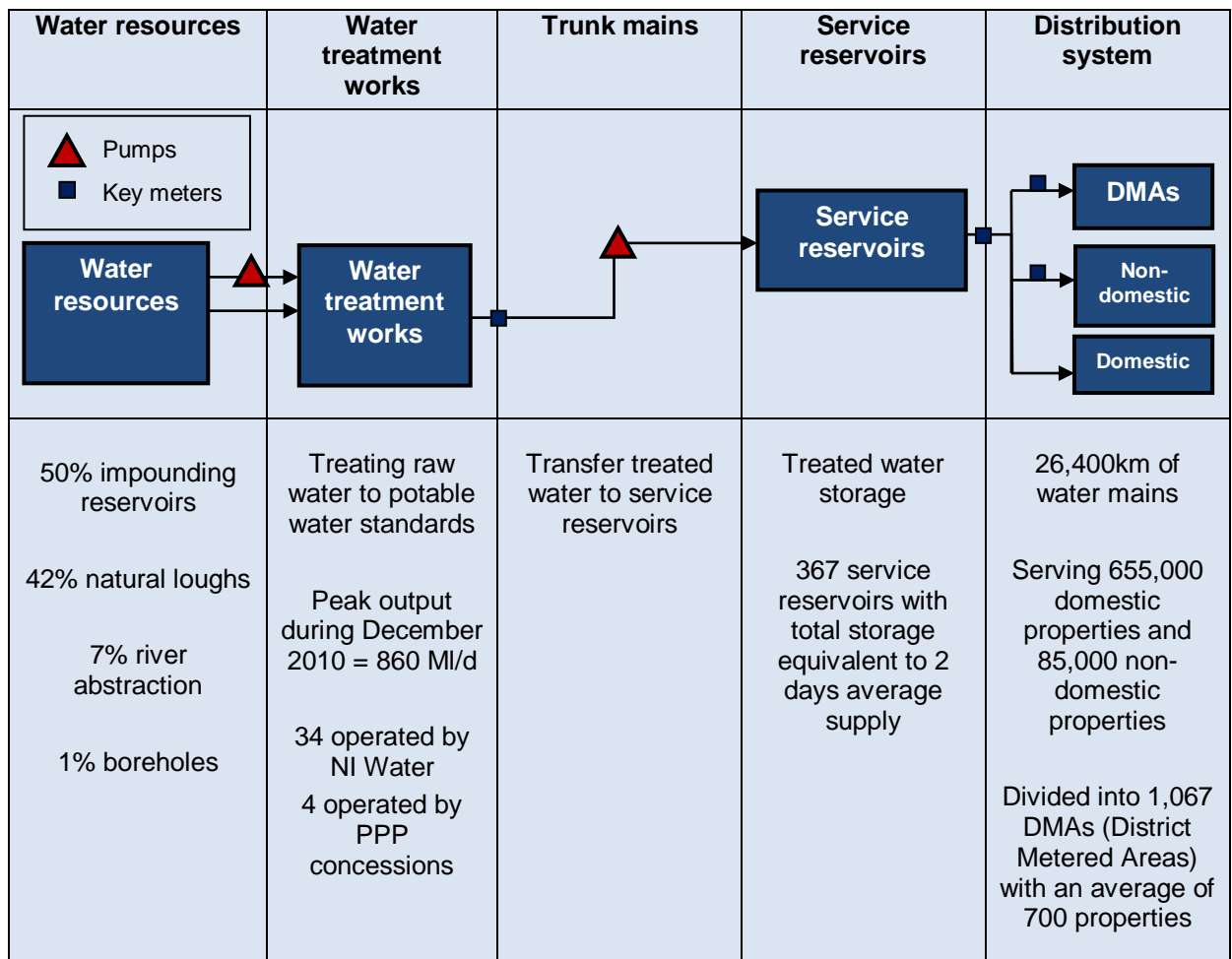


The performance of NI Water's water supply network

The water network

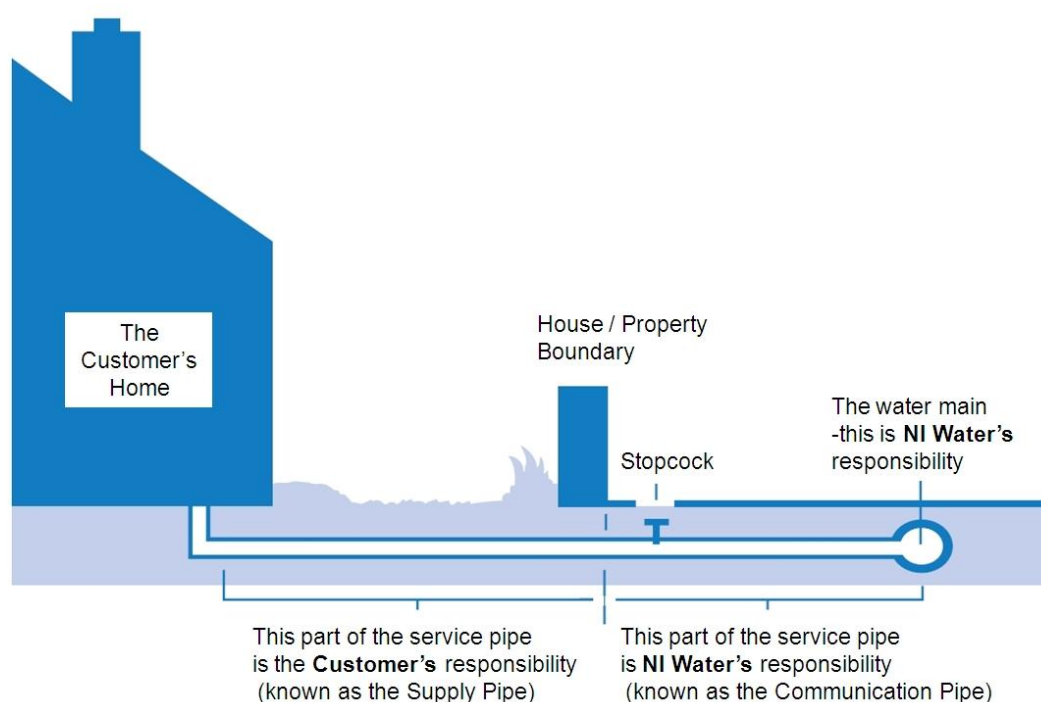
- 3.9 Figure 8 shows the network of assets that deliver water to consumers' properties.

Figure 8: The water network



3.10 As shown below, NI Water is responsible for the water mains and service pipes to property boundaries. The pipework within a property is the responsibility of the owner or occupier.

Figure 9: Supply pipe arrangement



- 3.11 Bursts on trunk and distribution water mains arise from fractures of the main and not freezing and bursting, which occurs in smaller pipes such as supply pipes that feed individual properties.
- 3.12 In Chapter 4 we consider the performance of the water supply network in greater detail. NI Water has identified areas where freezing conditions affected the performance of the assets. While these problems presented real difficulties that required a sustained effort to overcome, they were not the primary cause of the widespread failure of water supply. An overview of the network's performance is provided below.

Water resources Abstractions from loughs, rivers and impounding reservoirs continued throughout the freeze thaw. Local operational problems were addressed and NI Water worked with the Northern Ireland Environment Agency to ensure that abstraction licence conditions were complied with.

Water treatment NI Water was generally able to increase production at the water treatment works it operates to their full capacity. In some cases the company provided continuous staff cover to maintain production at or above works capacity.

Two of the water treatment works provided by the Public Private Partnership (PPP) partner suffered frost damage which affected treated water production. As a result, the supply to Belfast during the critical period was 19 MI/d less than the maximum amount available under the PPP contract.

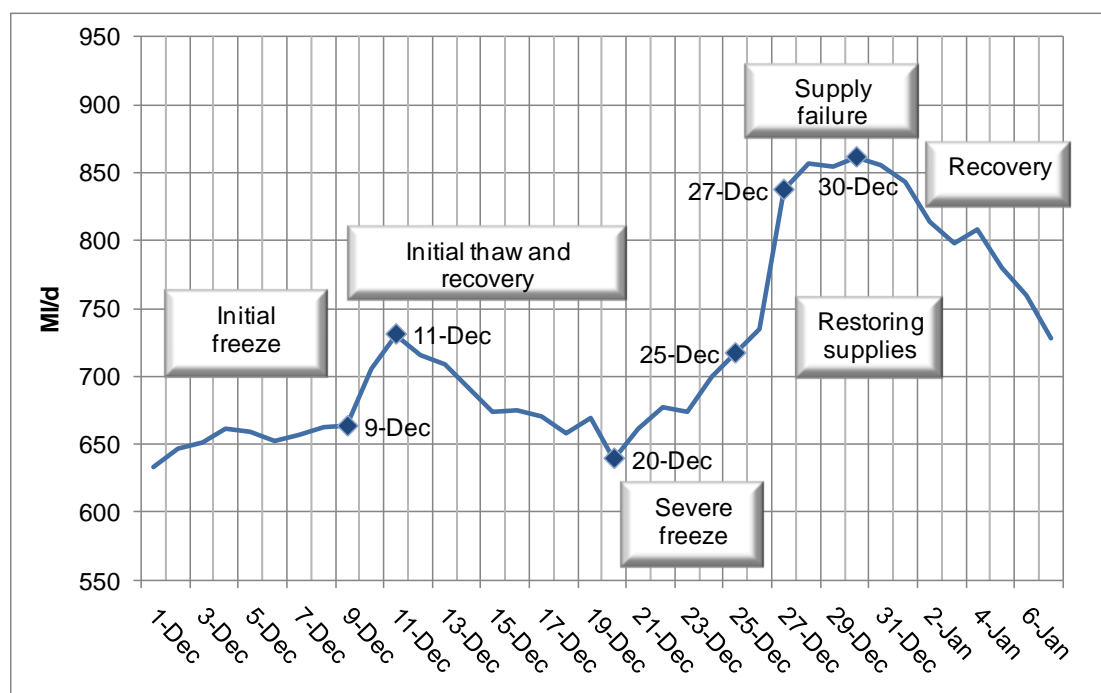
Trunk mains	A small number of fractures occurred on the trunk mains which transfer water from the water treatment works to the service reservoirs. These were fixed quickly and there was no widespread failure of the water transmission network.
Service reservoirs	Service reservoirs can provide up to two days storage capacity for treated water, which is typical of service reservoirs across the water industry. Despite this some service reservoirs drained as demand increased, resulting in loss of supply.
Water distribution	Fractures on the water distribution system increased from an average of 10 a day to an average of 30 a day in the peak period after Christmas. The company increased resources to deal with these bursts and completed repairs within a shorter time than it would in normal conditions. There was no widespread failure of the distribution network. The estimated additional water lost from bursts in the post-Christmas period only explains about 10% of the peak additional demand.

- 3.13 Overall, the assets performed well despite freezing conditions. Their performance does not suggest that under investment was a cause of the problems experienced in December 2010.

The increased demand for water

- 3.14 In this section we assess the additional demand for water that occurred during December 2010.
- 3.15 A starting point for any assessment of water demand is the distribution input. This is the volume of water entering the distribution system from water treatment works. In most circumstances, distribution input is a good measure of demand. However, in the extreme conditions experienced during the December freeze thaw, demand for water exceeded production capacity and service reservoirs began to drain down.
- 3.16 For the period from 26 December to 1 January it is necessary to look at additional information to estimate the demand for water when supply failed. This includes more detailed flow data from service reservoir outlet meters, DMA inlet meters, billing records and the company's domestic per capita consumption monitor.
- 3.17 We generally state the total water supply and demand figures in MI/d (megalitres per day). One MI/d is equal to 1,000 m³ or 1,000 tonnes of water.
- 3.18 The distribution input from 1 December 2010 to 7 January 2011 is shown in Figure 10.

Figure 10: Distribution input December 2010 to January 2011



Initial freeze thaw and recovery up to 20 December

3.19 The initial freeze thaw in early December led to an increase in demand. A substantial part of this had been recovered by 20 December before the main period of continuous sub-zero temperatures began.

Severe freeze from 20 December

3.20 Demand began to rise from 20 December as severe freezing conditions took hold and a period of sub-zero temperatures began. At the same time, an increasing number of consumers were contacting NI Water to report a loss of supply.

3.21 During this period, NI Water was meeting demand in most areas. Local problems with supply occurred as burst mains were repaired and NI Water worked to maintain supplies in some areas where treatment works experienced difficulty. However, this does not explain the escalating number of 'no water' contacts. Many of these contacts were the result of consumers reporting problems caused by frozen pipes or bursts on their premises.

3.22 An increase in domestic consumption explains more than half the increase in demand from 20 to 25 December. We cannot be certain what caused this increase in domestic demand. However, it is likely to include some bursts on plumbing as pipes froze overnight and thawed as heating came on during the day. It might also reflect taps left running to prevent supplies from freezing.

Between 17 and 25 December when temperatures were below freezing the main reason for consumers being off supply was because their own pipes had frozen.

Escalating supply failure from 26 December

- 3.23 Water demand started to rise on 26 December as the thaw began. Service reservoir levels began to fall and from this point on the distribution input no longer represents water demand.
- 3.24 Demand reached a peak on 27 December as the thaw developed and repairs began to be made to plumbing in household and non-domestic premises. Based on an analysis provided by NI Water of the flows into a sample of 100 DMAs from 26 December, we estimate that the peak demand on 27 of December was of the order of 1,050 MI/d. This is 20% greater than the maximum quantity of water the company was able to produce.
- 3.25 The overall imbalance between supply and demand from 27 December was exacerbated by local hydraulic constraints. At this point the introduction of widespread rotation of supplies became inevitable.

On 27 December, water demand peaked at 70% above average demand and 20% above the capacity of the water treatment works. The supply of quality water from the treatment works, working at maximum capacity and 40% above their normal daily output, was a limiting factor in the supply of water.

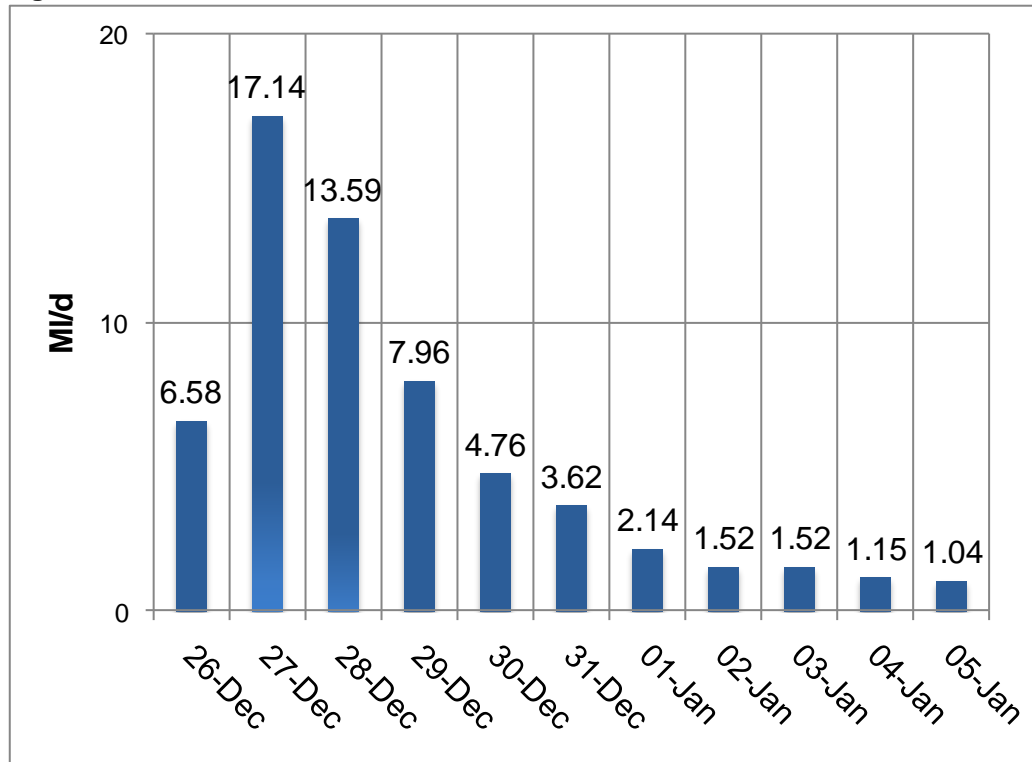
Rotational supplies were driven by the limitations of supply either due to capacity limitations or a lack of flexibility in the network to rezone supplies.

The cause of additional demand

- 3.26 The supply failure occurred because the company could not produce enough water to meet the peak demand which occurred on 27 December. In this final section on the cause of supply failure, we consider how much of the additional demand arose from defects on the company's distribution network and how much came from consumers' burst pipes or additional consumer consumption.
- 3.27 We analysed daily flow data from two sets of District Metered Areas (DMAs) provided by NI Water. These covered:
- 50 DMAs where the company did not undertake any interventions during the incident; and
 - 50 DMAs where the company undertook some intervention during the incident.

- 3.28 The assumption can be made that the recovery in the DMAs without any company intervention is entirely due to consumers fixing defects on their own properties.
- 3.29 The total daily demand for the sample of 50 DMAs where the company did not intervene during the incident is shown on Figure 11. By 5 January, 94% of the peak additional demand had recovered without any intervention from the company.

Figure 11: Additional demand at 50 DMAs with no intervention



- 3.30 We combined this with the aggregated flows from the 50 DMAs where the company carried out work on water mains during the incident.

Our assessment of the data concludes that at least 80% of the peak additional losses between 25 December and 27 December was caused by leakage on domestic and business consumers' premises. The selection and use of the data suggests that this estimate is likely to be conservative.

The fact that the thaw coincided with the holiday period, when premises such as commercial properties and schools were closed, compounded the problem with bursts going unnoticed for longer.

Chapter 4: Performance of NI Water: Extent of the supply problems

Key findings

- All assets were affected to some extent by the freezing conditions and snow cover during December. However, NI Water staff worked hard to address the problems which arose and maintained the performance of the assets.
- The availability of water resources from rivers, loughs or impounding reservoirs did not limit supply.
- During the critical period from 27 December to 2 January, water treatment works operated at or near maximum production capacity. Lessons learnt from the 2009/10 thaw in respect of water treatment were implemented.
- The PPP water treatment works suffered frost damage which reduced production to below the maximum contracted capacity during the critical period post Christmas.
- Water trunk mains generally performed well through the incident. Operating at peak capacity for extended periods exposed some hydraulic restrictions. The incident confirmed the need to complete the additional trunk mains included in the PC10 (price control 2010/2013) final determination. Further works should be carried out to assess the need for any additional trunk mains to improve resilience of the supply network.
- Service reservoir capacity averages approximately two days retention time which is typical of the water industry. Further work should be carried out to confirm that the capacity of individual service reservoirs is adequate.
- The age, condition and performance of the water mains suggest that under investment did not contribute to the loss of supply in December.
- The condition of the water mains is verified to be reasonable based on comparative burst rates which are lower than that of the water companies in England and Wales, and based on the average age of 29 years (compared with an average of 45 in England and Wales).

Introduction

4.1 Our investigation into the extent of the supply problems during the incident sought to identify how the NI Water's assets had performed in order to assess the need for additional investment. We examined:

- the extent of the supply interruptions;
- the performance of water resources;
- the performance of water treatment works;
- water transfer;
- service reservoirs; and,
- water mains.

The extent of the supply interruptions

4.2 In 2009/10, NI Water supplied 740,000 properties, 655,000 household and 85,000 non-household (which includes supplies to farms, schools and commercial and industrial premises).

4.3 During the freeze thaw incident approximately 215,000 household and non-household properties were affected by supply interruptions caused by:

- the rotation of supplies made by NI Water to conserve supplies;
- bursts on water mains including when they were isolated by NI Water to make repairs;and
- unplanned loss of supply when demand exceeded supply and the service reservoir emptied.

4.4 This means that 450,000 people were affected by interruption to their mains water supply at some time during the incident. It is consistent with the 24% of consumers who said that NI Water stopped the supply to their properties (equivalent to 165,000 domestic properties).

