

SUPPLYING RELIABLE SAFE WATER IN A FLOOD

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ABSTRACT

In natural disaster situations, maintaining town water supply is of high priority, however, this should not be at the expense of water quality and safe water. Floods and storms pose an increased risk of damage to water supply assets, threatening the provision of reliable and safe potable water. Such was the case following major riverine flooding of the Goulburn and Broken River catchments within Goulburn Valley Water’s (GVW) service region.

This paper will discuss GVW’s experience in meeting water supply and quality requirements during the 2022 floods along the Goulburn River. This event resulted in widespread major flooding in several towns within GVW’s service region, notably Seymour, Nagambie, Murchison, Mooroopna and Shepparton. During this flood event, GVW met challenges associated with the protection of our water treatment and reticulation assets, managing water supply and quality information within the community, and safety in carrying out our operational field response. Operations also had to plan for potential mains breaks which, in a flood environment, would pose an elevated risk of contamination to the reticulation network.

1.0 INTRODUCTION

Goulburn Valley Water provides water and wastewater services to the Goulburn Valley in Victoria. This region is in the northern part of the state on Taungurung and Yorta Yorta country and is known for its large agricultural and food processing industries which supply a significant portion of the country’s food. Lake Eildon in the upper catchment is the major water storage dam for the area and feeds into the Goulburn River which runs through several of GVW’s service towns and feeds into the Murray River at Echuca.

In October 2022, during a third consecutive year of La Nina, flooding occurred along the Goulburn River and tributaries, causing major flooding in the GVW serviced towns of Seymour, Nagambie, Murchison, Shepparton and Mooroopna. GVW was first notified of the potential for a flood in 2020 and the operations teams were instructed to review response plans, check emergency response assets and have sandbags and sand stocked at the depots. The 2020 floods never came but staff remained on high alert as the La Nina weather pattern continued into 2021 and 2022. In early October 2022 the warning was escalated to a Major Flood Warning for the Goulburn River system, as well as for several other waterways in the region and state. On the 14th October 2022 GVW stood up an Incident Management Team (IMT) to manage the flood response, and sent a representative to the Regional Incident Control centre (ICC). The first IMT mission dot point was to “Prepare for flood peak and protect critical assets” with the Murchison and Shepparton WTP specifically listed.

2.0 DISCUSSION

2.1 An Overview of the Water Supply Systems at Risk

Towns that were situated along the mid to lower Goulburn River were most at risk. This included the towns of Seymour, Nagambie, Murchison, Shepparton, and Mooroopna in which GVW own and operate WTPs and distribution network assets.

The Seymour and Nagambie WTPs were located away from the river on higher ground and were under no imminent threat, however the raw water offtakes and areas of the retic were within the flood impact zone. The Shepparton and Murchison WTPs were at an elevated risk due to their proximity to the Goulburn River. These at-risk sites were identified early, and the Shepparton WTP and treated water storages were given a high priority due to the number of towns and properties that it services (6 towns and approx. 22,000 properties).

2.2 Importance of Reliable and Safe Water During Flood Events

The need to continue a reliable and safe supply of water, even under extreme circumstances, is important for the following reasons;

Potential to impact a large service population: In smaller towns, alternative supply of drinking water can be an option in a flood situation where the drinking water service cannot be maintained. However, due to the large size of the service population of the towns under threat, this was not an option for GVW and continued operation was required.

High Priority Customers: The Shepparton WTP and associated water distribution network service several high priority customers including hospitals, aged care and large food processing businesses. Shortly after the flood warnings were released, GVW was contacted by a large commercial dry-cleaning business in Mooroopna asking about security of water supply during the floods. The dry-cleaning business provided a service to many hospitals within the state, including large hospitals in Melbourne. This business was added to our list of high priority customers due to their criticality of supply to the health services and assured that if supply was interrupted, we would do everything that we could to get an alternative water supply to them.

Sanitation: The provision of clean water for sanitation purposes is even more important in a flood event due to the increase in exposure to water borne diseases.

Reduce overall impact on the community: Floods can devastate communities by impacting human and animal health, damage to property, and displacement of people and families. In a time when the community is trying to defend and recover from the floods, it is GVW's responsibility as a community minded organisation to manage our operations to avoid interruptions to service and minimise the overall impact of the flooding on a community.

Reputation: Following on from the community mindedness of the last point, being seen to do everything to minimise impact assists in maintaining reputation and trust within the community.