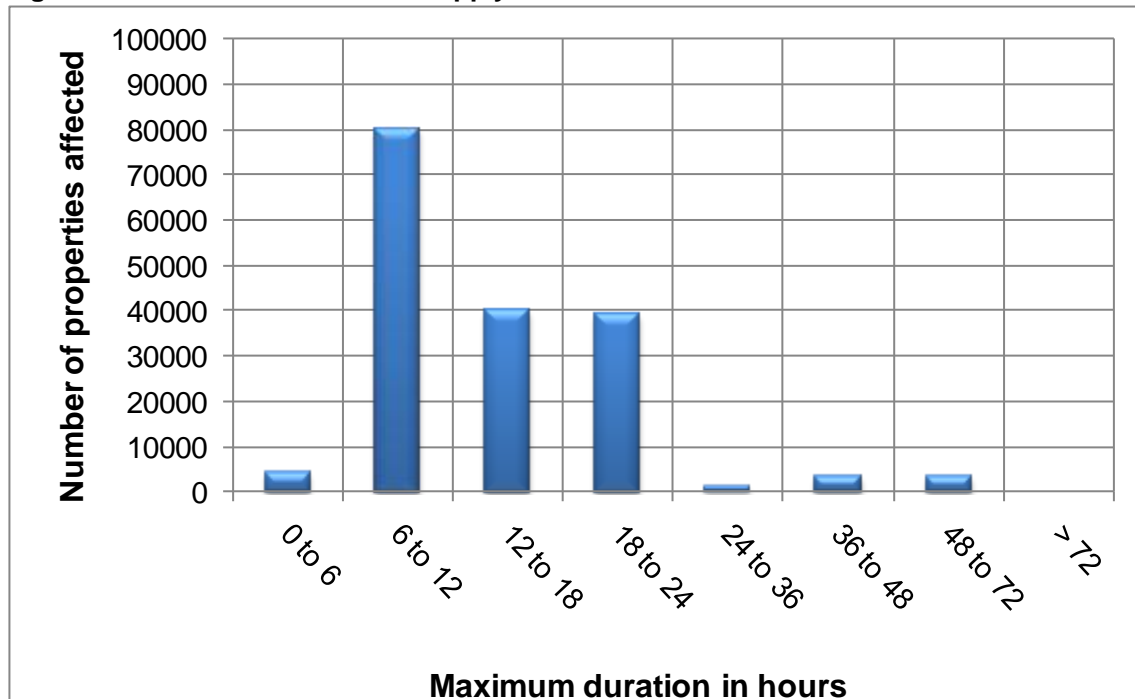
4.5 Some consumers lost supply over an extended period. For others the impact was much less. For example, some were subject to supply rotation overnight when water use is at a minimum and storage tanks secure supply in the house.

4.6 In this section of the report we provide more detail on the extent and duration of supply interruptions to mains water supply.

Consumers affected by supply on rotation

- 4.7 During supply rotation the company isolated individual DMAs for periods of time, typically part of a day, to:
- attempt to provide consumers with a supply for part of a day;
 - secure supplies to essential services such as hospitals; and
 - conserve supplies by reducing losses.
- 4.8 Limited supply rotation started on 27 December and escalated on 28 December as service reservoirs began to drain down. Supply rotation reduced on 3 January but continued in a small number of areas with high losses until 5 January.
- 4.9 At the peak, 95,000 properties were subject to rotation of supplies overnight from 30 to 31 December. A total of 180,000 properties (household and non-household) were subject to rotation of supplies at some time. We estimate that this will have resulted in some interruption to the supply to 380,000 people.
- 4.10 The maximum time that properties were subject to an individual supply rotation is shown in Figure 12. The data reflects the time that DMA valves were closed and opened again. However, some of these properties will have been subject to multiple supply rotations.

Figure 12: Duration of individual supply rotation

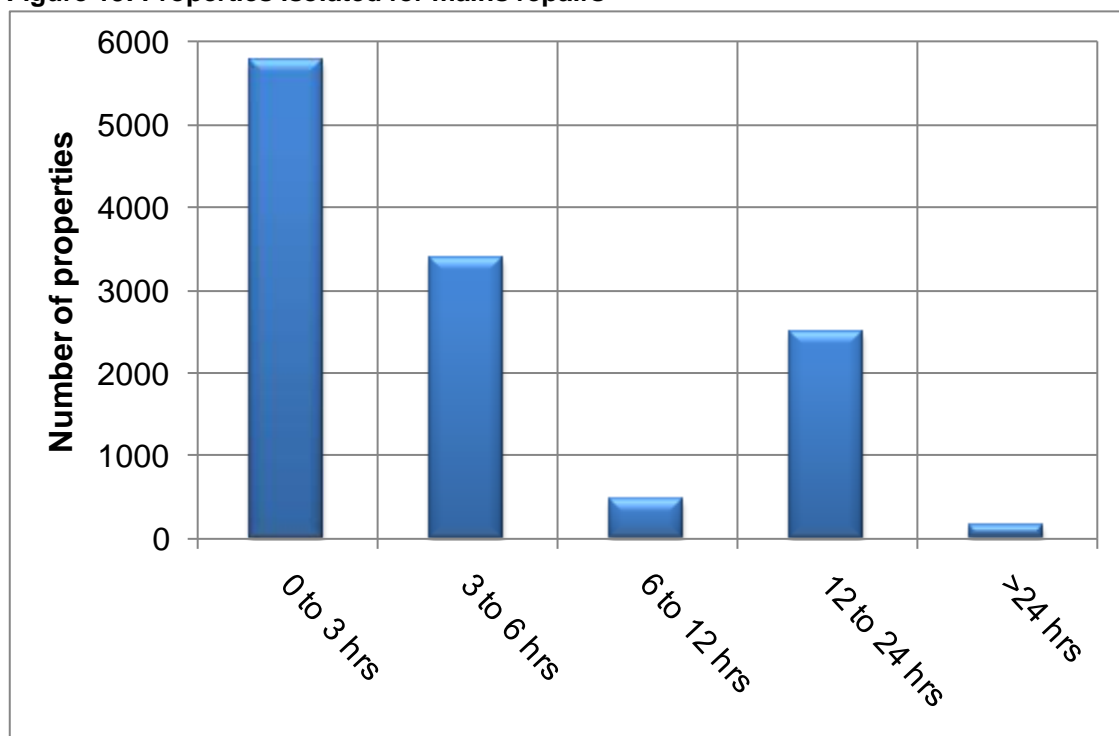


4.11 87,000 properties were subject to at least one period of supply rotation exceeding 12 hours. 7,900 properties were subject to at least one period of supply rotation exceeding 24 hours.

Consumers affected by mains isolation for burst repair

4.12 When a burst main is repaired, NI Water isolates as small a section of the distribution system as possible for the period necessary to make the repair. From 23 December to 7 January the company isolated approximately 12,300 properties to carry out 283 repairs on burst water mains. We estimate that this will have resulted in some loss of supply to 26,000 people. The duration of these interruptions are shown on Figure 13.

Figure 13: Properties isolated for mains repairs



Consumers affected by service reservoir drain down

4.13 In some areas properties were affected by interruptions to supply when service reservoirs drained down but where supply rotation was not introduced. These were generally smaller areas where the service reservoir feeds only one DMA. In these circumstances, properties closest to the service reservoir are likely to lose supply first as the system drains down. NI Water estimated that 23,000 properties were affected in 55 areas (excluding properties on supply rotation). We estimate that this will have resulted in some loss of supply to 48,000 people.

Performance of water resources

- 4.14 The water resource assets performed well through the freeze thaw incident. This was despite localised freezing of some equipment at abstraction points which caused temporary interruptions (which were dealt with by supply staff at the time). No significant problems arose that affected the ability to abstract water.
- 4.15 The availability of water in Lough Neagh and in impounding reservoirs (such as the Silent Valley) did not restrict supplies. This is confirmed by the status of NI Water's impounding reservoirs before and after the incident, which is shown in Table 3. The impounding reservoirs filled between the end of November 2010 and mid-January 2011 with run-off from snow-melt, rainfall and ground water exceeding demand and outflow over the period.

Table 3: Impounding reservoir status

Impounding reservoir status	% full
On 29 Nov 2010 before the start of the freeze thaw incident	93.79%
On 17 Jan 2011 at the end of the freeze thaw incident	96.10%

- 4.16 The equivalent status of the impounding reservoirs at the same point in January 2010 was 97.7% full and 90.8% full in January 2009.
- 4.17 Over the incident, the additional distribution input was equivalent to 4.5 days of average demand. This is not significant when considered in the context of the abstractions from Lough Neagh and the volume in storage in the Mourne.

Performance of water treatment works

- 4.18 NI Water treatment works have benefited from substantial investment over the last two decades to meet EU water quality requirements and to provide the treatment capacity identified in NI Water's Water Resources Management Plan. This includes the Alpha PPP concession commissioned in 2008 which now provides 48% of treatment capacity. The phasing of major water treatment upgrades is shown in Table 4.

Table 4: Proportion of treatment capacity upgraded

Period	Proportion of treatment capacity upgraded
1996 to 2000	20%
2001 to 2005	29%
2006 to 2011	48%
In construction	4%
Total	100%

- 4.19 As a result of this investment NI Water has modern water treatment work facilities, with much of the plant within buildings.
- 4.20 The water treatment works operated by NI Water performed well through the incident despite some plant being affected by the freezing conditions. The company has identified the impact of wind chill through building ventilation systems as a particular issue and some exposed plant and pipework, particularly sludge plant, suffered frost damage.
- 4.21 Despite these local problems, the company was able to increase treatment capacity to the design output for most plant. Production was limited by either the hydraulic capacity of the works or by a decision not to risk water quality by exceeding the nominal design capacity of the works. At a few works, peak production was more than the nominal design capacity, generally supported by continuous staffing. NI Water provided staff to operate the new works at Fofanny, which had experienced problems in the previous year's freeze thaw. It also provided continuous staffing at Lough Fea works which was operated above its nominal design capacity.
- 4.22 We have not assessed the impact on water quality during the incident. This is being considered separately by the Drinking Water Inspectorate (DWI).
- 4.23 Despite ramping up its treatment works to almost full capacity, the company was unable to meet the peak demand for water which occurred on 27 and 28 December. In its recent draft Water Resources Management Plan, the company did not identify an immediate need for additional water treatment capacity. This should be reviewed in light of experience over the winters of 2009-10 and 2010-11. The need for additional treatment capacity to deal with peak winter demands in critical periods such as freeze thaw events should be reconsidered. We understand that the same problem has been identified by other service providers in the water industry. We recommend that NI Water takes the opportunity to work with others to develop a rational basis for assessing peak winter demand and the provision of treatment capacity to meet this demand.

- 4.24 Any decision to provide additional treatment capacity in response to the 2010/11 freeze thaw incident should take account of the extreme nature of the event. The company should consult other stakeholders and consumers on the costs and benefits of investment that provides cover for infrequent events.
- 4.25 The company noted key actions taken under the winter contingency plan in respect of water treatment including:
- fuel and chemical stocks were checked and increased;
 - sludge stores were cleared; and
 - staff rotas were reviewed and populated.
- 4.26 The action taken was successful in helping the company maintain performance through extreme winter conditions.

Over the critical period from 27 December 2010 to 2 January 2011 when demand peaked NI Water's water treatment works were operating at or near maximum capacity.

Lessons from the 2009/10 freeze thaw incident in respect of treatment had been learnt.

Water treatment: PPP plant performance

- 4.27 During the incident the PPP plant at Dunore Point and Castor Bay did not deliver the maximum quantity of treated water included in the contract. The plant at Castor Bay operated at 139 MI/d compared with the contracted capacity of 147 MI/d and Dunore Point operated at between 161 MI/d (27 December) and 170.5 MI/d (31 December) compared with the contracted capacity of 180 MI/d. Both plants suffered frost damage to stainless steel pipework and small diameter dosing lines.
- 4.28 Local distribution arrangements meant that NI Water would not have been able to use the additional capacity from Castor Bay where it was most needed. A trunk main under construction will allow this additional capacity to be used in a future event. Had Dunore Point operated at full capacity, the additional 9.5 MI/d to 19 MI/d could have been supplied to Belfast and would have reduced the extent of supply rotation.

Over the critical period from 27 December 2010 to 2 January 2011 when demand peaked the PPP water treatment works at Castor Bay and Dunore Point did not achieve their contracted maximum daily outputs.

The PPP plant operator reported a few water quality failures (aluminium PCV level exceedances) at Ballinrees and Dunore water treatment works. These have been reported to the DWI for investigation.

Water transfer

- 4.29 The water trunk mains between water treatment works and service reservoirs performed well during the freeze thaw. There were a small number of trunk mains bursts and some air-valves also burst as a result of freeze thaw action.
- 4.30 The hydraulic capacity of the transfer mains was tested by an extended period of operation at the peak capacity of the treatment works and this exposed some hydraulic restrictions in the system. Some of the key restrictions identified (the supplies to Dungannon, Newry and Belfast from Castor Bay) already form part of the PC10 programme. NI Water is developing a hydraulic model of its trunk main system as part of its on-going work on water resources. We expect the company to take account of any weaknesses exposed by the 2010/11 freeze thaw incident in its analysis and identify any necessary investment for the next price control.
- 4.31 Some water supply areas in Northern Ireland are served by a single trunk main from a single works. These areas are at higher risk of supply failure than other areas which benefit from a more integrated system of supply. NI Water should continue its assessment of these areas to understand the risk of supply failure and bring forward proposals for additional investment to improve supply resilience where appropriate.
- 4.32 During the investigation, we considered the performance of two supply areas in greater detail (the area in and around Cookstown served by Unagh Service Reservoir and the area of Belfast served by Breda Service Reservoir). In both cases it was the availability of water rather than the capacity of the trunk mains which limited supply into the area. However, the configuration of the trunk main system caused both areas to be selected for supply rotation.

Service reservoirs

- 4.33 Service reservoirs provide short-term storage which allows the company to balance supply and demand over a day. They also provide some protection when a treatment works or trunk main fails or when

demand exceeds supply in the short-term (for example, during a freeze thaw incident or a major pipe burst).

- 4.34 NI Water has 367 service reservoirs with a total volume of 1,273 MI, providing two days retention time at the average distribution input. The retention time of NI Water's service reservoirs is similar to that provided by water companies in GB. In general, the average storage capacity available in service reservoirs is adequate. However, within the average, there may be individual service reservoirs which are smaller than they need to be. The company should review the capacity of its service reservoirs in detail to identify individual reservoirs which do not have the capacity necessary to reduce the risk of service failure to acceptable levels.
- 4.35 NI Water often operates its service reservoirs part full to maintain water quality. Typically, the company will attempt not to exceed a 24 hour retention time. The winter contingency plan makes provision for increasing the volume of water in service reservoirs in anticipation of increased demand during a thaw. There is evidence that this was done in December 2010. However, some service reservoir levels had been falling from 22 December before the treatment works had been ramped up to their full capacity. It would have been possible to increase production earlier to maintain levels in these service reservoirs in advance of the incident. This would have delayed the introduction of supply rotation, but would not have prevented it. It may, however, have facilitated consumer communication and thereby minimised their concerns.

The retention time of NI Water's service reservoirs is similar to comparative companies in GB.

We are concerned that NI Water did not increase water production sufficiently to recover falling service reservoir water levels prior to the loss of supply incident on 27 December.

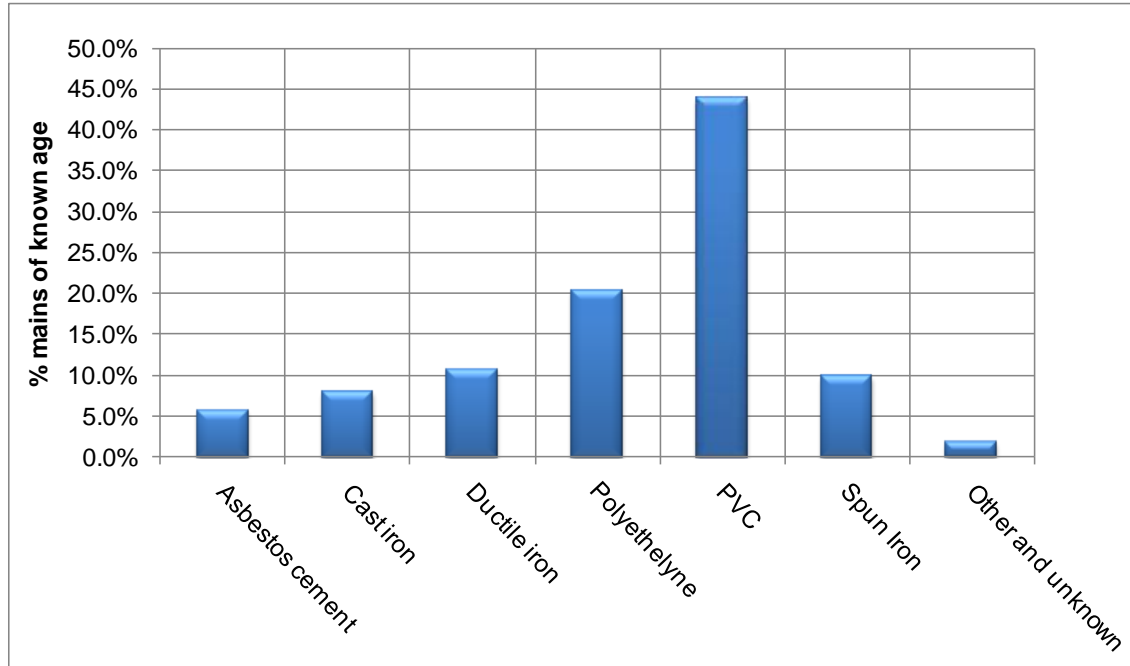
Water mains

- 4.36 NI Water distributes water through 26,500 km of water mains. The length of main per property is 33.1 metres compared with an average of 14.6 metres in GB. This reflects the connection of a distributed rural population to the public water supply. It impacts on the level of leakage and the level of interruptions to supply. If NI Water increased its mains replacement rates to the same percentage as companies in England and Wales, the cost per consumer would be about twice the average incurred in GB.
- 4.37 NI Water's water mains are the second youngest in GB. The average age of water mains is 29 years compared with an average for England

and Wales of 45 years. The relative age of the mains reflects work undertaken in the 1960s and 1970s to extend the distribution system to serve the rural community.

- 4.38 The most common material for water mains is uPVC (48%), again reflecting work undertaken in the 1960s and 1970s to extend the distribution system to serve the rural community. The proportion of cast iron mains is relatively small, consistent with the age profile of the mains.

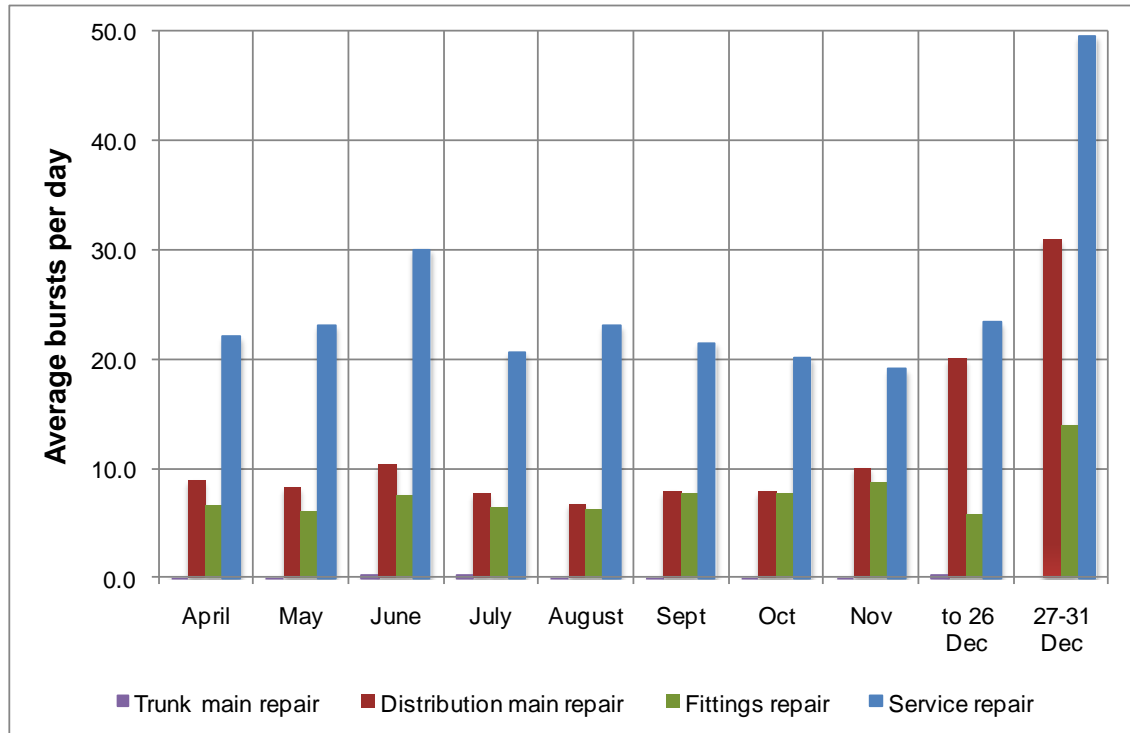
Figure 14: Distribution of water mains by material



- 4.39 The burst rate per length of main is lower than the average for GB, consistent with the age of the mains. During the freeze thaw incident, bursts occurred at a higher frequency on the older iron mains.
- 4.40 Leakage per length of main is also lower than the GB average, consistent with the age and performance of the mains. Leakage as a proportion of distribution input (30%) is high compared with England and Wales because of the very high length of main per property served.
- 4.41 The distribution system is divided into 1,067 DMAs which cover 99% of the connected properties. An almost universal DMA coverage is consistent with practice in GB and provides the basis for effective leakage control and management of the distribution network.
- 4.42 Overall, the performance of water mains in Northern Ireland, based on burst and leakage rates, indicates that they are in a better condition than the average for GB which have benefited from higher levels of investment over the last 20 years. The performance is consistent with the relatively low average age of the mains.

4.43 The frequency of bursts increased during the incident as shown in Figure 15.

Figure 15: Average number of water network repairs per day



4.44 There were only four repairs to a trunk main during the thaw, consistent with the conclusion that the trunk mains from treatment works to service reservoirs performed well during the thaw.

4.45 The frequency of repairs to distribution mains was double the annual average up to 26 December and treble the annual average in the post-Christmas thaw. This is consistent with comparative data provided by GB water and sewerage companies.

4.46 The frequency of fitting repairs increased during the thaw. In many cases this covers maintenance work to address minor leaks. However, 150 air-valves (of 36,000 on the water mains system) were found to be frozen and the casing burst. The company reports that this was exceptional.

4.47 Overall, there was an increase in bursts through the freeze and the thaw which was similar to that experienced by water and sewerage companies in England and Wales. However, there was no widespread failure of the water distribution network. The data suggests that underinvestment in mains rehabilitation was not a contributory factor to the increased water loss experienced during this incident.

- 4.48 We asked the company to provide plots of distribution mains bursts reported during the incident for the areas served by Unagh and Breda service reservoirs. The data was plotted on background Ordnance Survey maps showing DMA boundaries, distribution mains and historical burst records. The number of bursts in each area was small and they occur on relatively small mains. This supports the conclusion that mains bursts were not a significant contribution to the increased loss of water during the incident.
- 4.49 The burst plots also showed that the mains bursts which occurred during the incident were largely independent of historical burst clusters. Burst cluster analysis underpins decisions on mains renewal and rehabilitation work to maintain the condition of the asset and service to consumers. Since the bursts which occurred during the incident did not occur on pipes with a burst history, they would not have been prevented by pro-active water mains rehabilitation. Again, this suggests that underinvestment in mains rehabilitation was not a contributory factor to the increased water loss experienced during this incident.
- 4.50 NI Water lags slightly behind England and Wales in terms of water quality compliance. Most of the work on water treatment works to meet current water quality standards is complete. The residual difference in performance is mainly due to failures for parameters such as iron, manganese and turbidity caused by the corrosion of iron water mains.
- 4.51 Water companies in England and Wales have benefited from investment in defined water mains quality programmes over the last 15 years which resulted in higher mains relining rates. A consequential benefit of these programmes is that they replaced or relined older iron water mains. Since older iron mains were the main source of increased bursts during the incident, introducing a defined mains quality programme is likely to reduce the risk of the additional bursts occurring and reduce the impact of severe low temperatures on the distribution system.
- 4.52 On 27 December demand and flows in the distribution system increased and more than doubled in some areas. This will have increased pressure losses in the distribution system and reduced pressures in consumer supplies. However, NI Water had no data to inform them of this. If NI Water had been able to obtain this information on the pressure in the distribution system it may have understood the problems being experienced by consumers better. The introduction of real time pressure monitoring on the distribution system should be assessed by the company and introduced where appropriate.

The overall conclusion is that mains are in reasonable condition and performing well in normal circumstances. Historical levels of investment have maintained the performance of the network, as measured by bursts per length of main.

The frequency of repairs to distribution mains was double the annual average in December and treble the annual average in the post-Christmas thaw. This is consistent with comparative data provided by other companies.

Mains bursts were not a dominant cause of the increased loss of water which occurred during the thaw.

The bursts during the incident are largely independent of historical burst clusters. This suggests that increased mains investment could not have been targeted to prevent the increased level of bursts experienced during the incident.

Conclusions: Extent of supply problems

Conclusion 1 – Fittings – short term

- 4.53 NI Water should identify and assess the performance of key components affected by frost action and consider whether it can take action to prevent these difficulties arising in the future. For example the company reported failures on valves, exposed fittings etc.
- 4.54 Before embarking on changes, the company should undertake a risk-based assessment to justify, target and prioritise the necessary investment.

Conclusion 2 – Plant items – short term

- 4.55 NI Water should identify learning from the failure of plant through the incident and incorporate this into its design standards

Conclusion 3 – Service Reservoirs – short term

- 4.56 NI Water should assess service reservoirs which have a higher inherent risk of supply failure and are likely to require tankered volumes of water to maintain supplies. The company should ensure that access and connection arrangements are adequate including provision of hard standing for parking tankers.

Conclusion 4 – Mains isolation – Short term and ongoing

- 4.57 NI Water should capture information on key valve locations including GPS reference and photographic information to ensure that critical information is stored centrally and can be communicated to field staff during an incident. The company should check that isolation plans are in place for its service reservoirs and develop more detailed plans for network isolation. The company should consider developing an isolation routine on its geographical information system (GIS) system which would allow the valves necessary to isolate any section of the network to be identified quickly.

Conclusion 5 – Call volume reports – short term

- 4.58 The company should develop the call volume reports available to the Incident Command Team. Call visualisation and reports based on geographic areas might be difficult to interpret. The company should consider the production of reports of calls related to particular assets, such as service reservoirs or DMAs, which could provide early warning of developing situations related to the asset base to quickly focus on problem areas.

Conclusion 6 – Telemetry – short term and ongoing

- 4.59 NI Water should consider developing pressure monitoring of the distribution network to provide real time pressure data as an early indicator of a reduction in service. The development of this approach should be based on an analysis of how the network might have responded to increased flows during the 2010/11 freeze thaw. Pressure management to assist leakage reduction is provided for within the PC10 final determination. The company should consider extending this to include pressure measurement on telemetry.

Conclusion 7 – Access to assets - short term

- 4.60 The company should review its access routes to critical assets and make arrangements with Roads Service to request that routes are salted to maintain access under frozen conditions.

Conclusion 8 –PPP water treatment works – short term

- 4.61 NI Water should take the steps available to it under the PPP contract to ensure that any weaknesses in the PPP assets exposed by the freeze thaw event are rectified and that sufficient steps are taken to ensure that the full contracted plant capacity will be available when demand is at its peak.
- 4.62 Once the company has taken the action recommended above, it should review the assumptions regarding PPP plant output in its draft Water

Resources Management Plan to reflect the residual risk of reduced plant output at critical times and develop steps to mitigate such risks.

Conclusion 9 – WRMP – to inform future Price Controls

- 4.63 NI Water should review its draft Water Resources Management Plan to include a critical period assessment covering peak winter demands. NI Water should work with other water service providers, policy makers and regulators in GB and RoI to assess the likely reoccurrence and the impact of peak winter demand and develop a rational, risk based approach to address this issue.

Conclusion 10 – WRMP – to inform future Price Controls

- 4.64 NI Water should continue the work done under the draft Water Resources Management Plan to assess the hydraulic capacity of the existing and planned trunk mains drawing on the experience gained of operating at full capacity over a sustained period.
- 4.65 NI Water should assess the resilience of the trunk main network drawing on lessons learnt from the freeze thaw incident in 2009/10 and 2010/11.
- 4.66 The company should also work with policy makers, stakeholder and regulators to define appropriate levels of service in consultation with consumers.

Conclusion 11 – Service Reservoirs – to inform future Price Controls

- 4.67 NI Water should review the capacity of its service reservoirs in detail to identify individual reservoirs which do not have sufficient capacity to reduce the risk of service failure to acceptable levels. The assessment should consider the risk and consequential impact of supply failure resulting in a clear statement of need. The assessment should take account of the resilience of the supply arrangements and an appropriate level of service informed by consumer views and developed in conjunction with policy makers and regulators.

Conclusion 12 – Water mains – to inform the next Price Control

- 4.68 NI Water should complete an assessment for bursts which occurred during the freeze thaw to determine whether a planned programme of mains replacement could have prevented the bursts which occurred during the incident and then take account of this in its future proposals for mains rehabilitation.

Conclusion 13 – Water mains – to inform the next Price Control

- 4.69 NI Water should develop its water mains quality programme in conjunction with the DWI so that the extent of the quality programme is

defined and a rate of addressing current quality shortfalls agreed. On the basis of the limited investigation to date this may have the consequential benefit of reducing mains bursts (generally occurring on old cast and spun iron mains) during freeze thaw events.

Conclusion 14 – Water mains – to inform the next Price Control

- 4.70 NI Water should investigate the bursts that occurred through the winter of 2009/10 and 2010/11 to develop its understanding of the mechanisms that cause pipe failure which might inform its future asset management procedures. The factors which should be considered in this assessment will include mains age, mains material, air temperature, soil temperature, water temperature and soil type.

Conclusion 15 – Cost Benefit – longer term

- 4.71 NI Water and other stakeholders should recognise that extreme weather conditions can have an impact on the performance of plant. For example: biological and chemical processes become inhibited as temperatures fall, and low temperatures increase pipe bursts. It would be expensive to design plant to secure performance in all circumstances. Attempting to do so can result in plant which is so large that it is detrimental to normal operation. Policy makers and regulators should consider their requirements for the company to design infrastructure for all circumstances and ensure that design standards, consents, licences and regulatory action take account of the costs and benefits of investing to deliver full compliance in all circumstances.

Chapter 5: Performance of NI Water: contingency planning and implementation

Key findings

- NI Water's MIP is broadly similar to those of other water companies.
- There is strong operational focus in terms of ownership and operation of the plan. The implementation during the incident exposed a lack of corporate ownership and consumer focus.
- Evidence from the event indicates that implementation worked reasonably well operationally but that implementation of the equally important customer service elements of the plan was lacking.
- Not all of the lessons identified from the 2009/10 freeze thaw incident were addressed. In particular, NI Water failed to put in place an effective process for ramping up the number of customer call handlers before, during or after the thaw that was predicted to occur around Boxing Day. Similarly, proposed customer service initiatives to improve inferencing of calls and call visualisation were not prioritised to be addressed in 2010/11.
- An issue not identified from 2009/10 was the possibility of having to instigate rotation of supplies, which resulted in a failure to develop an associated supply rotation contingency plan and associated communication strategy.
- There is an aligned MIP arrangement with the outsourced PPP contract. No such arrangement exists with the outsourced call centre provider.
- NI Water's approach immediately before the thaw was more reactive than pro-active. The standby ('shadow') team could have taken additional pre-emptive actions if 'what if' scenarios had been fully explored in advance of the incident occurring.
- NI Water was initially reluctant to accept assistance when offered.

Introduction

- 5.1 This chapter focuses in the main on issues around the implementation of operational aspects of the MIP. Internal communications are covered in this chapter however external customer service aspects are considered more fully in Chapter 6.
- 5.2 This chapter includes sections on:
- NI Water's MIP;
 - operational issues in implementing the MIP;
 - Mutual Aid; and
 - the Civil Contingencies Group (NI).

NI Water's MIP

- 5.3 The Department for Regional Development (DRD) has a statutory role in relation to the company's requirement to have in place an Emergency Plan. DRD issued a Direction to NI Water in August 2010 (the Preservation of Services and Civil Emergency Measures (NI) Direction 2010), requiring the company to have an Emergency Plan in place. DRD may also issue guidance and stipulate requirements to accompany this Direction. While this has not been issued to date, we hope that the relevant conclusions contained in this report prove helpful.
- 5.4 NI Water has a responsibility to ensure that measures are in place to prepare for, respond to and recover from any incident that has an impact on the services it is required to provide.
- 5.5 NI Water's MIP provides a framework for the management of incidents and a vehicle to mobilise appropriate staff into incident teams. The MIP clarifies roles and responsibilities and provides a structure for the resolution of the crisis. It should be fit for purpose, irrespective of the nature of the event. The incident team must also draw on its knowledge, good communication and operational contingency plans that are more specific to the event. It relies on the culture and structure of the organisation being capable of managing the crisis.
- 5.6 The current version of the MIP was originally issued in 2002 and has been subject to regular updates.
- 5.7 NI Water's MIP is set out in two volumes:

NI Water's MIP contents	
Volume 1	Volume 2
1. Introduction	1. Introduction
2. Definitions	2. Alternative water supplies
3. Incident reporting	3. Customer information
4. The Major Incident Plan	4. Adverse weather
5. Tasks	5. Security
6. Specific events	6. Media plan
	7. Cross border
	8. Incident rooms
	9. Out of sewer flooding

- 5.8 Volume 1 sets out NI Water's classification of incidents (category 1 to 4), incident reporting procedures including escalation of response and incident management arrangements.
- 5.9 Volume 2 sets out specific incident plans, including alternative water arrangements, customer information, adverse weather, a media plan and security arrangements.
- 5.10 NI Water's MIP is supplemented by other contingency documents designed to help support any incident response. The MIP documents cover operational, scientific and customer services roles and responsibilities, defining and providing guidance where appropriate for specific tasks to be discharged.
- 5.11 The response to an incident will depend on its impact on the organisation and the public. Incidents are divided into the following categories:
- **Category 4** – routine, non serious daily matter, dealt with by normal service conditions without change to priorities at a local level. It is unlikely to give rise to public or media attention.
 - **Category 3** – non-serious daily matter, not greatly disruptive to normal service conditions, but may require some reorganisation of priorities at a local level. It may give rise to some public or media interest.
 - **Category 2** – an incident involving a serious disruption to services and requiring special mobilisation and organisation of personnel beyond the normal routine, but unlikely to involve head office staff. It will give rise to public and media interest at local level.
 - **Category 1** – an incident involving an exceptional disruption to services and requiring widespread mobilisation and organisation

of staff, including the head office incident team. It will give rise to public and media interest at a national level.

- 5.12 Category 1 events led to the establishment of a Gold (Head Office) Incident Team supported by Silver (Functional) teams. Category 2 events would generally be managed through the establishment of Silver (Functional) teams only. Bronze teams support the higher level teams by undertaking the operational tasks associated with the incident response. The establishment of the Gold, Silver and Bronze structure is based on established processes for providing a co-ordinated Strategic (Gold), Tactical (Silver) and Operational (Bronze) response to an incident.
- 5.13 The MIP has well-defined benchmarks for classifying incidents, and a clear escalation route to enable appropriate categorisation to take place. There are formal arrangements in place to provide 24-hour cover for Functional (covering Water and Waste) and Head Office Duty Officers. These on-call officers monitor developing operational issues and provide the route for escalation should an incident team be required.
- 5.14 It has been noted however that the categorisation benchmarks do not include any provision for escalating customer contact issues above category 3. This is based on the fact that another escalation route, such as an investigation of the root cause of the issue (for example, the burst main or failed treatment works) would lead to escalation, rather than the number of customer calls.
- 5.15 This was exposed as a potential issue through this event, as the main reason for the high volume of calls initially was a result of problems with consumers' own frozen or burst pipes, not problems on NI Water's network. The company should consider making an increase in consumer calls a trigger level for the escalation of an incident above category 3. This approach would reflect greater consumer awareness and enable the company to identify and assess emerging issues and develop an appropriate response.

The company should consider making an increase in consumer calls a trigger level for the escalation of an incident above Category 3.

- 5.16 We benchmarked the MIP against other water utility plans and found that it was broadly similar. After the December 2010/11 freeze thaw incident, the Minister required the company to have an independent expert evaluation. That too concluded that the MIP was broadly fit for purpose, with the caveat that a clear role for the company's executive team needs to be included for events of this scale.

- 5.17 Our review of the MIP established that it extended beyond the two volumes referred to above. Nine related contingency documents exist to support a range of incident responses. A further 17 Business Continuity Plans have been developed. It is noted, however, that none of the contingency planning documentation made provision for the rotation of water supplies.
- 5.18 Of the other contingency documents, the most relevant to this incident is the winter contingency plan. This has two main elements: a winter weather strategic game plan and a severe weather contingency plan in the form of a checklist.
- 5.19 The purpose of the strategic game plan was 'to reaffirm the NI Water strategy for responding to any severe weather events during the 2010/11 winter season'. Its objective was to clarify and pre-plan communications, logistics and strategy.
- 5.20 The severe weather contingency plan checklist detailed the actions to be undertaken by the Customer Services Delivery Directorate in preparation for winter.
- 5.21 The winter contingency plan included a number of lessons learnt from the 2009/10 freeze thaw incident. It also included a copy of the Gold command incident management rota for the period December 2010 to July 2011 and the makeup of the standby (shadow) incident response teams for the period from 23 December 2010 to 4 January 2011.
- 5.22 The winter contingency plan including the associated checklist was reviewed and approved at the Operational Management team meeting on 24 November 2010. The checklist contained a total of 143 activities. Of these, around 55% were reported as complete, around 40% were marked as ongoing, and the remainder as either partially complete or referred to other areas of the business to address. It is unclear whether all actions were completed at the time of the incident.

The winter contingency plan provided a means to incorporate lessons learnt and to ensure that there was a level of awareness of the plan.

The checklist of actions included in the winter contingency plan was comprehensive and provided a good mechanism for ensuring that appropriate preparatory action was undertaken. However, failure of certain elements, such as arrangements for ramping up the number of call handlers to meet increasing call volumes during the incident, indicates that appropriate monitoring and checking were not always in place to ensure delivery. This will be required, along with clear responsibility and accountability for tasks, to ensure the full effectiveness of this plan in future.

Lessons learnt from the 2009/10 freeze/thaw

- 5.23 The majority of actions identified following the 2009/10 freeze thaw event were incorporated in contingency plans for 2010/11. Those associated with the operational response generally proved successful. This includes improved chemical storage levels at PPP sites, the replacement of tanker fittings, improved access to operational resources, and inclusion of work control centre roles in the incident teams. Those associated with communications, however, were not as successful such as the arrangements for ramping up the number of call handlers and the new system for recording key messages for the incident teams.
- 5.24 Three actions were not completed for 2010/11. Two of these related to customer service initiatives to introduce call inferencing and call visualisation which the company did not prioritise for delivery in 2010/11. The other related to the co-location of the company's telemetry, work control and incident management centres. The company have advised that this has been postponed to 2013 at the earliest.
- 5.25 To overcome last year's freeze thaw NI Water successfully increased water production by some 29%. This negated the need for rotation of supplies. However, the investigation noted that during the 2009/10 incident a substantial number of reservoirs were identified as having empty/very low levels for anything up to 12 days.
- 5.26 Furthermore, it was noted in meetings with NI Water during our investigation that the company had come close to having to introduce rotation of supplies last year. This prompts the question about why the potential for having to take such action in advance of this incident was not considered and why the company had not developed both an operation and communication contingency plan for such a scenario.
- 5.27 Companies can only realistically prepare for what they can foresee, and allowance needs to be made for this. However, this event was of very similar nature to that in 2009/10; differing mainly in scale. The company should therefore have addressed lessons learnt and been better prepared. Last year's experience should have provided an insight into the potential issues that could arise and allowed the company to focus on addressing these. The relative success of the response last year may however have introduced an element of complacency.

NI Water's proposed customer service initiatives, to improve inferencing of calls and call visualisation, were not prioritised for investment in 2010/11. The company has advised that it will revisit the prioritisation for these initiatives in light of the recent event.

There was a failure to identify the possibility of the need to rotate supplies, given the near miss in 2009/10.

Scenario planning and testing the MIP

- 5.28 NI Water had not identified the risk of an event of this scale and type occurring. It had planned for the worst possible single event affecting the largest population in any part of its area. This was in line with the planning parameters used in England and Wales which NI Water adopted on the basis that they provided a best practice guideline.
- 5.29 The company advised us that it had undertaken nine internal mock incident exercises since 1999, ranging from desktop exercises focused on specific issues to full scale incident simulations involving a broad range of staff across the organisation. Three of these were facilitated by external bodies. The last full-scale incident simulation was undertaken in 2005. This tested a province wide freeze thaw scenario.
- 5.30 NI Water also advised us that it had participated in six external mock incident exercises since 2008 arranged by other utilities, government bodies and 'blue light' responders.
- 5.31 Operationally the MIP was tested regularly in 2010 (93 times at category 3 level, four times at category 2 level and three times at category 1 level).
- 5.32 Three audits have also been carried out in relation to emergency planning in the last 10 years, namely:
- Internal Audit of Emergency Planning within Water Service (July 2001);
 - Manned and unmanned sites – Ernst & Young (December 2007); and
 - Business Continuity Planning and IT Disaster Recovery – Ernst & Young (August 2009).
- 5.33 It is noted that the Preservation of Services and Civil Emergency Measures (NI) Direction 2010 requires NI Water to provide an annual statement to DRD confirming that its MIP fully meets the requirements of their Direction. It is also noted, however, that the Direction does not

require this to be independently certified and does not explicitly state that NI Water should review its plans at least once every year. This is the case in the equivalent Direction for England and Wales.

NI Water had not considered the risk of such an event occurring or planned for an event of this type and scale.

Testing of specific processes within the plan mainly occurs through implementation of the plan in 'live' incidents.

Audit of the MIP has been limited and infrequent over the last 10 years.