2.2 Identifying and Managing the Risk to Water Reliability and Quality During a Flood

Damage to Water Supply Assets

Risks to water supply and quality were identified both in the planning before the floods and during the floods as unforeseen risks arose. Damage to water treatment and supply assets were big concerns from the start and sandbagging occurred early at Murchison and Shepparton to protect pumps and electrical assets at the WTPs.

The Nagambie raw water offtake pumps became fully inundated with flood water and failed. Although water usage within the town was at a low, the repair time on the offtake pumps was still unknown so GVW commenced water carting that continued for several days to supplement the treated water storages.

GVW also have several water mains that run under bridged river crossings, and at least one standpipe next to the river bank that was fully submerged in flood water. Because of the proximity to fast flowing water, damage to these assets by debris being carried in the water was a concern. Unlike at the treatment plants, there were no safe preventative measures that could be taken to protect these assets so they were simply monitored where possible and contingencies were considered in the event of damage occurring.

Water Quality Risks

The identified risks to water quality were around floodwater ingress into treated water storages or supply assets (water mains). Raw water quality was poor and challenging to treat during the floods, however, this was not exclusive to the actual flood event and had been occurring throughout periods of high rainfall leading into the flood event.

Protection of the Shepparton WTP and underground treated water storages was high priority. The storages have a small above ground clearance and there was uncertainty around whether the flood peak would be above the level of these storage but it was known that it would come very close. Due to the level of risk, should the treated water storages be compromised, the direction was given from the IMT to sandbag these storages early. The photos below show the before and after condition of the storages, no technical language required here – it came really, really, close!



Figure 1. The treated water storages before (left), and during the flood peak (right). The photos above were shared on GVW social media so that the community would have confidence in the town water supply. Misinformation was a common occurrence but the communications team quickly corrected rumours on social media that the town water supply was about to be cut off.

Regarding the water distribution network, it was generally accepted that as long as the network operated as designed and without interruption, maintaining positive pressure within the mains, then there would be no increased risk to water quality. However, the inundation from floodwater would, pose an elevated risk to water quality should a mains break occur. The *Australian Drinking Water Guidelines 2011* stipulates a preventative risk management approach is the most effective way to protect public health, and that this approach is to cover all steps from the treatment plant to the tap. Given this, GVW had to consider how a mains break in a flood event would be risk assessed and managed for repair, understanding that repair may not be possible until flood waters receded.

Access to Water Supply Assets

GVW has a safety first policy and this was observed during the flood response. Staff were advised that they were not to risk driving through floodwaters. Trucks were used to access some sites, and remote monitoring via SCADA allowed some visibility of operation when access was cut off. Fortunately, no WTPs became inaccessible, but some areas of the distribution network did. Bridge crossings for the Goulburn River were closed in Murchison, Shepparton, Mooroopna and surrounding areas, rendering the centrally based operations teams geographically split. This scenario was identified in planning for the floods and mobile operational assets had been distributed across each side of the river in preparation for it.

Availability of Staff

Availability of staff had to be considered as it was understood that some employees would need to take time off to protect their own properties and that access was going to be cut off to some areas due to roads flooding. With the information that access across the river was to be cut off, key WTP staff were put up in accommodation in Shepparton to ensure continuity of 24/7 attendance at the Shepparton WTP during the flood.

Fatigue management was a big focus throughout the floods to protect the health and safety of employees. Rest days were staggered amongst the operations staff to ensure a continuation of available operators. GVW's fatigue management process for hours worked per day was followed throughout and the workload was spread as much as possible, however, the more experienced operations staff were inevitably the most sought after and had to be protected from burn out.

Interruptions to Other Essential Service and Supply of Fuel

The Mooroopna power substation was significantly impacted by the flood and had to be deenergised for safety reasons, leaving the towns of Mooroopna, Murchison and parts of Shepparton without power. The town of Tatura was also affected by the power outage, meaning that GVW then had a town indirectly affected by the flooding to add to the response efforts. GVW managed through the power outages via the use of permanent and trailer mounted generators and pumps strategically placed at key assets.

The supply of fuel and chemicals also became a concern as the flooding cut off access to towns. The IMT moved quickly to fill a diesel pod and place it at the Shepparton depot as the availability of diesel in the town became limited.

2.3 Case Study: Murchison Water Supply and Quality – Risk Assessing a Potential Leak

Following the flood peak at Murchison, the turbidity of the raw water was at around 400

NTU and treating the water was challenging with constant operator supervision required. To avoid a failure in the treatment process, the WTP was taken offline overnight as the treated water storages had enough to supply the town for this time. However, the next day the WTP operator raised a concern that the WTP was struggling to catch up with the overnight water usage, and outflow rates indicated a leak in the network contributing to this.