Incident management training

- 5.34 NI Water undertakes two broad types of formal incident management training: training on the MIP documentation itself; and training in incident management. The latter is generally provided through exercises as detailed above. Staff familiarity with the MIP is mainly developed through regular use of the plan in business as usual activities and during live incidents.
- 5.35 Where activities are outsourced the responsibility for incident management is retained within NI Water. The Emergency Planning Officer (EPO) has worked with the PPP providers to ensure that their emergency procedures align with NI Water's MIP. The outsourced call centre provider has its own business continuity plan.
- 5.36 NI Water's Emergency Planning Officer attends regional and national groups including being involved with Emergency Planning Officers across the water industry via Water UK. This allows him to keep up to date with current industry threats and best practice and should result in appropriate updates to NI Water's MIP.

Operational issues in implementing the MIP

- 5.37 Through our investigation we have determined the following sequence of events in relation to invocation of the MIP.
- 5.38 Gold and Silver incident teams were established between 10 and 12 December in response to a lesser freeze thaw event. Following this they operated in 'shadow mode' until 27 December.
- 5.39 It is understood that shadow mode for the Gold and Silver teams means that individuals are on standby and receive relevant information about the ongoing incident. This provides a route for the escalation of the incident and incident teams to be established. It has been demonstrated that the operational members of the shadow team were

communicating via email and telephone to discuss the developing situation prior to the incident being called on 27 December.

- 5.40 There is limited evidence of extensive discussions extending beyond the operational perspective of the ongoing situation (for example, 'what if' scenarios). The company missed an opportunity to consider and plan communications strategies to meet the potential challenges associated with the response to the freeze thaw event.
- 5.41 The decision to call the category 1 incident and reconvene the incident teams was made at around 17.30 on 26 December. It was taken on the basis of information available to the Shadow team at the time (for example, call statistics, service reservoir levels, distribution input, number of 'no water' calls and number of mains bursts). This was described as a precautionary decision and followed discussions between the Shadow Incident Manager and the Director of Customer Services Delivery. It was agreed that incident teams would convene at 10:00 on 27 December and relevant staff were notified. The Director of Customer Service Delivery informed the company's executive team of the decision on 26 December via email.
- 5.42 At around 00:30 on 27 December the Shadow Incident Team Manager was advised of concerns over some reservoir levels. This reinforced the decision to call the category 1 event.
- 5.43 The Gold team was based in the Incident Management Centre in Westland House where it had ready access to key information, including the following company systems:
- Emergency Planning documents on EPIC – a document management system that provides easy access to the company's emergency planning documentation.
 - Ellipse (work management system) – a system used to allocate jobs to the field and provide feedback in relation to progress on jobs.
 - Telemetry – a system that provides real time information relating to the performance of NI Water's assets (for example, alarms, service reservoir levels and metered flows).
 - GIS – NI Water's map based geographical information system which shows the company's pipework and assets and holds key information on the assets in the form of associated attributes.
- 5.44 Silver teams were established in Bretland and Altnagelvin. The Silver teams broadly reflected the operational teams for each of the company's network areas and therefore helped preserve the normal operational chain of command. However, the need to coordinate the response from two Silver teams in the event will have contributed to the Gold team having to deal with tactical as well as strategic issues.

- 5.45 The Silver teams play a critical role in managing the deployment of the workforce during an incident. They are also the teams with the local network knowledge and the ability to make appropriate tactical decisions. Communication between the Silver and Gold teams is critical and during this incident there was regular communication through briefing sessions, direct contact between team members and the issue of update reports.
- 5.46 The Bronze teams working on repairing burst mains were operating on a 24-hour basis.
- 5.47 Under normal operations, NI Water's repair squads receive and close out jobs in the field using mobile devices known as 'tough books'. During a major incident, however, the full mobile work management system is not operated. The issuing of work to squads instead reverts to a manual process. This allows the company to adopt a more flexible working regime. However this means that the call centre does not have access to live updates from the field. Instead they are dependent on the Gold team providing updates. These were usually issued twice daily. This reduced the call centre's ability to provide up-to-date feedback to consumers.
- 5.48 The Director of Customer Services Delivery operated in the role of Incident Director and was responsible for escalating issues to the company's executive team and the Board. The Chief Executive was present in the incident room from 28 December and the Chairman from 29 December. Both participated in round table discussions during the incident. However the company's executive team did not meet at any stage during the incident.

There is a strong operational focus in terms of ownership and operation of the plan. The implementation during the incident exposed a lack of corporate ownership and consumer focus.

There was limited and late corporate engagement by the company's executive team during the incident and no company executive team meetings.

The Gold Team dealt with both strategic and tactical issues during the incident. This was an issue for an event of this scale.

Early 'what if' discussions are important as they test the possibilities of what could happen and allow the organisation to prepare. Based on the information available, it appears that additional pre-emptive action could have been undertaken which could have improved communications and reduced the impact of supply interruptions.

The incident team at Gold and Silver levels did not operate on a 24-hour basis

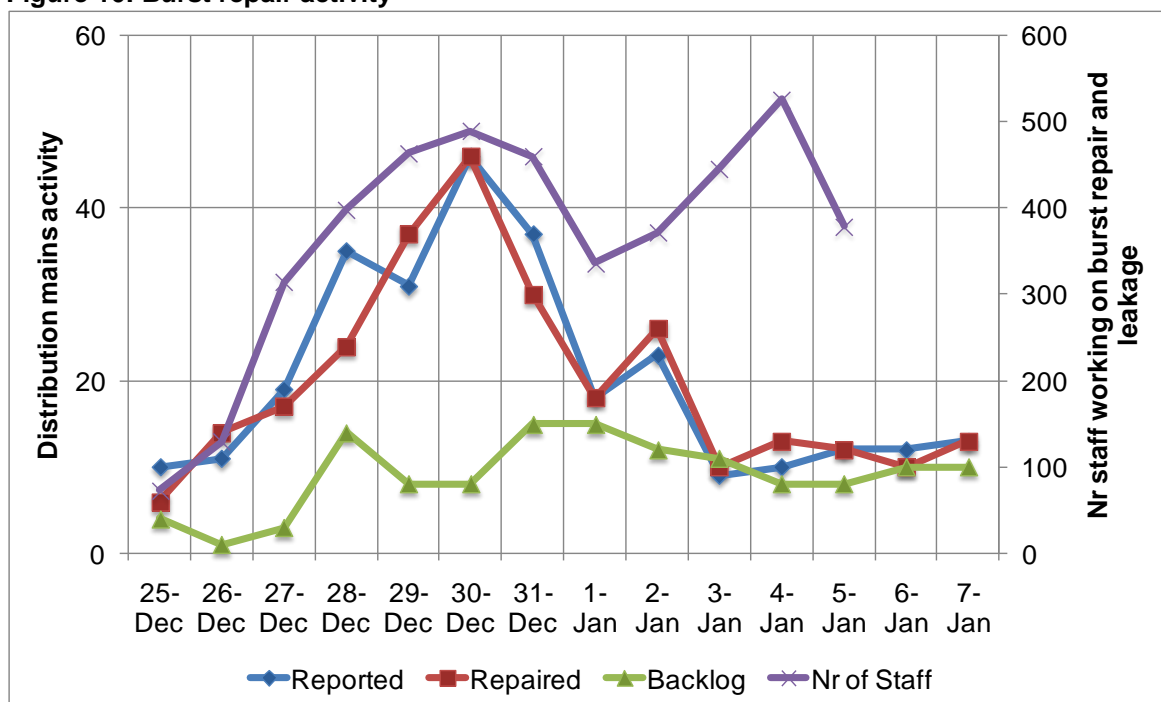
It would appear that sufficient issues were occurring on the evening of 27 December, particularly with the rapid decline of service reservoirs to supply rotation should have been introduced earlier. eg Breda Service Reservoir had emptied by 22.00. on the 27th December.

All key roles identified within the MIP were present in the Incident Team. However, failure to comply with the priority customer and stakeholder contact requirements, indicate that some of the roles were not undertaken effectively.

Repairs of mains bursts

5.49 The company indicated that it remained on top of burst repairs during the incident. Figure 16 shows the number of bursts reported and repaired from 25 December. It also shows the backlog in burst repairs and the total number of network staff working on repairs. This demonstrates that the operational workforce generally kept abreast of water main repairs, working tirelessly over long periods in adverse weather conditions.

Figure 16: Burst repair activity



5.50 The customer call centre was overwhelmed in the early stages of the incident. As a result the company will not have received all reports of bursts from consumers. This may have resulted in a reporting backlog and contributed to the peak seen from 28 December to 3 January, when information eventually got through. Reported and detected bursts returned to average annual levels after 3 January, indicating that a major backlog in reporting had not developed over the course of the incident.

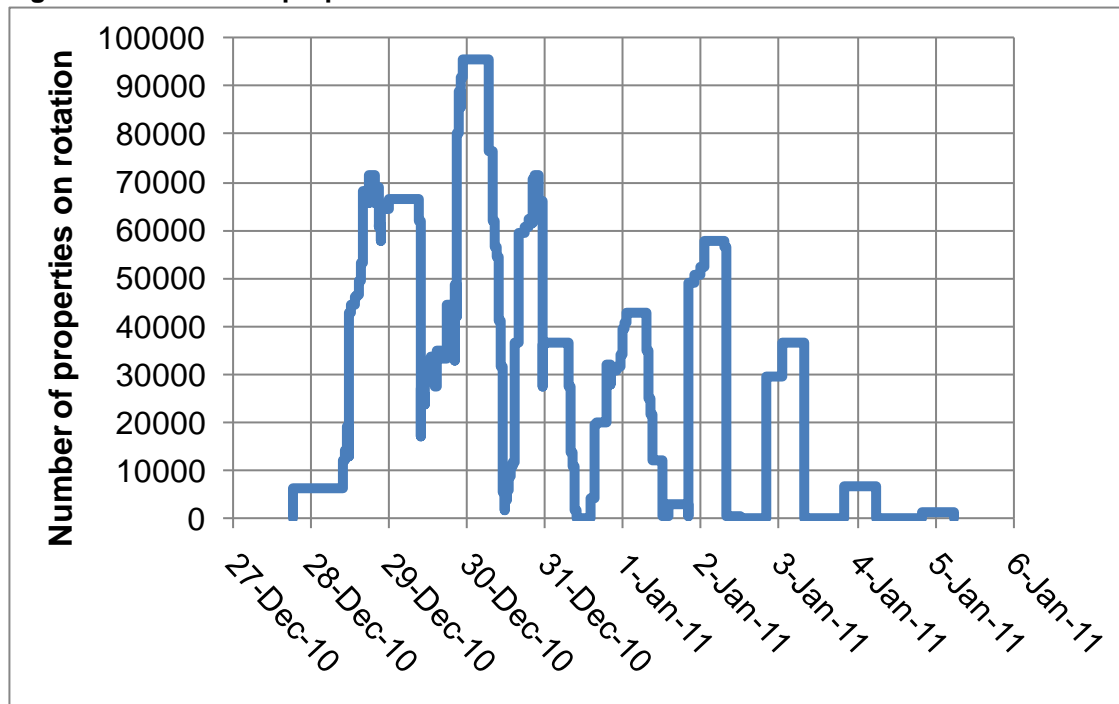
The number of repairs rose in line with the number of reported bursts. Resources increased in line with the escalating event. Only a small backlog of bursts developed over the period.

Rotation of supplies (27 December to 5 January)

- 5.51 Rotating supplies is a means of controlling water demand and allowing depleted reservoir levels to be restored. It generally means that different supply areas are advised on a rotational basis that they will be without water for a specified period of time.
- 5.52 NI Water did not have a contingency plan to cover the possibility of having to instigate rotation of supplies. The company advised us that this was because the last time it had to rotate supplies was some 10 years ago. In addition, since that time there have been considerable enhancements to both the network of water mains and water treatment capacity.
- 5.53 To overcome last year's freeze thaw NI Water negated the need to increase supplies by increasing water production by 29%. This year, despite successfully increasing water production by around 40%, NI Water had to introduce rotation of supplies on the evening of 27 December to protect supplies to the Royal Victoria Hospital. The consequence of not having planned for this eventuality is that no communication plan existed and consumers were not notified. More widespread rotation of supplies was introduced early on 28 December as demand increased and storage at service reservoirs fell. Communication in relation to rotation of supplies continued to be poor.
- 5.54 Decisions in relation to the rotation of supplies were informed by the local knowledge of the Silver team, assessment of the information available at the time, and consideration of the need to maintain supplies to key consumers such as hospitals.
- 5.55 During the incident NI Water took steps to mitigate against the need for rotating supplies. These included:
- deploying leakage staff to unoccupied premises such as caravan parks, student accommodation and vacant buildings;
 - tankering water to water treatment works and service reservoirs; and
 - balancing water supplies between service reservoirs within the distribution network.
- 5.56 NI Water deployed water tankers to supplement service reservoirs and vulnerable water treatment works both before and during the incident, within the limits of the water available at the time.

5.57 Figure 17 shows that NI Water sought to manage the rotation of supplies so that the greatest number of properties was off supply overnight. This is when the impact on consumers would be kept to a minimum.

Figure 17: Number of properties on rotation



The decision to rotate supplies was driven by a need to maintain supplies to key consumers such as hospitals. It was initially introduced to a very limited degree.

Over the night of 27 December service reservoir levels fell significantly. This prompted much wider rotation of supplies on 28 December. It appears that it was only at this stage that NI Water realised the scale and nature of the crisis it faced.

It is felt that the introduction of more widespread rotation of supplies on 27 December could have helped mitigate the impact of the event on consumers.

Plans to rotate supplies and an associated communications strategy were not in place in advance of the decision to introduce widespread rotation of supplies. This resulted in poor, inaccurate and timely information being provided to consumers.

The need to rotate supplies ended on 5 January when the incident was reclassified from a category 1 to a category 2 incident.

5.58 The Minister issued a temporary direction to NI Water on the 30 December under Article 295 of the Water and Sewerage Services

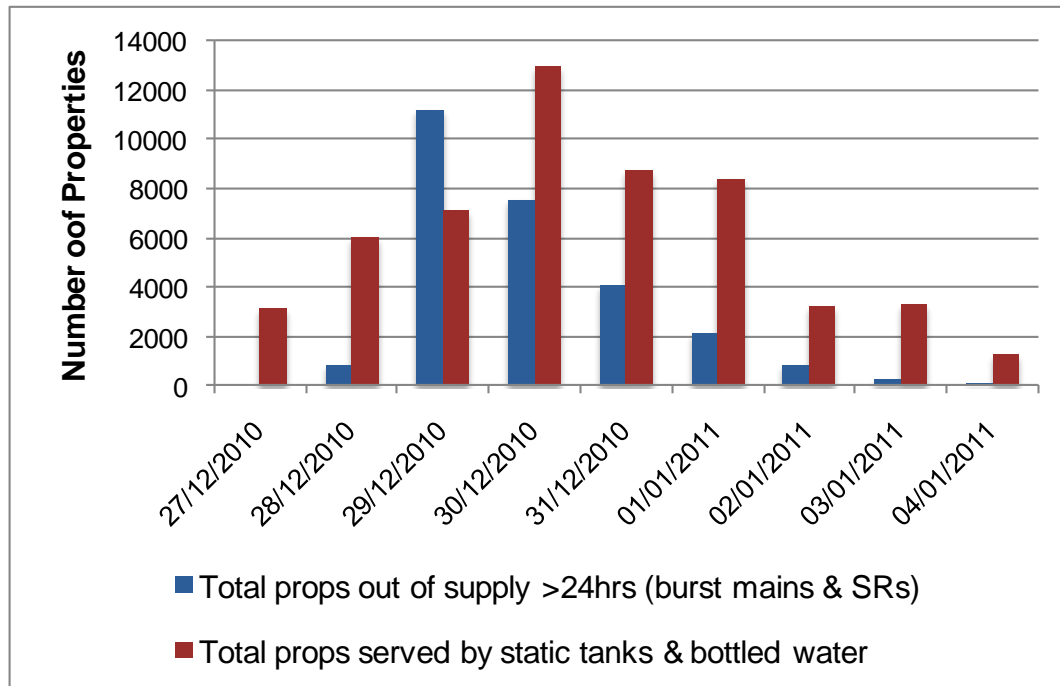
Order 2006. This was a general direction to NI Water to take such reasonable steps to interrupt supply as necessary during the emergency. This addressed the need to introduce the rotation of supplies and consequently stop the supply of water to certain premises.

- 5.59 There was however some uncertainty during the incident over NI Water's ability to turn off supplies to individual premises where there was a significant loss of water. Whilst NI Water has a range of powers to cut off water supply, we suggest that NI Water conduct an audit of whether these are adequate for emergency situations. In light of the outcome of that audit DRD should consider whether it should make new regulations under the order or amend the order so as to ensure the company has adequate powers to respond to such events.

Alternative supplies

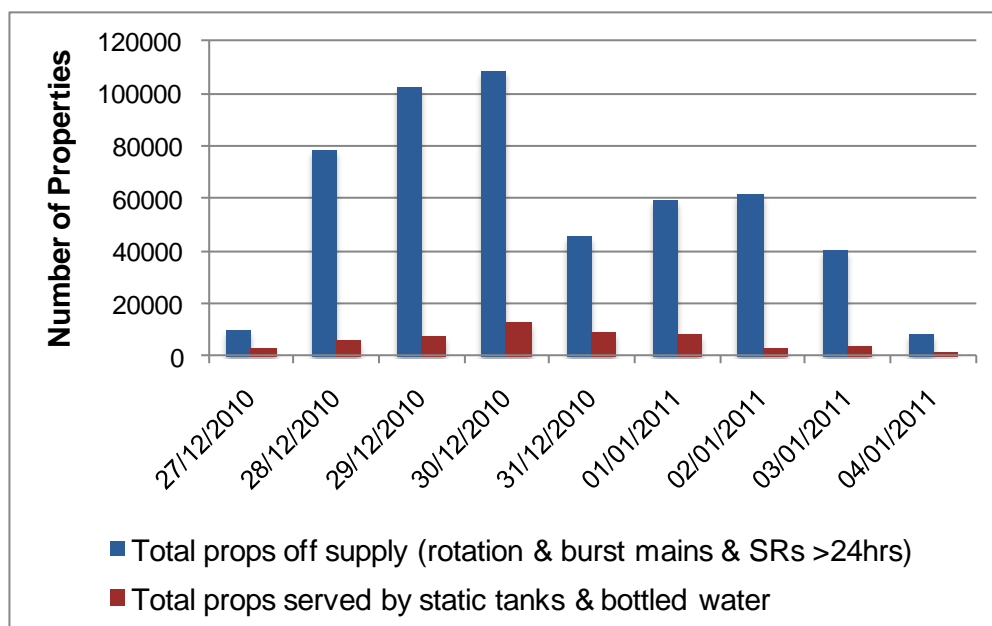
- 5.60 NI Water's customer charter states that alternative supplies will be provided where consumers experience a loss of supply for more than 24 hours. This commitment only pertains to consumers affected by failures of the assets and water mains for which NI Water are responsible, not from a loss of supply due to burst or frozen consumer pipes. However, NI Water decided to try to make alternative supplies available to all consumers who were suffering a loss of supply during the incident, regardless of the reason and duration.
- 5.61 Unlike other UK water companies NI Water is not subject to regulations that dictate the level of alternative supplies to be provided to consumers who have lost water supply for more than 24 hours. However the company has used the Security and Emergency Measures Direction (which is issued by Defra to the water companies in England and Wales) to guide its alternative supplies approach and aims to provide 10 litres per person per day.
- 5.62 From 28 December, alternative supplies were mainly distributed at sites provided and manned by councils. These arrangements were established through the Civil Contingencies Group (NI) and managed by a dedicated team at Gold Command. Before this date, NI Water was distributing alternative supplies from its own premises. From 31 December, council liaison officers were embedded within the dedicated team, helping to deploy alternative supplies.
- 5.63 As Figure 18 shows, the company provided enough alternative supplies to meet its obligations for properties out of supply for more than 24 hours (i.e. due to bursts on NI Water's mains and low service reservoir levels) on all but one day. This conclusion assumes that water was distributed to the appropriate locations (which was not always the case).

Figure 18: Number of properties served by alternative supplies compared to properties out of supply for more than 24 hours (excludes private supply pipe issues and rotation of supplies)



5.64 In Figure 19, we have also included the maximum number of properties on rotation. Although this shows that provision appears significantly lower than required. However the company commented that it has no obligation to provide an alternative supply to consumers whose interruption to supply was less than 24 hours. It is noted that after the 29 December all rotations were less than 24hours.

Figure 19: Number of properties served by alternative supplies compared to the properties out of supply for more than 24 hours and off supply due to rotation of supplies (excludes private supply pipe issues)



5.65 NI Water used the following options to distribute alternative water supplies.

Static tanks – approximately 160 tanks were distributed from a stock of around 600. There were therefore no issues with regard to the availability of tanks during the incident. Initial problems with deployment were quickly resolved through the provision of suitable vehicles by NI Electricity (NIE). The use of NIE vehicles was subsequently supplemented with further vehicles provided by DRD Roads Service.

NI Water did not follow the standard approach identified in its incident plans for the deployment of static tanks, which is based on loss of supply to a given area. This is due to the fact that the scenario faced in this incident was different, with a mix of problems affecting both large and small groups of properties distributed amongst properties that remained on supply.

Bottled water – NI Water had around 100,000 litres of bottled water in stock at the start of the incident. This included additional stock that the company had arranged to be provided in advance of the incident. The company's supply contract allowed for a daily provision that would have covered the maximum quantity distributed on any day of the incident. However volume supplied fell well short of this level. The quantity of bottled water distributed increased significantly after additional supplies were provided by Scottish Water and NORBEV on 30 December and as council staff started to collect and distribute the bottled water.

Standpipes – the decision to establish standpipe locations was made on 29 December due to the widespread nature of the incident and the need to maximise the use of water available in the distribution network.

NI Water did not have predetermined locations for static tank deployment, despite these being referenced in the MIP. The company's use of standpipes was limited.

NI Water's approach to the deployment of static tanks using council sites provided a means of distributing supplies to a wide area and for dealing with the dispersed nature of the 'no supply' issues. However, in a few rural areas the provision was less than the levels defined in the company's generic contingency plan and in other rural areas the tanks were deployed too late.

A shortage of bottled water through the company's contract with a third party supplier appears to have restricted NI Water's ability to supply water by this means in the early stages of the incident. Additional bottled water was supplied by Scottish Water and another local supplier on 30 December.

NI Water deployed only 10 standpipes during the incident.

Mutual Aid

5.66 All UK water companies have signed up to a Mutual Aid scheme, which allows resources to be shared when a company is experiencing an incident. The scheme is detailed in the Water UK Emergency Planning and Security Manual. While the scheme is primarily used for the provision of physical equipment such as tankers and static tanks it also encompasses other resources including manpower. We would encourage NI Water to continue to participate and build its networks and relationships in the wider water industry, which might helpfully be facilitated through Water UK.

NI Water was unaware in the initial stages of the incident that the Mutual Aid scheme could provide it with call handlers. The company did not make use of this facility until 31 December, which was after the peak in demand.

During the incident Mutual Aid was received from Scottish Water (the provision of bottled water), Yorkshire Water (containers for consumers to use at static tanks and standpipes) and Thames Water (which provided call handlers at its Bangor call centre).

We note the value of this co-operation during the incident and consider that there would be merit in there being a Northern Ireland Utilities Mutual Aid Programme.

The Civil Contingencies Group (NI)

- 5.67 In Northern Ireland the organisation that delivers inter-agency coordination arrangements for a civil emergency (i.e. an emergency situation that is likely to affect Northern Ireland's infrastructure, including the delivery of public services) is the Civil Contingencies Policy Branch (CCPB) of the OFMDFM.
- 5.68 The Northern Ireland Central Crisis Management Arrangements set out the arrangements for the formation of appropriate inter-departmental groups to facilitate coordination of the response if it becomes apparent that a civil emergency has occurred. The structures used for strategic coordination reflect the organisation of public services in Northern Ireland.
- 5.69 The Civil Contingencies Group (NI) provided an effective way to include other partners in the response to the incident. It was particularly useful in terms of alternative supplies where councils were able to provide locations for the provision of static tanks and bottled water, and in most cases to manage these sites. Collection and distribution of bottled water through Civil Contingencies Group (NI) was also arranged.
- 5.70 The Civil Contingencies Group (NI) provided a route to obtain additional call handlers and facilitated the provision of water to vulnerable individuals in affected areas through councils acting in conjunction with the Health Service and support from the Red Cross.
- 5.71 On 17 December, Northern Ireland Fire and Rescue Service activated multi-agency audio conferences. This was largely because of road conditions and access issues that were being experienced during the cold weather and an increase in the number of chimney fires. NI Water was represented at the meetings by the Emergency Planning Officer.
- 5.72 The decision was taken on 29 December to activate the Central Crisis Management Arrangements in the form of the Civil Contingencies Group (NI) and to set up a Regional Tactical Group. The Director of Engineering and Procurement became the lead NI Water contact.
- 5.73 We acknowledge the contribution of this group, who shared their are carrying out a review of the arrangements for emergency planning. We look forward to any recommendations they may make and hope that our conclusions will prove helpful, particularly that of a Northern Ireland Utilities Mutual Aid Programme.

NI Water was initially reluctant to ask for and accept offers of assistance.

NI Water is not a specified body under Regulation 57(4) of the Civil Contingencies Act 2004 (Contingency Planning) Regulations 2005. This

would bring NI Water in line with other public service organisations and NI Utilities.

Conclusions: Contingency planning and implementation

Conclusion 16 – Company’s executive team role – short term

NI Water should review the efficiency of its planning arrangements for an event of this scale. In doing so the company should consider whether existing arrangements allow the Gold team to maintain an appropriate strategic focus or whether plans need to be amended to formalise arrangements for strategic support from the company’s executive team.

Conclusion 17 – Testing of MIP response – short term and ongoing

NI Water should review its processes for testing the incident management response in light of the recent incident. As part of this review the company should consider the use of more frequent focused exercises to test specific elements of the plan in addition to large-scale exercises. These exercises should make use of both desktop and staged exercises; use of ‘unplanned’ testing and use of industry experts to help develop scenarios to fully test the plan.

Conclusion 18 – Independent audits – short term

NI Water should ensure that more frequent independent audits of the emergency plans are undertaken. This is a requirement in the rest of the UK, whereby annual audits of compliance against Security and Emergency Measures Direction (SEMD) are undertaken by certified auditors. We would encourage the Department for Regional Development to require this in any guidance it issues to accompany the Preservation of Services and Civil Emergency Measures Direction. We would also recommend that this guidance requires the company to undertake an annual review of its plan and clearly defines the company’s obligations. These should include those relating to alternative supplies and the need to work with other agencies to secure information about vulnerable customers.

Conclusion 19 – Co-location of centres – short to medium term

NI Water should review the benefit and priority for co-locating the telemetry, Work Control and Incident Management centres to facilitate greater interaction between these functions. PC10 provided the funding for this work, and if the company considers this to be a significant issue it is encouraged to prioritise co-location of these functions. We note however that this is not the

practice in all companies and should not be a reason for any shortfall in service.

Conclusion 20 – Information flow – short term and ongoing

NI Water should review the operational practice associated with reverting to the manual dispatch of jobs during incidents. This mode of operation affects the ability to provide 'real time' feedback on the progress of jobs from the field to the incident team and to the call centre. This impacts on the company's ability to respond to consumers effectively during an incident. The company should consider how more up to date information can be provided to the call centre.

Conclusion 21 – MIP - rotation of supplies contingency plan – short term

NI Water should develop the appropriate contingency plans to address the future possibility of the need to rotate supplies. . It should include the development of an appropriate customer communication strategy. The company should also consider network modelling to inform operational procedures and so that accurate information on the timing of supply interruptions can be relayed to consumers.

Conclusion 22 – Emergency isolation of supplies – short term

NI Water should conduct an audit of whether its powers to isolate consumer supplies during an emergency are adequate. In light of the outcome of that audit DRD should consider whether it should make new regulations under the order or amend the order so as to ensure the company has adequate powers to respond to such events.

Conclusion 23 – Alternative supplies – short term

NI Water should review its approach to alternative supplies in light of the experience and knowledge gained during this event. This should include a review of the distribution of alternative supplies for events where the affected consumers are interspersed among consumers still on supply. It should also review its arrangements for obtaining increased volumes of bottled water in emergency situations.

Conclusion 24 – Mutual Aid – short term

NI Water should identify potential additional sources which can be mobilised during an incident The Utility Regulator also considers there would be merit in establishing a Northern Ireland Utilities Mutual Aid Programme in which all utilities could participate. The Utility Regulator will give further consideration to the development of a NI Utilities Forum which could also facilitate wider risk management and investment discussions. It should also consider other

sources of assistance, including the Republic of Ireland, as well as the Water UK Mutual Aid scheme.

Conclusion 25 – CCGNI – short term

NI Water should consider how it can best utilise the resources of the Civil Contingencies Group (NI) in widespread incidents such as that experienced. It is also recommended that lessons from the current incident are defined, brought to the Civil Contingencies Group (NI) for consideration and addressed for the benefit and assurance of all stakeholders and citizens of Northern Ireland. It is also recommended that NI Water is included as a specified body under regulation 57(4) of the Civil Contingencies Act 2004 (Contingency Planning) Regulations 2005.

Chapter 6: Performance of NI Water: Communication with consumers

Key findings

- NI Water did have a pre-emptive 'protect your pipes' winter campaign which it launched in October. Unfortunately, our survey of consumers indicated that only 13% were aware of this campaign.
- A large proportion of water was lost from consumer pipes with a significant loss of resource and distress to consumers. Greater support and advice must be given to consumers on how to protect their pipes.
- Despite the lessons identified from the 2009/10 freeze thaw there was no effective action to improve customer services for a 2010/11 freeze thaw event. There was no effective ramping up arrangements in place for the call centre and no communication strategy for the rotation of supplies.
- Management, ownership and knowledge of how a call centre operates is lacking within NI Water; this is compounded by the contractual nature of the service.
- The technology and systems in place at the call centre were not fully utilised. The reversion to a manual process for feeding on site information back to the call centre resulted in a lag time for the provision of accurate information to the consumer.
- Weaknesses in the management of customer services resulted in the consumer voice not being heard or given priority throughout the incident. The need to notify consumers affected by the rotation of supplies in advance did not appear to have been considered.
- No advance consideration had been given to how operational information could be converted effectively for consumers to understand and access. Such issues ought to have come to light through test exercises of the MIP.
- NI Water did not communicate proactively or effectively with critical care customers and key stakeholders during this incident. MLAs experienced difficulty in contacting the call centre, as their priority number was not a dedicated line.

Introduction

6.1 This chapter focuses on issues around the implementation of customer services aspects of the MIP. The investigation examined:

- pre-emptive actions in advance of the freeze thaw;
- the problems experienced when trying to contact the call centre;

- why the problems at the call centre arose;
- the quality of information provided to consumers during the incident; and
- the company's performance in protecting critical and vulnerable customers.

Pre-emptive actions in advance of the freeze thaw

- 6.2 The importance of alerting consumers to the need to protect their own pipes and fittings was highlighted in the 2009/10 lessons learned review. As part of the review NI Water stated that it would provide information in a wide range of forms. The company began its 'Winter Warmer' campaign in October 2010.
- 6.3 The company launched web pages and a video, issued press releases and distributed leaflets. Press releases were also issued prior to Christmas. These reminded consumers about the campaign and urged them to find details of a Scotland and Northern Ireland Plumbing Employers Federation (SNIPEF) plumber should they experience problems with their own pipes. However, when this information on plumbers was sought from NI Water's website, it is found to be lacking and confusing.
- 6.4 The campaign received reasonable levels of media coverage. This is especially true given that this is not a particularly newsworthy story that involves asking people to spend money on something many may not have considered important at that stage.
- 6.5 In view of the large losses from consumer pipes and the risk of a similar climate event occurring again it is really important that more pro-active support is given to consumers. This will also help to restore public confidence in the service they receive. The leaflets can be made more clear and accessible. The information on plumbers can be made more accessible and clearly related to the company and locality.
- 6.6 All other water utilities in the GB provide access for consumers to purchase insurance and emergency repair services from 'Homeserve' which is already active in NI under the Warm Homes scheme.
- 6.7 The company does not have any opportunity or discipline of contacting consumers on a regular basis. It should consider what it might do as an alternative to ensure that consumers are kept aware of the latest information and support available to them.

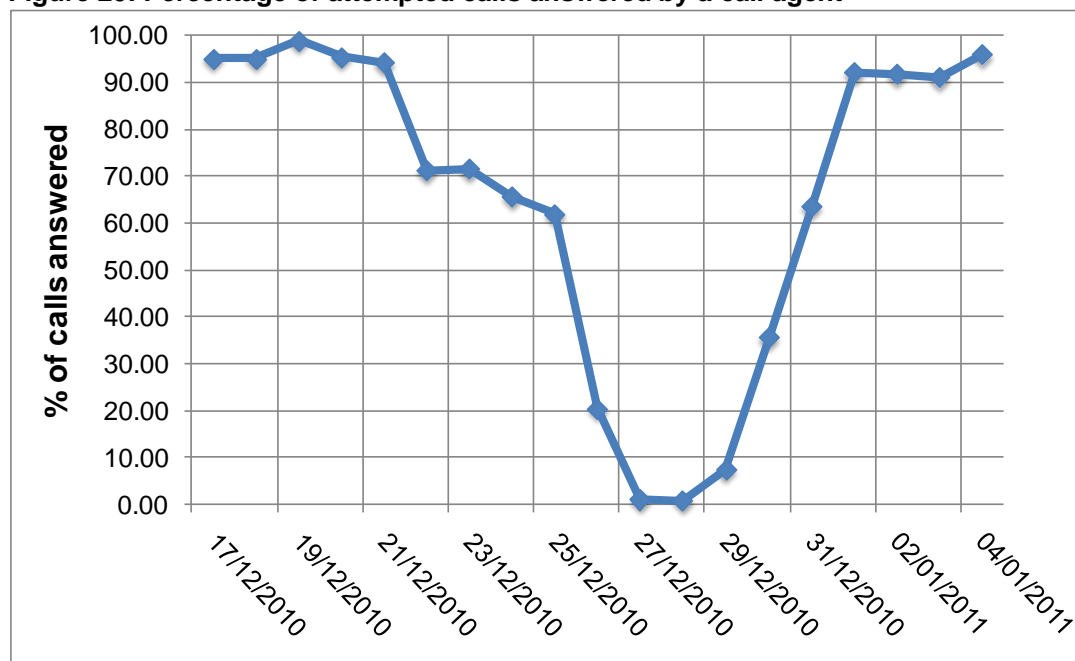
From the consumer research 66% of consumers are aware of their responsibility for supply pipes. However, only 13% were aware of NI Water's winter campaign advising of the importance of lagging pipes.

NI Water should consider other means and opportunities to promote and improve the advertisement of its winter advice campaign to consumers. This should include providing appropriate, relevant and helpful information on approved plumbers on its website.

Problems experienced when trying to contact the call centre

- 6.8 The average number of calls from consumers to the call centre is usually around 1,000 per day. This number is known to escalate during a period of freeze thaw as a result of consumers being affected by burst water mains and leaking domestic service pipes.
- 6.9 During last year's 2009/10 freeze thaw there was a period during which the call centre was overwhelmed and did not have adequate resources to cope. NI Water provided the Utility Regulator with assurances that adequate ramp up procedures had been put in place to staff the call centre. This assurance was reiterated to a wide range of stakeholders on 23 December 2010.
- 6.10 There was a tripling in the volume of calls from 21 December, as a result of freezing conditions. This higher level of calls was maintained with a dip on Christmas day to 1,617, only to escalate again to 6,223 on 26 December as the thaw came. Calls continued to soar, reaching an all-time high of more than 400,000 attempted calls on 28 December; fewer than 1% of these were answered.

Figure 20: Percentage of attempted calls answered by a call agent



6.11 Information about the number of individual callers reveals that consumers were making several (up to 14) attempts to get through, as Table 5 shows.

Table 5: Average number of attempts per consumer

Date	Number of calls attempted	Number of unique consumers	Average number of attempts per consumer
26 December	6,223	3,353	2
27 December	266,579	18,884	14
28 December	403,420	32,667	12
29 December	66,543	16,496	4

6.12 Consumers who were successful in having their call answered over the period of 27 to 29 December had to wait on average up to 26 minutes, with some experiencing a wait of up to 1 hour 30 minutes.

Why the problems at the call centre arose

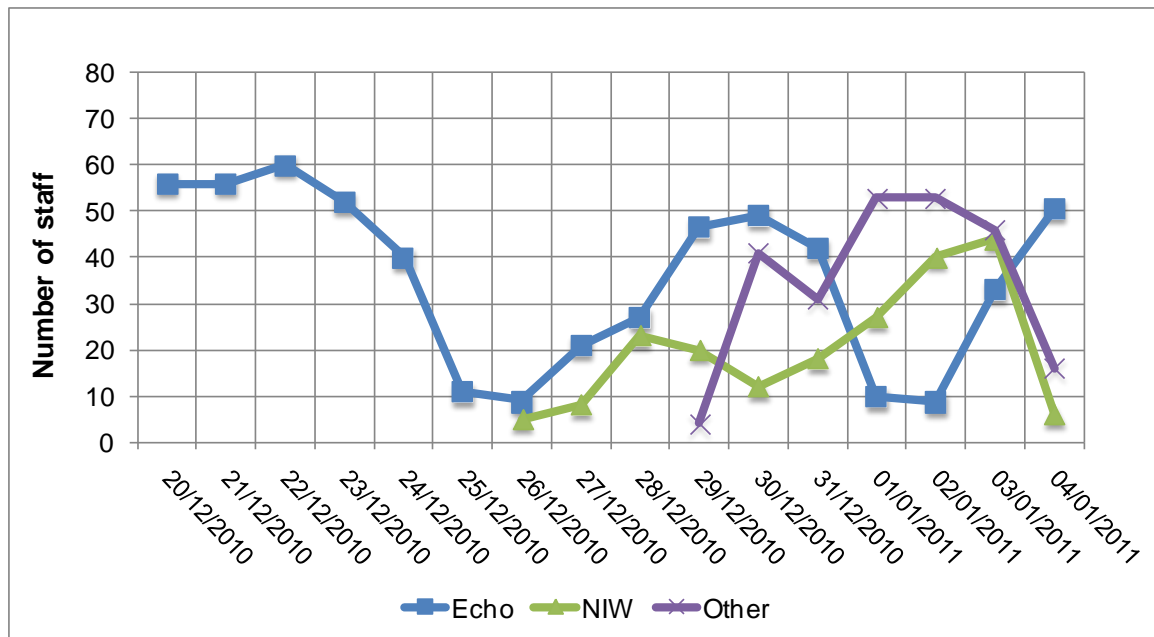
Lack of call centre staff

6.13 There appears to have been no structured approach to the planning of the resources required over the holiday period. As a result, the number of staff in place to manage calls was insufficient. This was despite the

expectation that the thaw would occur, as it did on 26 December and into 27 December.

6.14 We established that the number of call handlers required within the call centre is assessed in advance by use of a forecasting tool. A forecast for the period of the incident was completed prior to December, before the freeze thaw was predicated. However despite this fact, the number of call handlers between the 24 and the 27 December fell short of this forecast, and proved totally inadequate given the additional demands from the freeze and subsequent thaw.

Figure 21: Number of staff available to handle calls



6.15 During the investigation we were made aware of the following:

- NI Water received requests from Echo throughout the week before Christmas for additional resources from 24 December onwards.
- A review of resource arrangements over the holiday period took place via conference call between NI Water and Echo on 22 December.

6.16 Both of these facts indicate an awareness of the staff resource issues with the call centre.

6.17 We were advised by NI Water that the following arrangements were in place and had all been activated in order to ramp up call handlers, but that they had not proved sufficient.

- Echo can call on other resources within its NI Water team to help with call handling. Out of hours, these staff are contacted via a text alert facility.
 - Echo can request (subject to availability) other resource from its own clients (for example, NI Direct) to assist in major incidents during out of hours periods.
 - NI Water can make a general call to its staff for assistance (on a volunteer basis) with call handling during a major incident.
- 6.18 The detailed submission of call handling resources evidenced that the response from NI Water staff was only forthcoming on 26 December, when five people volunteered. NI Direct provided six call handlers on 29 December and two on 30 December.
- 6.19 Given this level of response, we can only conclude that the procedures in place for increasing resources within the call centre were totally inadequate and very poorly administered. This is especially the case given that the thaw was predicted to occur when it did, on 26 and 27 December.
- 6.20 The Civil Contingencies Group (NI) offered to help NI Water on 28 December. The help was initially refused but subsequently accepted on 29 December. Following this, additional call handling resources were brought in from the NICS and recruitment agencies. On 31 December, 20 additional call handlers were provided by Thames Water at its Bangor call centre (under Water UK's Mutual Aid scheme).
- 6.21 The lack of staff had a critical impact on the call centre's ability to handle calls, and explains why it rapidly became overwhelmed. Table 6 shows that fewer staff were provided on Christmas Day and Boxing Day than in the previous year. This was despite the predicted thaw, the already high volume of calls being received, and assurances given that 'effective' ramping up procedures were in place for deploying additional call handlers.
- 6.22 The additional resources that were eventually drafted in were not skilled or trained in NI Water's systems or processes and answered calls simply by taking messages. The use of message takers does not provide a good consumer experience. It also introduces delays in getting potentially vital repair information to NI Water's operational field teams.
- 6.23 The problems with management of the call centre demonstrated that there would be advantages in double skilling some staff to work in emergencies in the call centre. Indeed this concept of human resource flexibility could be extended to other areas of the company and is used in other organisations.