The networks operations staff were sent to look for a leak and drove along the water mains on the southern side of the river with no leaks found. The bridge crossing the river to the northern side of the town was closed due to floodwater damage, and the town couldn't be accessed from the North due to road closures. Furthermore, most of that side of the town had been inundated with floodwater. Through the process of elimination, the operations staff suspected that the leak was on the northern side of the river but couldn't access this area to confirm. Initially, the course of action deemed appropriate was to shut the isolation valve before the bridge on the southern side, we would then be able to confirm the location of the leak via the flowmeter reads. However, this would mean isolating the northern side of the town and once that occurred, it had to be assumed that loss of positive pressure would occur for that part of the network, and with much of the area inundated with floodwater, it also had to be assumed that contamination of the main was likely to occur. Given the significant impact of this scenario to supply and quality of water to the northern part of Murchison, the decision was made not to close the valve and isolate the northern side of the town, maintaining positive pressure unless the WTP could not keep up with outflow, in which case the valve would have to be closed in an effort to secure supply to the southern side of Murchison.

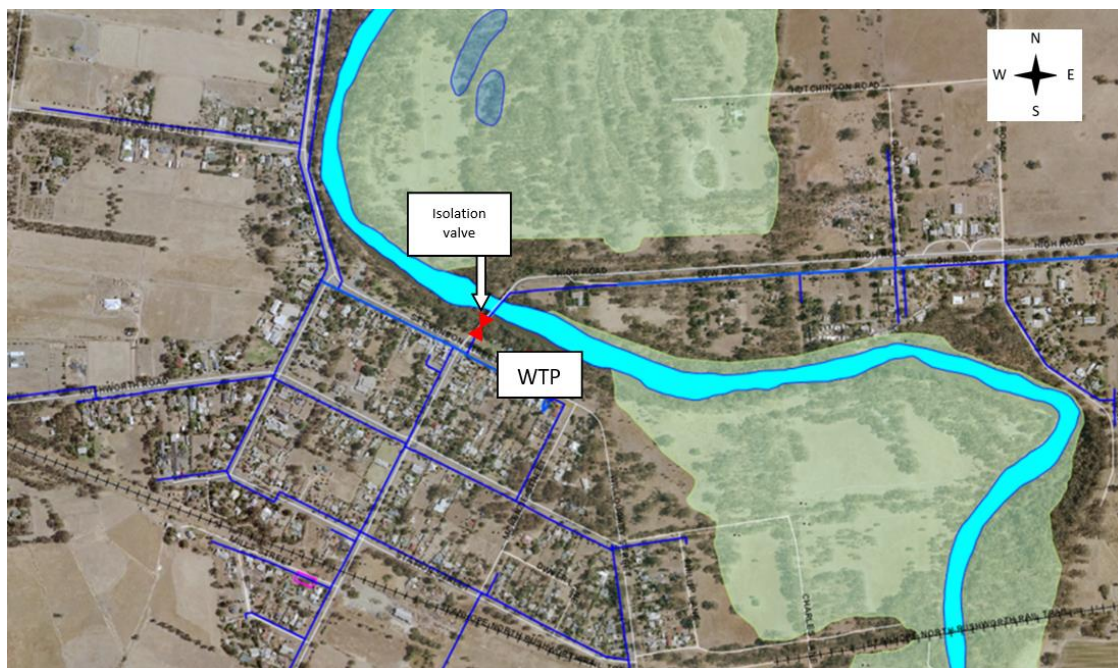


Figure 2. GIS image of Murchison's water distribution network.

3.0 CONCLUSION

Floods present significant risk to water supply reliability and quality. Despite the challenges that the flood presented to GVW operations, the following was achieved;

- No loss of water supply
- No contamination of the water supply and no boil water or do not drink/use advisories.

- Staff safety and fatigue was well managed. No injuries reported during the event.
- Community support and appreciation for GVW's performance during and after the floods.

The floods had a significant impact and recovery is still ongoing. The response effort to protect the drink water supply during the event was successful and this can be largely attributed to the efforts put into planning and readiness for such an event. Preplanning efforts such as understanding our assets, knowing where they were located and what the flood level forecast was, understanding potential scenarios, where our critical customers were, and reviewing our fatigue management protocols ensured a good level of readiness. GVW operations staff were aware of the imminent treat of a flood, understood the risks to our assets and service, and prepared an appropriate response that was rolled out in a controlled manner.

4.0 ACKNOWLEDGEMENTS

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5.0 REFERENCES

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