From 22 December NI Water was aware that it did not have sufficient resources in its call centre. From 25 to 30 December NI Water was answering less than 50% of its calls.

NI Water was aware that the thaw was predicted to come on 26 and 27 December and that this would give rise to a substantial increase in call volumes. The company was reliant on the goodwill of its staff to volunteer to answer phones. There was a very limited and slow response to this request.

NI Water call handler numbers decreased between 23 and 25 December. The number of call handlers was only supplemented to any meaningful degree from 28 December.

Table 6: Comparison of call centre call volumes and staff resources 2009/10 and 2010/11

Date	Total calls offered 2009/10 (includes all lines busy)	Maximum number of staff provided (FTEs) 2009/10	Total calls offered 2010/11 (includes all lines busy)	Maximum number of staff provided (FTEs) 2010/11
21 December	850	61	3,020	56
22 December	851	56	3,923	60
23 December	475	51	3,285	52
24 December	815	38	3,845	40
25 December	211	15	1,617	11
26 December	1,156	15	6,223	14
27 December	4,451	26	266,579	29
28 December	3,479	48	403,420	50
29 December	2,286	60	66,543	67
30 December	1,699	64	15,822	86
31 December	1,661	48	7,603	58
1 January	486	27	2,784	83
2 January	490	17	1,336	98
3 January	409	14	1,976	123
4 January	2,012	62	2,368	59

Failure to use appropriate technology

Telephony systems

- 6.24 Use of automated messaging and, in particular, interactive voice response (IVR) by call centres allows high numbers of calls to be answered with short handling times. Accurate and regular updates can be an effective way to communicate with large numbers of consumers.
- 6.25 During the incident automated messaging was applied to only one of NI Water's customer numbers, 'Waterline'. The message was only updated three times on this line over the period 22 December to 3 January. Other water companies would update this hourly. The wording used and the frequency of the updates were not adequate and were not helpful to consumers. One of the messages also directed consumers to the website, which NI Water knew to be unstable at the time.
- 6.26 Use of the telephony systems, together with adequate resourcing of the call centre, could have minimised or prevented the lines becoming overwhelmed.

Prioritising calls

- 6.27 Five different numbers go into the call centre: Waterline, Leakline, MLA Line, Billing and Debt. It is possible to prioritise calls by forcing certain calls to certain lines and to the top of the queue. Although consumers will have been trying all numbers just to get through, it is reasonable to prioritise Leakline calls above others. This is because the information from these calls may be used to deploy operational teams, therefore helping to remedy the situation.
- 6.28 There is no evidence that NI Water prioritised calls in this way during the incident's early stages. On 27 December, following the declaration of a category 1 incident and a significant increase in distribution input (a classic sign of high leakage) only 7% of Leakline calls were answered, compared with 31% on Waterline and 79% on the MLA line.
- 6.29 It should be noted that NI Water did not promote its Leakline during the incident, but instead asked consumers to use the Waterline number to report leaks (on press releases etc.). As this is also the number that appears on the company's vans, consumer awareness of Leakline is likely to be low.
- 6.30 The system for the Waterline number incorporates the ability to route calls to particular call agents. This could have been used during the incident to filter off certain types of calls. For example, other water companies reported directing calls about problems on consumers' own pipes to message takers who could provide the relevant information and deal quickly with the call without having to take further action.

There is a reluctance to use automation within NI Water to help customer communication and a lack of general understanding of the telephone systems that the company has in place. Methods that other water companies consider as standard when managing demanding situations, and which were available to NI Water, were not used.

There were 210 lines going into NI Water's call centre. This number is broadly comparable with GB utility companies with a similar consumer base to that of NI Water. However, none of the 210 lines within the telephone system were dedicated or 'ring fenced' for outbound calls, emergency cases, MLAs or priority customers such as hospitals.

NI Water's ability to make outgoing calls was affected as outgoing and incoming calls compete for an available line. This hindered the company's ability to run the wider business effectively during the incident and communications with the call centre itself.

Better use of the system and proper staffing levels would have allowed a significant percentage of the calls received between 27 and 29 December to have been answered.

NI Water's overall management of the call centre contract

- 6.31 NI Water's call centre activities are outsourced to a third party, Echo, which operates under a service level agreement (SLA) contract. This arrangement is not unusual for a water company and is found to work satisfactorily elsewhere.
- 6.32 Echo's performance under the contract is usually measured and monitored using a system of defined key performance indicators which cover service levels and abandoned calls. These are reviewed at regular monthly performance meetings and are generally satisfactory. In the course of our investigation NI Water informed us that Echo has been granted various suspensions of the SLAs due to a number of service initiatives, but primarily because Account Services had been brought within NI Water on 1 December 2010. This final initiative suspended all SLAs and was still in effect during the freeze thaw incident.
- 6.33 Overall responsibility for managing the contract rests with NI Water's Director of Customer Services Delivery. Day-to-day responsibility for the call centre's operation lies within the Echo business. There consequently seems to be no-one within NI Water with direct responsibility for the call centre's operations below Director level.
- 6.34 Echo's use of automated messaging is restricted under the terms of the contract. Echo was therefore inhibited in the development of this element of an effective and efficient call centre.

The absence of an operational role within NI Water with specific responsibility for the call centre contributed to issues relating to the call centre management not being addressed effectively before or during the incident.

NI Water needs to take ownership and responsibility for the call centre performance. There needs to be a full internal understanding of how this centre functions and a commitment that it will deliver for consumers.

The quality of information provided to consumers

From the call centre

- 6.35 The issues of information flow and systems are considered more fully in Chapter 5.
- 6.36 The information that was available to call handlers was very general and therefore of little use to individual callers. Additional external call handlers who took messages were only provided with limited information, none of which went beyond information that was already in the public domain. Similarly, emergency water supply information was not specific and so not particularly helpful to individual consumers.
- 6.37 During the major incident, call centre staff had no access to live information but depended on twice daily updates from the Gold team. This did little to address consumers' frustration, which was heightened by the long wait many experienced before their calls were answered.

Through the media

- 6.38 Press officers had previously received training in emergency events standby rota was in place to staff the press office over the Christmas period.
- 6.39 NI Water issued a number of press statements to the media throughout the incident and gave many interviews. Towards the end of the incident public notices were also placed in newspapers. From a review of statements and public notices we found that the language and tone of the media information was more operational in nature than consumer focused.
- 6.40 The issue for the Communications Team was that critical hours were lost between identifying the need to call a category 1 incident on the evening of 26 December and having to rotate supplies on the evening of 27 December. Staff had no experience in managing the communications needed to support the rotation of supplies to such a large number of consumers and, in the event, rotation of supplies commenced half an hour after the decision to rotate supplies was

taken. This left inadequate time for a communication plan to be developed, resulting in poor, inaccurate and untimely information being provided to consumers.

Through stakeholder relations

- 6.41 The press office team (part of the main Communications Team) had overall responsibility for stakeholder management during an incident. However other key 'technical' personnel in NI Water take responsibility for specific stakeholders. For example, the water quality team is responsible for the relationship with the Drinking Water Inspectorate and the regulatory team is responsible for the relationship with the Utility Regulator.
- 6.42 The information sent to these and other stakeholders during major incidents is generally a summary of the 'upward reports'. This information is not sent to the media. In previous incidents this information was effectively circulated, however there was a failure to do so during this incident.
- 6.43 Stakeholders were sent copies of press statements from 29 December onwards. During the event NI Water also distributed three mobile phone numbers to the councils and the Northern Ireland Housing Executive.

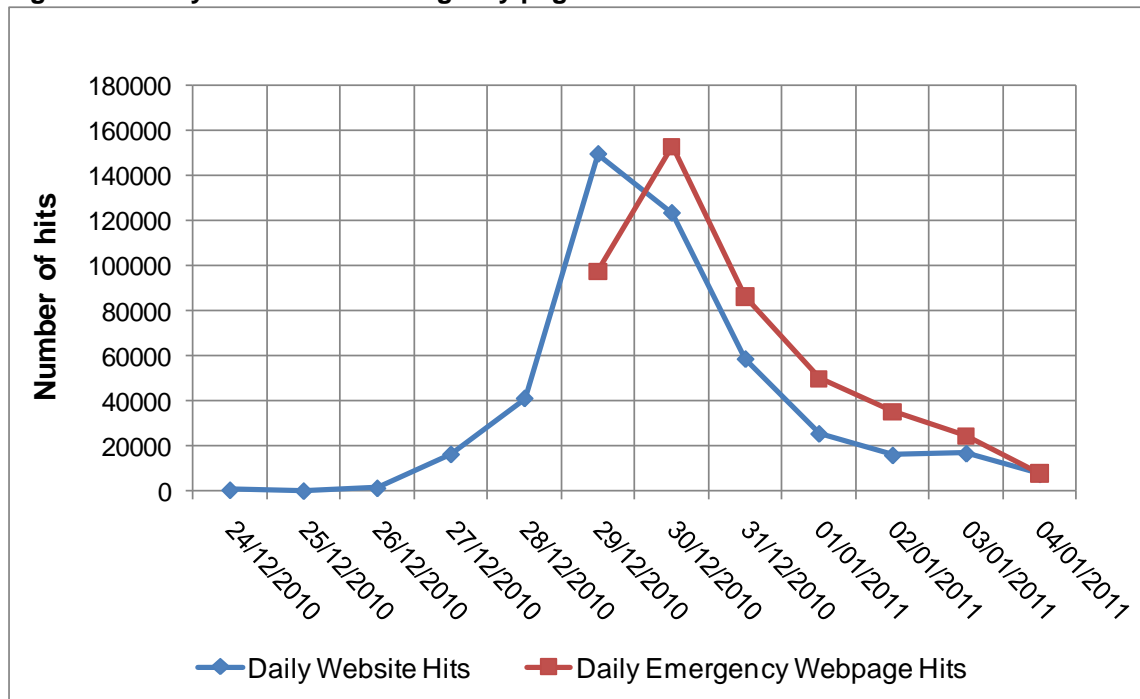
The company's website

- 6.44 The website was developed in conjunction with an outside contractor and is the responsibility of NI Water's Communications Team. The website is seen as a corporate/public relations tool, rather than a customer service tool, and was designed as such.
- 6.45 The number of visits to the company's website is usually around 500 a day, although it can take up to 20,000 hits a day. The site was developed so that if it received more than this number the firewall protection came into play (on the basis that the site must be being 'attacked'). This protection led to problems for users trying to access the site during the event.
- 6.46 When NI Water first became aware that its website was having problems on 28 December it acted promptly, increasing the bandwidth and removing the firewall protection. Changes were made to the server capacity and firewall protection on 28 December and an increased bandwidth was in place on 29 December.
- 6.47 The website did not have a postcode search facility for consumers to check if their property was affected by an emergency. This limitation meant that NI Water was not initially able to publish detailed geographic breakdowns of information about properties that would be affected by rotational supplies and when supply was likely to be

restored. Measures were taken and subsequently a level of information was provided. However, the accuracy of the information was not precise to individual post coded properties.

- 6.48 It is possible that the overall lack of detail about who would be affected, and when, added to the overall volume of customer contacts. It is also possible that it encouraged some consumers to 'store' water.
- 6.49 The website incorporates a specific page for emergencies. However, this was only made available on 29 December. From this point on, rotation information was updated twice daily and burst data updated more frequently. Information about alternative supplies was also placed on the website. From 29 December the availability and accessibility of information improved, although accuracy was still an issue. As the website started to function and call centre resources improved, the volume of calls started to decline.

Figure 22: Daily website and emergency page hits



Limited use was made of the media to inform consumers proactively about the rotational supply interruptions. The information that was provided was more operationally focused than consumer friendly.

NI Water did not view its website as a key customer communication tool. Despite this consumers were directed towards it and consequently it was initially unable to withstand the high level of hits received.

Within a very short timeframe NI Water successfully adapted its website to be capable of handling consumer queries. The company also made postcode

data for areas affected by supply rotations accessible to consumers.

However, this information was neither timely nor accurate.

Several updates were given to the media.

Eventually, the website was also regularly updated. However, these updates were not aligned with updates forwarded to the call centre, automated messages or automated responses to emails. This may have caused customer confusion and created avoidable contacts.

- 6.50 NI Water have been criticised for being so reliant on its website as a means for consumers to access information during incidents. It is important that NI Water reviews the balance between traditional and contemporary means of communicating with its consumers.

Performance in protecting critical and vulnerable customers

- 6.51 NI Water's critical care scheme is described in its code of practice, 'Priority services for domestic consumers'. This explains the additional services that are offered and how they can be used. The scheme is generally focused on the help available if domestic charging is introduced for bills and meter reading, a password scheme, and the provision of alternative supplies during interruptions for consumers with medical needs. In addition, if the water supply is turned off for more than 24 hours NI Water will provide an alternative supply, no matter what consumers' needs are.
- 6.52 NI Water policy on priority customers is also described in a leaflet 'Customer care register'. These two leaflets are contradictory and may cause confusion for consumers. In addition, neither of these publications reflects the arrangements for meeting the needs of priority customers as described in NI Water's MIP.
- 6.53 Customers opt in to the register on a voluntary basis. NI Water registers critical care/priority customers on its customer record system, and customers are identified by a 'flag' on the system.
- 6.54 When comparing NI Water's information about the register with other utilities that we regulate we note that there is a lack of clarity as to what additional services are provided to customers following their registration. We would encourage NI Water to review and apply best practice in this area.
- 6.55 The company is still developing its register, which was re-launched by the Minister in October 2010 to increase awareness. We understand that prior to the incident approximately 593 customers were registered. We understand that this number has increased to 1,025 customers as

a consequence of contacts during the incident. NI Water has confirmed that it contacted customers registered on the Critical Care Register (dialysis patients) by letter on 10 December i.e. prior to the incident to provide advice on how to protect pipes in the home.

- 6.56 NI Water's MIP sets out special arrangements to be followed for priority/critical care customers including the requirements for notifying customers. These requirements vary based on the type of customers and their particular needs (e.g. partially sighted, elderly or dialysis patients). Priority establishments such as hospitals and residential care homes are also identified.
- 6.57 During the incident any customers who contacted the call centre and were identified as critical care were prioritised and logged and flagged to the Front Desk for attention and in some extreme cases escalated to Gold Command. Customers were identified either via the flag on the system, or through questioning and listening by the message takers.
- 6.58 In addition following engagement with the Civil Contingencies Group (NI) alternative supplies, including bottled water, were delivered to nursing homes and vulnerable customers with the support of DHSS, the councils and the Red Cross. This facilitated the use of lists held by the Department of Health during this incident which extended NI Water's reach to a larger number of consumers.
- 6.59 No early proactive actions were taken. That is to say, critical care customers were not proactively identified for any exceptional action for example prior to rotation of supplies. Critical care customers who had contacted NI Water during the course of the incident were contacted on 2 January to check that their supplies had been restored. About 134 calls were made at this point.
- 6.60 Following engagement with the Civil Contingencies Group (NI) alternative supplies, including bottled water, were delivered to nursing homes and vulnerable customers with the support of DHSS, the councils and the Red Cross. This made use of lists held by the Department of Health during this incident, which extended NI Water's reach to a larger number of consumers.

NI Water has been very slow to develop its critical care register, despite constant liaison and prompting by CCNI. This is evidenced by the low number registered before the incident.

Even with this small number NI Water did not follow its own guidance contained within the MIP for these vulnerable consumers.

Subsequently with the aid of other statutory bodies including the councils, Public Health Agency and the Red Cross measures were taken to ensure that this vulnerable group was looked after.

Conclusions: Communication with consumers

Conclusion 26 – Protect your pipes – Winter Campaign – short term

- 6.61 NI Water should further develop its annual campaign on 'Protecting your pipes' to increase consumers' awareness of it and the importance of protecting their water pipes and other fittings from frost. More people may view the 'Protecting your pipes this winter' video if it was available for viewing directly from the niwater.com website and not via a link to YouTube. Other means of access to this information must be developed for those who do not have website facilities.

Conclusion 27 – Protect your pipes – helpful information – short term

- 6.62 NI Water should review its information on approved plumbers to ensure that this is up to date and relevant to NI. They may also wish to explore the feasibility of providing access to a home insurance and emergency repair service provider to match all other GB water utilities. The company should also consider how it can establish a personal contact with all consumers and in doing so draw their attention to the new information on protecting pipes, plumbers, home insurance and critical care.

Conclusion 28 – Call Centre – short term

- 6.63 NI Water should ensure that it has a full understanding of its telephony system including use of Interactive Voice Response (IVR). NI Water should consider ring fencing separate emergency and priority lines, for example hospitals and MLAs, so that urgent calls are not lost in a situation where call lines are busy or overwhelmed. NI Water should consider ring fencing separate capacity for outbound lines so communicating with customers or the wider business is not hindered when call lines are overwhelmed.

Conclusion 29 – Call Centre – short term

- 6.64 NI Water should develop a template so that adequate telephony management information is provided to the Incident Team so that informed decisions can be made and guidance offered. Information should include total calls offered at network, calls at switch, abandoned calls, numbers of engaged tones, average wait, longest wait, IVR performance, last update of IVR, numbers of calls taken split by category, numbers of resources available, call forecasts and resource gaps. Where appropriate, information should be provided per line e.g. Waterline, Leakline, MLA line. All managers should be briefed on the importance of this information and the intelligence that can be extracted from it.

Conclusion 30 – Call Centre – short term

- 6.65 NI Water should conduct a review of its call overflow facilities both internally and externally. Regular reviews of call forecasts should be made in an incident situation. Resource planning must be started and in place well before the start of an anticipated event, such as a freeze thaw. An understanding of the potential resource requirements and shortfalls should be gained to ensure that sufficient resources are in place. Formal standby arrangements must be considered to ensure that resources can be mobilised as needed. A formal commitment should be sought from employees, and there should be less reliance on goodwill.

Conclusion 31 – Call Centre – short term

- 6.66 NI Water should review its outsourced contract, including business continuity plans for the Call Centre and ensure performance levels and tolerances reflect the possible needs that may arise during an incident. Agreement should be made on work priorities (for example, SLA performance, consumer experience, priority of work types and work volumes).

Conclusion 32 – Call Centre – short term

- 6.67 The company should consider the benefits of double skilling its workforce to provide extra and more flexible resources in the event of major incidents.

Conclusion 33 – Stakeholders – short term

- 6.68 In relation to getting messages out to consumers NI Water should consider the use of proactive customer contact methods to help inform key customers about supply interruptions and other emergencies (for example, SMS texting etc). NI Water should also consider using stakeholders and other parties (such as UFU, MLAs and community groups) more to assist with getting messages out. NI Water needs to improve stakeholder management processes and procedures to restore confidence and trust.

Conclusion 34 – Consistency and updating of information – short term

- 6.69 NI Water should review the various means with which it communicates with its consumer base, matching different consumer needs to the particular tools employed. An examination of good practice by other similar companies should inform this review. NI Water should also review the language it uses to communicate with consumers to ensure that it is consumer-friendly and not operationally focused. To ensure that consistent and accurate messages are relayed to consumers, NI

Water should put in place updating procedures for all consumer contact points (such as the website, call centre, media).

Conclusion 35 – Website – medium term

- 6.70 NI Water should review the website's purpose, content and functionality. As part of the review the company should explore options for making available at short notice critical information during major incidents. It should also review all of the literature and other information that is on the website to ensure that any guidance provided is helpful. This is not currently the case, for example, for contact information for SNIPPEF approved plumbers. To be effective a website must be kept up to date and NI Water should ensure that it has effective processes in place for regular updates.

Conclusion 36 – Critical Care – short term

- 6.71 NI Water should review its website to ensure that the Critical Care Register information is both consistent and accessible. NI Water must ensure that, similar to NIE, it provides clear information to its critical care customers on the service it will provide during a major incident and during any planned interruption to supply.
- 6.72 NI Water must aim to have a fully developed critical care register which is comparable to the list utilised by NI Electricity. NI Water should in common with other utility companies in Northern Ireland refresh its critical care register on a monthly basis.

Chapter 7: Performance of NI Water: Governance, leadership and management

Key findings

- Although the Interim Board was focused on dealing with legacy issues, governance systems were in place and assurances were provided to and accepted by the Board.
- There were shortfalls in both leadership and management by the company's executive team in relation to the incident.
- The company lacks the opportunity and discipline of communicating directly with consumers. The culture of the organisation is still evolving from impersonal utility service to personal consumer service.
- The company's executive team did not anticipate an incident which would have caused such a widespread failure in water supplies to consumers. The experience of the 2009/10 freeze thaw event may have led to complacency.
- The company's executive team was not cohesive, did not meet as a group during the incident and morale was low. Morale and motivation are areas within the organisation that need to be reviewed.
- There is no evidence that the MIP related risk was escalated or significantly adjusted in light of the freeze thaw incident in 2009/10.
- A category 1 incident was called by the company on the evening of 26 December, but at that stage not enough was done – particularly from a communications perspective – to address the possibility that a significant number of consumers could have burst water pipes.
- Shortcomings in communication, both within NI Water and externally with consumers and other stakeholders, turned a major incident into a crisis.
- The scope of the Director of Customer Service Delivery post is extensive and had never been tested in an incident of this magnitude.
- Front line operational teams worked well – the most significant failing was the failure by the company's executive team to take a strategic oversight of the impact on consumers.

Introduction

- 7.1 The scope of our investigation in this area was restricted to reviewing those elements of governance, leadership and management within the company that are directly relevant to the handling of the 2010/11 event and to the issues raised in the relevant questions in the Terms of Reference (see Appendix 1). The governance arrangements between the company and DRD is outside the scope of this investigation.
- 7.2 Our investigation covers practices in place before the incident and the management by Board, Executive Team and Gold Command of the incident itself.
- 7.3 NI Water is owned by the DRD, which is the shareholder of the Government Owned company. The Minister for the DRD appoints NI Water's Chairman and independent Board members. The Board governs the company and is made up of a balance of Executive Directors and independent non-executive directors. The company's executive team is led by a Chief Executive who is responsible for running of the organisation on a day-to-day basis.
- 7.4 NI Water's organisational structure, as it was during the incident, is shown in Figure 22.

Figure 22: NI Water's organisational structure



- 7.5 Corporate or organisational governance provides structures and processes to ensure that companies are managed in the interests of their owners and that there are clear lines of accountability. However, these structures alone will not in themselves deliver effective outcomes; the right conditions and behaviours are also necessary.
- 7.6 Four members of the company's executive team were also members of the Board: the Chief Executive; the Director of Finance and Economic

Regulation; the Director of Asset Management; and the Director of Customer Service Delivery. It is noted that two of these Executive Board members have been subject to on-going disciplinary procedures.

Governance

- 7.7 NI Water's Board comprises six NED positions (including that of the Chairman) and four Executives (as well as the company Secretary). There was only one NED on the Board between March and July 2010. Four interim NEDs were appointed on 30 June 2010 and the Interim Chair was appointed on 6 August 2010.
- 7.8 At the time of the incident there were five NEDs in post (one of the interim NEDs appointed in June 2010 stepped down in November 2010) – four of whom were interim appointments.
- 7.9 The Interim Board concentrated on legacy issues such as procurement, dealing properly with the disciplinary aftermath, rebuilding the Board, settling the Steria contract and the PC10 Price Control (2010-2013) negotiations.
- 7.10 The company has risk management processes and risk registers in place, ownership of risks is assigned and the Audit Committee actively considers the risk register. The MIP and Business Continuity risk are combined under one risk. There is no record of significant discussion at Board or at the Audit and Risk Committee on this risk in the period before the freeze thaw event.
- 7.11 Despite the fact that there was experience of harsh winter conditions in 2009/10 there is no evidence that the risk or the potential for consequent rotation of water supplies and associated communications was elevated subsequently to the highest risk status in the Register. However, the company's executive team had captured what they believed to be the lessons from the 2009/10 freeze thaw incident and on the back of that incident it was assumed that the company could cope with a similar incident.
- 7.12 On 23 December a memo issued by the Director of Customer Service Delivery provided assurance that the company was in a position to cope with the then current freeze thaw incident. There is no evidence to suggest that the company considered the impact of a significantly bigger scale freeze thaw incident to that which had occurred in the previous year.
- 7.13 The Risk relating to the MIP's status was amber. There was general acceptance that the risk of the MIP proving inadequate was low based on collective experience of previous category 1 incidents. Interviews indicated an acceptance that the 2009/10 freeze thaw had lulled the

company's executive team into a sense of security and that challenging the MIP was not considered necessary.

- 7.14 There is no evidence that either the company's executive team or the Board considered that dealing with a major incident was anything other than an operational issue that was within the capacity and capability of the Customer Services Delivery Directorate to manage. It is not surprising, therefore, that there was no plan to draw either body into a simulation or exercise that might look beyond dealing with an operational crisis.
- 7.15 The company's executive team considered and approved the October 2010 response to the Utility Regulator's concerns arising from the 2009/10 freeze thaw incident. It is apparent, particularly around call handling, that some of the assurances were not actioned in time for the 2010/11 incident.

The interim Board had been through a period of dealing with legacy issues and restructuring.

There are currently four Executive Directors and five NEDs on the Board.

The Water Contingency Plan had not been updated to reflect the possibility of rotation and subsequent communication with consumers.

Leadership

- 7.16 There are several facts that are relevant to understanding the role and impact of the company's executive team in the crisis.
- 7.17 Several of the company's executive team had been through or have still to go through disciplinary procedures.
- 7.18 The company's executive team never met as a group in the crisis. It did not perceive that it had a role in the incident because the MIP did not say that it had. The post incident review recommends that the MIP be changed to rectify this.
- 7.19 The Chief Executive was contacted on the evening of 26 December (when category 1 was declared) but did not attend the incident in the office until 28 December.
- 7.20 The Director of Customer Services Delivery was present in the office from 26 December.
- 7.21 The company's executive team did not have significant numbers of years of water utility operational and crisis management experience by

comparison to those in other GB water utilities. Only one member of the company's executive team had such previous experience and he was away on holiday overseas.

- 7.22 The interim non-executive Chairman brought appropriate experience and a clear sense of strategic imperative. He was working with the Chief Executive towards setting the conditions for NI Water to put its turbulent period behind it and move forwards towards being an effective and trusted utility company. The Chairman was alerted to the crisis by email on the 28 December and assumed a lead role from the 29 December.

The company's executive team lacked coherence and morale within the company was not high.

It never met as a group during the incident.

Leadership of the incident at company's executive team level was left largely to the Director of Customer Services Delivery until late in the crisis.

The leadership style of the Chief Executive was not considered to be effective and the lack of visible leadership during the incident became a significant issue.

Management

- 7.23 The failure to realise the significance of the experiences in the 2009/10 freeze thaw event in relation to the winter contingency plan was a management failure. The sense of security following the relatively successful handling of the 2009/10 freeze thaw created complacency regarding the plan. No-one challenged the assumption that 2009/10 was as bad as it could get; as a result there was no attempt to validate the plan or test it to destruction.
- 7.24 The failure to think strategically in constructing a communications plan (customer as well as media) led to a reactive and defensive media posture.
- 7.25 The freeze and subsequent rapid thaw was treated first as a consumer problem (frozen pipes), then as a water supply problem which could be solved effectively through good central planning and hard work by the local operations teams.
- 7.26 The information flow to the incident room was initially interpreted from the perspective of an operational event and not viewed as a widespread consumer supply failure.

- 7.27 The Director of Customer Services Delivery was to co-ordinate and be the ultimate decision maker of the Incident Management Team, responsible to the Chief Executive. The company's executive direction would be delivered through the Director of Customer Services Delivery. However the company's executive team's specific responsibilities are not set out in the Major Incident Plan and this is considered further in Chapter 5.
- 7.28 The scope of the Director of Customer Services Delivery post was extensive, as Incident Leader and Director responsible for each of the operational lines (engineering, customer relations, media planning and business recovery). This merged directorate post had not been tested and perhaps not considered in the context of a major incident.
- 7.29 The primary focus was on getting water flowing again to consumers. The information from the call centre was less well interpreted, leading to a failure to recognise the significance of the lack of consumer communication.
- 7.30 There was evidence that communications, horizontal and vertical, did not work as well as might be expected in an incident of this magnitude.
- 7.31 A review of organizational structure and management should ensure clarity of roles and responsibilities, effective team working and learning from experience.

The balance of emphasis between water operations and customer relations in data collection, interpretation and action planning at Gold Command and above may be an issue.

Even though the engineering situation was clear (frozen pipes, not broken supply) the developing situation with consumers (no water, no response, no apparent help) was not. Had it been, it should have triggered a category 1 call much earlier.

Business recovery within NI Water is synonymous with operational recovery and is covered in a comprehensive, although not fully tested, set of Business Continuity Plans. The wider concept of planning to recover wider business imperatives such as reputation is an area in which the Chief Executive and the company's executive team should have had an immediate interest.

A clearer top level management plan, particularly for members of the company's executive team, with well defined responsibilities and pre-planned lines of delegation would considerably improve the execution of MIP.

Governance, leadership and management

Conclusion 37 – Company’s executive team roles – short term

7.32 NI Water should define formal roles for company’s executive team members within the Major Incident Plan. The company’s executive team should also take greater ownership of the MIP to ensure that its corporate importance is recognised, that the shortfall in customer services expertise is addressed, and that the company’s executive team engage in MIP mock exercises and challenge its effective operation and the company’s preparedness.

Conclusion 38 – Risk Register – short term

7.33 The process of preparing and challenging the risk register generated by the company’s executive team and reviewed by the Audit Committee and Board should be flexible and responsive enough to identify and highlight risks and their mitigation as they arise.

Conclusion 39 – Skills sets and experience – short term

7.34 NI Water should review and assess the skill sets and experiences of its executive leadership. This should be considered for the specific context of NI Water and its requirements, not merely by a benchmarking exercise which while informing may miss the crucial need for experienced corporate water industry knowledge. It will be important to ensure that the company’s executive team becomes more consumer focused whilst maintaining the emphasis on reducing costs and improving services.

Conclusion 40 – Director role – short term

7.35 NI Water should re-evaluate the Director of Customers Services role in the context of the MIP and consider if too much is expected from one individual (operations, engineering, customer relations, media planning and business recovery).

Conclusion 41 – Call Centre management – short term

7.36 There is an issue of management regarding the Call Centre which must be addressed. This conclusion should be cross referenced to the section dealing with the Call Centre.

Conclusion 42 – Morale – short term

7.37 The company should now take steps to re-energise a dispirited workforce.

Conclusion 43 – Board membership – short term

- 7.38 Consideration should be given to the appropriate balance of Executive and Non Executives on the Board with reference to other water utilities.

Conclusion 44 – Consumer focus – short term

- 7.39 The company must make additional effort to refocus its culture of impersonal utility service to personal consumer service.

Chapter 8: Future risk and mitigation

Future risk and resilience measures

- 8.1 The water industry manages a complex process of water abstraction, treatment and distribution. It takes water from rivers, loughs and impounding reservoirs which it processes to a standard suitable for human consumption. On a typical day, NI Water produces 620,000 tonnes of wholesome water, which it distributes to almost every home and most non-domestic premises in Northern Ireland.
- 8.2 In delivering this essential service, the water industry must deal with wide ranging technical and external risks, each of which could disrupt water supplies. Many of these risks cannot be controlled by the company directly. Nevertheless, it must plan for them and manage them effectively to ensure that the high-quality continuous water supplies that consumers expect is delivered.
- 8.3 Examples of key risks to water supply which NI Water must manage on a day to day basis are summarised in Table 7. The table also provides examples of the work done across the industry to understand and manage these risks.
- 8.4 A key lesson learnt from the December 2010 freeze thaw is that the company had not planned for an event which would result in a widespread loss of water supply. The use of industry standard approaches and its success in dealing with past events had given the company comfort that it would be successful in the future.
- 8.5 The company had also planned for an emergency response based on typical benchmarks adopted in England and Wales. It planned to provide alternative water supplies of 10 litres per person per day when the mains water supply is cut off for more than 24 hours. The extent of the planned response was based on the company's view of a worst case scenario of loss of supply.
- 8.6 The company could now increase either the capacity of parts of the water supply network or its emergency response capability in response to the 2010/11 winter. However, this approach could:
- overlook other key risks and not make the right provision for them;
 - require investment which has limited benefit compared to the cost; or
 - fails to provide the level of service which consumers expect or are willing to bear the cost of.

Table 7: Water industry – key risks

Key risk	Example risk management and mitigation measures
Drought	Preparation of water resource management plans which consider long term availability of water resources against a projection of demand over 25 years.
Failure of an impounding reservoir	Reservoir safety inspections (completed but not yet placed on a statutory basis in Northern Ireland). Dambreak analysis to assess the impact of failure.
Pollution of water resource	Regulation of industrial premises. Service reservoir storage, bank-side storage. Investment in farm premises. Trade effluent management. Interconnectivity of supply system.
Power failure	Dual supply to major plant. Stand-by generation.
Failure of water treatment process or subsequent contamination	Monitoring of treatment works. Drinking water safety plans Cryptosporidium risk assessments.
Trunk main failure	Service reservoir capacity. Strategic spares. Service reservoir monitoring.
Flooding of a critical piece of plant	Flood risk assessments.
Deliberate attack on key assets	Civil Emergency Measures Directive for Northern Ireland (supporting advice notes to be issued by DRD).
Critical plant failure	Risk assessments in construction and operation. Duplication of critical plant.
Health epidemic	Flu pandemic/swine flu contingency plan.
Third party impacts	Management of interfaces during construction. Operating procedures (for example physical separation of chemical deliveries). Foot and mouth response plan.
Severe weather	Winter contingency plan
Loss of telemetry	Telemetry Business Continuity Plan

8.7 Risk management recognises that risk can only be reduced and cannot be eliminated. It is not possible to plan for or guarantee that water

supplies will be maintained under all circumstances. For example, the Water Resources Management Plan process is based on explicit or inherent decisions on the level of service which can be defined in terms of the frequency of different severities of supply interruption. The company must plan for a defined level of response and plan the action it will take when this is exceeded.

- 8.8 While these decisions are a key part of the strategic management of the company, they must also reflect the wider views of stakeholders and the consumers who fund the company through taxation and direct charges. In view of this, the company should consult widely with other stakeholders and consumers on:
- the level of emergency response the company should provide. This should consider the type and quantity of emergency water supplies to be provided and when this should be triggered;
 - the levels of service the community expects the company to deliver and the frequency at which a reduced level of service would be acceptable; and
 - the cost the community is willing to pay to mitigate risk.

Planning future investment

- 8.9 Many commentators highlighted under-investment as the cause of the supply disruption which occurred in December 2010. Our investigation of the incident suggests that this is not the case. For example, through the investigation we have found that:
- much of the water treatment capacity consists of modern covered works upgraded to meet current water quality standards within the last 15 years;
 - the average age of water mains is the second lowest in the UK;
 - the average rate of bursts is lower than the average for England and Wales;
 - leakage per km of water main is lower than the average for England, Wales and Scotland;
 - the relative increase in bursts during December 2010 was similar to that in England and Wales;
 - the estimated loss of water from additional mains burst post Christmas 2010 explains 10% of the peak additional demand; and
 - the bursts which occurred from the 25 December did not align with historic burst clusters. It is unlikely that they would not have been prevented by a planned rehabilitation programme.

- 8.10 We also recognise that performance is not just about investment. The dedicated work carried out by NI Water on water production, network management, leakage management and mains rehabilitation underpins water service delivery.
- 8.11 The general performance of the water supply assets through this severe incident reinforces the key lesson that the scale of investment and efficient targeting and prioritisation of investment must be based on good information. This includes:
- a sound understanding of the condition and performance and deterioration of the asset base; and
 - clear messages from consumers on the level of service they expect NI Water to deliver and their priorities for investment.
- 8.12 We expect NI Water to continue to develop its asset management systems to ensure that future investment can deliver consumer priorities efficiently.

Planning for the future: climate change

- 8.13 The underlying cause of water supply in December 2010 was the severe and wide-spread freeze thaw. It is likely that much of NI Water's asset base and many consumer properties had not experienced a cold snap of the depth and duration that occurred in December 2010.
- 8.14 The water industry is exposed to and must plan for extreme climate conditions. For example:
- water supply is affected by extreme drought conditions;
 - water demand and supply is affected by extreme cold periods;
 - wastewater collection and treatment is affected by extreme rainfall; and
 - wastewater treatment is affected by extreme cold.
- 8.15 As well as learning the lessons from the winter of 2010/11, NI Water should continue to address the potential for climate change in the design of its assets. The risk is that within a gradually warming climate we will see greater extremes. The questions posed by the Royal Commission for Environmental Pollution in March 2010 on adapting to climate change are relevant to this.

Future support for consumers

- 8.16 This section should be read in conjunction with our observations and conclusions in Chapter 6.
- 8.17 The freeze thaw of December 2010 also caused widespread problems on domestic and non-domestic properties. The NI Housing Executive reports a rapid increase in defects on properties post Christmas. One third of schools were affected by burst pipes. The Association of British Insurers reports claims of £40 million from 6400 properties due to the extreme weather. The incident points to weakness in our housing stock which must be considered.
- 8.18 Improving the resilience of properties in the longer term will come from an ongoing review of design standards and Building Regulations to take account of the experience of the 2010/11 winter and projections of climate change. In the shorter term, there may be scope to promote improved information to households and encourage lagging of pipes.
- 8.19 There are immediate actions which consumers could consider to reduce the risk of pipes freezing and bursting during future cold weather. For example:
- confirm where the internal stop tap is located and make sure that it can be turned off. For domestic properties the stop-tap is often under the kitchen sink. Being able to close the stop tap in the event of a pipe burst can reduce damage and water loss;
 - check that tanks, cisterns and pipes are lagged to reduce the risk of frost damage;
 - check that pipes and taps in garages and outbuildings are lagged and protected. Since these buildings are rarely heated, it is helpful to have a separate stop tap to allow them to be isolated in the event of a leak without affecting the dwelling house;
 - consider additional property insulation which will reduce the cost of heating and allow properties to be kept warmer, reducing the risk of pipes freezing and bursting. Take advantage of subsidised insulation schemes from energy providers and others;
 - when improving insulation, check that cold water pipes and tanks in lofts are lagged at the same time and check that they are not cut off from the source of heat in the house which helps prevent frost damage;

- if you are away from home during the winter make arrangements for some-one to check you property periodically and turn on heating if the temperature drops;
- be aware that you are responsible for the supply pipe from the property boundary to your house or premises. Check for leaks (which you may first notice as a drop in pressure) and be prepared to arrange for any burst to be fixed;
- keep the contact details of a local plumber to hand in case of emergencies (the details of registered plumbers are available from SNIPEF); and
- make sure you have adequate home insurance.

Conclusions: Future risk and resilience measures

Conclusion 45 – to inform future Price Controls

8.20 NI Water should undertake a wider review of its risk management processes to ensure that each risk mitigation measure is properly considered and takes account of industry best practice. We will ask the company to identify improvements it considers necessary and consult its consumers on its proposals to improve service.

Conclusion 46 – to inform future Price Controls

8.21 NI Water should consult widely with other stakeholders and consumers on:

- The level of emergency response the company should provide. This should consider the type and quantity of emergency water supplies to be provided and when this should be triggered.
- The levels of service the community expects the company to deliver and the frequency at which a reduced level of service would be acceptable.
- The cost the community is willing to pay to mitigate risk.

Conclusion 47 – to inform future Price Controls

8.22 NI Water should continue to develop its asset data and asset management systems and engage with consumers to support clear medium term investment programmes. In the short term the company should identify and address local weaknesses in asset performance exposed by this incident.

Conclusion 48 – to inform future Price Controls

- 8.23 NI Water should continue to review its design standards in light of information from the UK Climate Change Programme. The company should also keep under review its progress in adapting to climate change using a formal framework such as that set out in the Royal Commission for Environmental Pollution's report of March 2010 on adaptation to climate change.

Conclusions identifying underlying issues with domestic consumers' pipework

Conclusion 49 – Service Pipes – short term

- 8.24 There is an opportunity to learn from the rapid increase in demand during the freeze-thaw incident. The company should undertake a more detailed assessment of demand taking account of detailed information such as DMA flow data, service reservoir outflow, service reservoir data and information on water loss on consumer premises. It is possible that there are key lessons to be drawn on the type and age of property which suffered most during the incident. Other stakeholders, such as the NI Housing Executive may wish to collaborate with NI Water in this work. The outcome would be improved advice to owners and occupiers on steps they might take to prevent pipe bursts in the future.

Conclusion 50 – Service Pipes – short term

- 8.25 Current regulations specify that supply pipes should be installed to at least 750 mm cover. In part this provides protection against freezing. There is the possibility that this protection will be eroded as consumers amend ground levels to alter access to and hard-standing around properties. The responsible authority should check that cover to supply pipes will be maintained when granting permission for work involving amendments to access or paving around properties.

Conclusion 51 – Service Pipes – short term

- 8.26 NI Water is not responsible for the supply pipe from a property boundary and it does not carry out repairs on supply pipes. Other companies in GB offer a free or subsidised supply pipe repair service to help control leakage. In light of the incident NI Water, in conjunction with policy makers and regulators, should review the benefits of a free or subsidised repair service.

8.27 The company should also review its policy of repairing consumers' supply pipes during a freeze-thaw when the need to reduce demand becomes the clear strategic objective. Any move to repair consumers' supply pipes during a freeze-thaw incident should remain at the discretion of the company which will need to retain the flexibility to prioritise its resources to best effect.

APPENDIX 1: GLOSSARY OF TERMS

Automated messaging	A communications facility that provides pre-recorded phone messages to one or more callers.
Burst rate per length of main	The ratio between the number of bursts on a water main to the overall length of that main. It is used across UK by water companies and regulators to assess condition and performance of the network of water mains and to determine the need for replacement or refurbishment.
Burst repair activity	The frequency of repairs of water main bursts repairs
Business Continuity Plans	Plans prepared which seek to ensure the delivery to consumers of a continued service during and after a major incident.
Call visualisation	The ability of a call handling system to note and record the caller's number electronically and to indicate the source location on a map. Allows the company to see whether calls concentrated in a particular area and can provide an early indication of a developing problem.
CCNI	The Consumer Council for Northern Ireland. A statutory body which represents the interests of water consumers.
Civil Contingencies Group	The Civil Contingencies Group (NI) is the public service strategic emergency planning policy review and development group.
Critical care customers	Consumers of utility companies whose circumstances dictate that they may require a secure service or advanced notice of a change in service; these include consumers at home who are on dialysis for example. Customers are usually on a register and will be contacted directly if the level of service they normally receive has been or is likely to be affected.
Distribution input	The amount of water supplied to the distribution network of a specific region of area.
DMAs	District Metered Areas. Defined areas of the network which are supplied via a single supply point through a large water meter and which typically supply 700 properties.
Domestic per capita consumption monitor	Technical process used to determine the average amount of water consumed per person, based on the results of meter readings taken over a long period of time from of a large number of properties of specific and different types with known numbers of occupants.
DRD	Department for Regional Development. The sole shareholder of NI Water and Water Policy maker for Northern Ireland.
Drinking Water Inspectorate (DWI)	The government agency with statutory responsibility for regulating public drinking water quality.
GPS	Global Positioning System. A system of satellites,

	computers, and receivers that is able to determine the latitude and longitude of a specific location.
Incident Category	The category of an incident according to its severity numbered 1 to 4, with 1 being the most severe as detailed in NI Water's Major Incident Plan.
Incident Team Gold Silver Bronze	The teams of NI Water staff, previously designated, from a variety of disciplines who respond to and manage the company's actions through the incident. Gold Team – Head Office. To manage the incident and coordinate the response. Silver Team – Functional team, having knowledge of the area in which the incident is taking place and with the necessary skills to respond to the incident (directing tasks of the Bronze Team). Bronze – Team specifically designated to undertake tasks to respond to the incident (e.g. repair burst mains).
Inferencing of calls	Analysis of consumer call data and in particular the source location of the call to try to determine if they are related and indicating that there is a common problem on the company network.
Interactive voice response	IVR is a technology that allows a computerised telephone system to interact with callers through the use of voice and keypad inputs. IVR systems can respond with pre-recorded messages and can be employed to handle large call volumes.
Key messaging system	A system used to record and display key information for incident teams during an incident. It can also be used to allocated tasks to individuals and to monitor progress on activity.
Major Incident Plan (MIP)	The plan used by NI Water to manage its response to incidents. The plan is intended to minimise the impact of any incident on consumers, the environment and the business.
MI/d	Megalitres per day. One million litres per day, 1,000 m ³ per day or 1,000 tonnes per day (of water).
Mutual Aid Scheme	The UK water industry's scheme to enable any member water company to call upon plant, equipment and resources in times of emergency.
NI Direct	NI Direct is the official government website for Northern Ireland citizens.
NI Water executive team	NI Water's directly employed senior management of Directors who are responsible for managing the utility company and who are responsible to NI Water's Board.
PC10 Final Determination	The statutory agreement for the three year period 2010 to 2013 between NI Water and the Utility Regulator where water and sewerage tariff increases are capped; but provide for the necessary revenue for NI Water to run its business in an efficient and sustainable manner.
Peak additional demand	The highest demand for water over and above the normal demand.

Potable water	Water treated to the required quality standard, i.e. drinking water.
PPP	Public Private Partnership. A contractual agreement with a private sector company (or consortium of companies) to finance, build and operate water assets to provide NI Water with a guaranteed service over a long period, typically 25 years.
Private supply pipe	The pipe owned by the consumer which starts from the boundary of the property and ends at the entry to the property itself and is the responsibility of the consumer. See also service pipe.
Rezone supplies	Changing the source of drinking water for an area by supplying water from supply points which are not normally used to supply that area.
Risk management	The formal and documented process by which NI Water, identifies, assess and manages the risks to its business.
Risk register	The formal company register of those risks identifies, assessed and managed
Rotation of supplies	The shutting off in a controlled manner of the water supply to consumers in a particular area, usually for a number of hours, to control demand and to allow water storage levels to be restored.
Service pipe	This is the pipe which carries water from the water main in the street to the property. This is divided into the communication pipe; which is the pipe from the water main in the street to the boundary of the property (and is the responsibility of the water company); and the supply pipe which carries water from the boundary of the property to the property itself (and is the responsibility of the owner or occupier of the property).
Service Reservoirs	Large covered concrete tanks for storing water, located around the water companies area of supply, typically holding between 24 and 48 hours water for the consumers they serve. There are 490 in N. Ireland.
Stakeholders	The principal stakeholders of NI Water are: the government's policy maker (DRD Water Policy Division), CCNI (representing NI Water's consumers), the quality regulators (NI Environment Agency and the DWI) and the economic and performance regulator, the Utility Regulator.
Standpipes	A vertical pipe with one or more taps attached to a fire hydrant on a water main to provide a temporary water supply point from which consumers can collect water. Often located along footpaths.
Static tanks	Tanks with taps which can be deployed by the company to provide alternative means of water supply to consumers that are without water. Typically trailer mounted water tanks of capacity 2,500 litres (2.5m ³).

Supply zones	A specific area of the water supply network supplied from a specific source (or sources) which is routinely monitored for water quality purposes and for compliance with water quality regulations
Trunk mains	Large diameter water mains (typically 1m, 3ft, in diameter) transporting drinking water in bulk quantities from the water treatment works to a specific region or area.
Upward reports	NI Water's established incident response and 'upward-reporting' mechanism.
Utility Regulator	Independent government body with statutory responsibility for economic regulation of the electricity, gas and water industries in N. Ireland
Void properties	Properties that are connected to NI Water's water network, but are vacant (i.e. there are no occupants).
Water Asset Management Plan	A plan prepared by NI Water as part of its business plan submission to the economic regulator to ensure that its water distribution and sewerage networks, and assets both above and below ground, are financed to operate efficiently and effectively.
Water infrastructure assets	NI Water's water treatment works, trunk mains, service reservoirs and network of underground pipes by which it supplies water to its consumers.
Water mains	Underground pipes usually made of cast iron, polyethylene or PVC and typically 100mm (4") to 300mm (12") in diameter which supply water to an area, district or street. NI Water has 26,500 km of water mains.
Water Resources Management Plan	A statutory requirement on NI Water to prepare and have approved by government a 25 year plan setting out the company's water resource requirements and how it will manage those resources to provide sufficient water for its consumers over that period.
Water resources Impounding Reservoirs Natural loughs River abstraction Boreholes	The raw untreated water employed by NI Water which is treated to supply drinking water to its consumers. The raw water may be stored in impounding reservoirs (behind dams), natural loughs such as Lough Neigh, rivers which are abstracted (River Bann) and boreholes which draw water from deep underground.

APPENDIX 2: QUESTIONS ANSWERED TO OUR INVESTIGATION TERMS OF REFERENCE

The cause and extent of supply problems

Q1: What was the root cause of the supply problems throughout the incident?

- The root cause of the supply problems was the sustained severe freeze from 19 December and subsequent rapid thaw from midnight on 25 December. Burst pipes in domestic and commercial/industrial premises caused a rapid increase in water demand on 26 and 27 December. Demand peaked on 27 December when it exceeded NI Water's water production capacity by around 170 MI/d.
- Bad weather, and the fact that the incident occurred during a holiday period, probably increased the time it took to find and repair pipe bursts which occurred on consumer premises. This delay extended the period when demand exceeded supply and rotation of supplies remained necessary.
- Only a small proportion of the increased losses which occurred were attributable to the company's assets. The condition of the water supply network was not the cause of supply failure.

Q2: What factors could reasonably have been foreseen and were within the control of the company?

The company could reasonably have foreseen that:

- The forecast thaw would result in significant and rapid increased in water demand. Plans to increase water production following the thaw appear to have worked well. However, levels in some key reservoirs had been allowed to fall (from 22 to 26 December) when treatment plants were not running at full capacity.
- The freeze thaw would lead to an increase in bursts on the distribution network and more resources would be required to fix these. The company's planning for this appears to have worked well, with reported leaks being fixed more quickly than under normal circumstances.
- Frost could damage plant and limit access, so reducing asset performance. Although the assets generally performed well there are lessons to learn from the failures that occurred (these are covered in our conclusions).

- The thaw might take place during the holiday period when staff were on holiday. Although additional operational resources were mobilised the number of call centre staff was allowed to fall from 21 December.
- Rotation of supplies was a possibility, especially given experience from previous freeze thaw incidents. Rotation of supplies could have been planned in advance, and preparations made to communicate information about them to consumers
- Call volumes would increase as the freeze developed and would escalate with the thaw. Call handling staffing levels over the holiday period were lower than the company forecast for normal operations and no definite arrangements existed to mobilise additional staff to cover the thaw predicted to occur on Boxing Day.
- Alternative supplies would be required in the event of a failure of the mains water supply. The Major Incident Plan made provision for alternative supplies. However, there was no clear plan on how alternative supplies should be provided in the circumstances encountered where the company could not be certain of the initial extent of supply failure or when falling demand would allow supplies to be restored. From the 28 December the company took advantage of an offer from the district councils to locate static tanks at council facilities to provide some alternative supply across Northern Ireland.
- It would need to communicate with consumers effectively, including through the media. The company did not have a clear communication plan in place to deal with the widespread supply failure which occurred.
- That critical care consumers would need support when water supplies were interrupted.

Q3: What factors could reasonably have been foreseen but were not within the control of the company, what measures were taken to mitigate the impact of these factors on supply?

- The company could reasonably have foreseen that the severe freeze-thaw would lead to increased demand as frozen pipes on domestic and commercial premises began to thaw. The company could not prevent this. The company took steps in advance of the freeze thaw to provide advice on how to minimise the risk of burst pipes.
- Although the company could reasonably have foreseen the thaw it could not control its speed and extent. The company recognised that the thaw

would increase demand. However it did not expect that this would cause a widespread loss of supply.

Q4: How did the company's assets perform throughout the incident?

The company's assets generally performed well during the incident and performed up to their capacity. Some plant suffered frost damage and NI Water operational staff worked hard to repair the damage and maintain water production in extreme weather conditions that caused widespread access problems. It was high demand as opposed to the performance of the assets which caused supply failure. A summary of asset performance through the incident is included in Section 3 of our main report.

Q5: What short, medium and longer term measures can be taken to improve the performance of the infrastructure in such adverse weather conditions?

This question is covered by our conclusions.

Contingency planning and implementation

Q1: Was the risk of such an event identified and what were the contingency plans for such a major incident?

NI Water had not identified the risk of an event of this scale and type occurring. It had planned for the worst possible event affecting the largest population in any part of its area in line with the planning parameters used in England and Wales. It had not identified the risk of such widespread problems, including a significant level of consumer supply side issues largely outside the company's control, leading to such an increase in demand.

NI Water has a two-volume MIP which provides a framework for managing incidents. The plan has well defined escalation routes for categorising incidents and clearly defined roles and responsibilities for incident management. The plan is supplemented by a wider set of contingency documents which help support any incident response. The most relevant of these other documents to this event was the winter contingency plan.

Q2: What pre-emptive measures were taken to mitigate the severity of the incident on customers?

The pre-emptive measures undertaken were largely based on NI Water's winter contingency plan. This plan included a checklist comprising of more than 140 actions which were to be undertaken in preparation for winter in the following areas:

- Staff Availability
- Liaison
- MIP Issues
- Customer Communications
- Networks Water
- Alternative Water Supplies
- Emergency Equipment
- Treatment Works
- Generators
- Vehicles
- Fuel

The checklist was supported by a winter weather strategic game plan. Its purpose was 'to reaffirm NI Water's strategy for responding to any severe weather events during the 2010/11 winter season'.

The checklist of actions was comprehensive and in theory provided a good mechanism for ensuring that appropriate preparatory action was undertaken. However, failure of certain elements, such as arrangements for ramping up the number of call handlers to meet increasing call volumes during the incident, indicates that appropriate monitoring and checking were not in place to ensure delivery.

Q3: How were these plans implemented in this case and were they sufficient?

The plan provided an appropriate framework for managing the incident. The operational response in terms of dealing with burst mains appears to have been reasonably effective with only a small backlog developing during the incident. The success of the company's alternative supplies approach was more mixed. It provided a means of distributing supplies to a wide area and for dealing with the dispersed nature of the 'no supply' issues. However the level of provision and timing was found to be lacking in some rural areas. In addition issues with the company's bottled water contract restricted its ability to provide water through this means in the early stages of the incident.

Implementation in other areas was less successful. For example:

- The effectiveness of the strategic response was affected by the Gold team having to deal with both strategic and tactical issues.
- Company's executive team engagement was slow.
- Contingency plans for rotation of supplies were not in place and when initially introduced notification was not given to affected consumers.
- Rotations were initially introduced to a limited degree and more extensive rotations at this stage may have mitigated the impact of the event on consumers.
- Customer communication during the incident was poor. This key issue is dealt with in greater detail under the internal and external communications section below.

Q4: Were the plans sufficient and did they incorporate lessons from previous such incidents?

The sufficiency of the plan has been dealt with under question 3 above.

The most recent freeze thaw event experienced by NI Water occurred in 2009/10. The company produced a lessons learnt report in March 2010 which identified areas for improvement.

The majority of actions were incorporated in contingency plans for 2010/11. Those associated with the operational response generally proved successful such as improved chemical storage levels at PPP sites, the replacement of tanker fittings and improved access to operational resources and inclusion of work control centre roles in the incident teams. Some associated with communications however were not as successful such as the arrangements for ramping up the number of call handlers and the new system for recording key messages for the incident teams.

Three actions were not completed for 2010/11. Two of these related to customer service initiatives to introduce call inferencing and call visualisation which the company did not prioritise for delivery in 2010/11. The other related to the co-location of the company's telemetry, work control and incident management centres. The company have advised that this has been postponed to 2013 at the earliest.

The company also did not identify the need to develop a contingency plan for the rotation of supplies despite a near miss last year.

Q5: How did the plans and their implementation compare to that of other companies in the UK and Ireland?

NI Water's MIP was found to be broadly similar to those of other water companies. It provides an appropriate framework for managing incidents. The Emergency Planning Manager attends both national and regional groups to access best practice and gain information that informs the review and development of NI Water's plans.

A comparison of implementation to that of other companies at an operational level is difficult due to the different circumstances faced (for example, network configurations, management structures, extent of consumer supply pipe issues and weather conditions). No other company in Great Britain for example found themselves in a position where water supply was unable to meet demand or where rotation of supplies was required. Some companies established Gold Incident Teams in advance of NI Water.

NI Water did not have plans in place for rotation of supply based on recent operational experience. In the Republic of Ireland rotational plans were implemented in advance of the thaw. This approach however was based on previous experience and knowledge of the particularly acute supply problems that affect Dublin and so is also not directly comparable.

The other area of critical importance in relation to comparative performance is communications. This is dealt with in detail in the internal and external communications section below.

Internal and external communications

Q1: Was there a communications plan in place for dealing with a major incident?

NI Water confirmed to us that no separate communications plan was in place immediately before the incident. However the MIP had dedicated chapters on communications issues such as 'Media Plan' and 'Customer Information'.

While NI Water's MIP is broadly comparable to MIPs in Great Britain it did not have a pre-established plan (including a communications plan) for implementing rotation of water supplies.

Q2: How was the plan implemented and what measures were identified to increase communication channels in light of demand?

The main channels of communication with consumers were via a call centre, press statements, media interviews and the website. Communications was undoubtedly the greatest area of failure during the incident, for the following reasons:

- NI Water failed to staff the call centre adequately, even though it was aware of the freezing conditions and an anticipated thaw on 26 December which would result in burst pipes, burst water mains and an escalation in the volume of calls.
- With the call centre being overwhelmed, the company directed consumers to its website for information. However, due to the large number of 'hits', it malfunctioned.
- NI Water did not anticipate the introduction of rotational supplies. It had no communication strategy and no mechanism to translate operational postcode information into a format accessible to consumers.

Reacting to the large consumer response to the introduction of rotational supplies, the company quickly got its website functioning, developed a process for translating postcode information and engaged additional call handlers. Despite these efforts, information continued to be limited and inaccurate.

Q3: What were the means of communication between NI Water and consumers, agencies, departments, other bodies and how effective were they?

The main means of communication between NI Water and consumers were:

- telephone communications via the call centre;
- email;
- information provided via NI Water's website; and
- communication through the media.

There is a documented process within NI Water's MIP for providing information to stakeholders such as the Consumer Council and the Utility Regulator. It is evident that this process was not followed during the incident.

Q4: What were the shortfalls in communications from consumers and other stakeholders' perspectives?

We commissioned research to obtain feedback from consumers, the findings of which are detailed in Chapter 2 of this report. CCNI published its own report entitled 'Left high and dry' on consumers' stories and experiences of the water crisis.

Some of the main issues highlighted by consumers and stakeholders in relation to shortfalls in communication from NI Water are as follows:

- A large number of people who rang the call centre did not have their call answered.
- Information provided about areas affected by planned rotation of supplies and when these would start and end were not accurate and not readily available. Only a minority of consumers were aware of NI Water 'protect your pipes' media campaign.
- NI Water's website was not 'fit for purpose' in an incident situation.
- Inaccurate or incomplete information was provided on alternative supply arrangements.

Q5: How effective were internal communications during the event. Was the information communicated timely and accurate?

The call centre provided a range of information to the Incident Team on an hourly basis. However, no information was provided on how effectively the calls were being managed, such as performance per line, effectiveness of IVR or use of skill sets. There was also no visibility in the call centre and therefore in the Incident Centre on the number of engaged tones until 30 December. The information provided to the Incident Team from the call centre was therefore incomplete.

During the incident updates were provided to the call centre at most twice daily (usually mid-morning and late afternoon). This created a delay in the

normal process and hindered the flow of critical information to the call centre. The flow of information from the Incident Team to the call centre during the incident was therefore neither timely nor complete.

The Mobile Work Management system (Toughbooks) was not in use during the incident. As a result job information was not available on the system and the service chain was reliant on a manual system. This hindered the flow of information important to consumers such as job progress and restoration times.

The ability for call agents to determine existing problems in an area is limited to looking on the bulletin board, or limited call inferencing to look for similar jobs in the system. This link is made via partial postcodes and is not linked to the network records.

Q6: How did the means of communication and their implementation compare with that of other companies in the UK and Ireland?

In overall terms the means of communication that NI Water used were broadly comparable with those used by water companies in Great Britain and by the 34 councils responsible for water and sewerage services in the Republic of Ireland. However, companies in Great Britain made better use of their Interactive Voice Response systems.

The key difference between NI Water and other companies in the freeze thaw period is that other companies were more proactive and consistent in their approach to communication with consumers and key stakeholders. Companies in Great Britain and the councils in the Republic of Ireland provided more accurate, timely and consistent information than NI Water provided.

As concerns media relations, companies in Great Britain and the Republic of Ireland used staff who had operational knowledge to provide key messages and interviews to the media. In contrast NI Water used staff from various areas of its organisation to provide key messages and interviews to the media during the incident.

Both in the immediate pre-incident period and during the incident period itself NI Water failed to communicate with other water companies either in Great Britain or the Republic of Ireland to see if it could learn or share approaches.

Q7: What shorter and longer term measures can be taken to improve the effectiveness of communications?

This question is covered by our conclusions.

Governance, leadership and management

Q1: How effective was the leadership immediately before and during the incident?

The Board and Executive Committee were not operating as a single entity on a common mission. Legacy issues dominated the Board agenda and the Chief Executive's leadership style was not succeeding with his executive team. The restructured Directorate of Customer Services Delivery had not settled down. The process of cost cutting and staff reductions, together with the leadership style at the top was causing low morale. There was a (false) sense of security over the company's ability to withstand a major crisis.

Q2: Was the management of the operational response adequate?

The restoration of water supply given the extraordinary circumstances was well handled; communications to customers was not. Planning was good as far as it went; it did not adequately address the strategic level and did not cover a range of possible eventualities including loss of customer communications and how to handle the effects of the decision to introduce rotation of supplies. Business recovery planning concentrated on operational recovery, not on the wider threats to the company.

Q3: Were the roles and responsibilities clearly defined?

Within the Gold Team roles and responsibilities were clear. At Board level, roles and responsibilities were clear. Within the company's executive team roles and responsibilities in normal business circumstances were clear. The roles of the Executive Committee and of the Chief Executive in a crisis situation were not clear. As a result the company's executive team members contributed, each in their own way, as individuals and not as a team. The Chief Executive failed to engage his team effectively in a way that would add value to the Gold Team operation. In particular, the handling of the information campaign was inadequate.