

*Winner of Ecolab Prize for Best Operator Paper at the  
36<sup>th</sup> Qld Water Industry Operations Workshop, Toowoomba, June 2011*

## **TOOWOOMBA 2011 - FROM DROUGHT TO FLOOD**



*Paper Presented by:*

**Marcus Boyd**

*Author:*

**Marcus Boyd**, *Senior Technical Officer,*

Toowoomba Regional Council



*6<sup>th</sup> Annual WIOA NSW Water Industry Engineers & Operators  
Conference*

*Tamworth Regional Entertainment & Conference Centre,  
27 to 29 March, 2012*

# TOOWOOMBA 2011 - FROM DROUGHT TO FLOOD

**Marcus Boyd**, *Senior Technical Officer*, Toowoomba Regional Council

## ABSTRACT

Up until January 2011 the Toowoomba region was in the grip of one of the worst droughts on record. During the dry conditions Council implemented measures to conserve the remaining storage supplies, Level 5 water restrictions were introduced and ground water extraction was increased after drilling and equipping additional basalt aquifer bores. In January 2011 flood events were experienced and all 3 surface storage supplies filled above full supply level. The flood event stretched Council resources to the limit and caused significant damage to council's water infrastructure. Sewer and water mains were washed from their foundations, major pump stations were submerged and dam walls experienced water levels and hydraulic loads higher than ever previously recorded.

## 1.0 INTRODUCTION

From late 2004 until early 2010 Toowoomba's three surface storage supplies Cressbrook, Perseverance and Cooby dams received little to no inflow, resulting in declining storage levels down to the lowest recorded combined storage of 7.8 % in late February 2010. In March 2010, 188mm of rain fell in the catchment and lifted the combined storage to 17.2%, followed by significant further rainfall in December 2010 and January 2011 which resulted in the filling of Toowoomba's dams for the first time in ten years. The extensive rainfall caused significant flood damage across the region, and took Council teams to their limit in order to continue operating the water and wastewater systems.

## 2.0 DISCUSSION

### 2.1 Drought - Will it Ever End?

As drought conditions worsened during 2004 Council investigated a range of options to ensure a sustainable water supply to the Toowoomba region. The primary option considered by Council staff was the recycling of wastewater through a series of 4-step process of BNR, ultrafiltration, reverse osmosis and ultraviolet treatment, producing a 6-star quality final product suitable for potable use. Due to the controversial nature of this proposal a vote was held to determine whether recycling would go ahead. Following a long and well publicised campaign the vote on the addition of purified recycled water to the water supply was lost, and additional measures had to be considered.

Options to increase bore water production into the cities water supply to supplement the dwindling surface water storages was considered to be the most effective short term option. At this time extraction from existing groundwater sources averaged 1,800 ML/a. With the potential to extract up to an additional 2,000 ML/a under the current licence, Council provided funding in its 2005/06 Budget to investigate and construct additional basalt aquifer bores. This project resulted in an additional 8 basalt aquifer bores pumping into the reticulation system, producing an extra 1409ML/year supplementing surface water storages.

As a further measure Council received approval to drill a number Great Artesian Bores to supplement the Cooby Dam storage.

Following an unsuccessful drilling near the wastewater treatment plant, five boreholes were drilled around Cooby Dam, and three subsequently equipped to supply artesian water to supplement the Cooby Dam storage.

Following the continued decline of surface water storage levels, in late 2008 the Queensland Government commissioned a project to construct a pump station and pipeline to deliver water from Wivenhoe Dam to Toowoomba's Cressbrook Dam, at a cost of \$187M. This pipeline was commissioned in January 2010, merely two months before the rain started.

Throughout this time council implemented a strong water conservation campaign, including a strict 5-tier water restriction policy. From September 2006, when the combined surface storage first dropped below 20%, Level 5 restrictions were in effect, completely prohibiting outdoor water use. This level of restrictions is far more stringent than even the strictest water restrictions used in other areas of SEQ.

## **2.2 Implications of Amalgamation**

In March 2008 Toowoomba City Council amalgamated with seven Shire Councils to form Toowoomba Regional Council. This brought about further challenges in ensuring water supply as the onus to supply water for the entire new Council rested with TRC's newly formed Water Services Department. Following review of each district's water networks, work on ensuring a sustainable water supply for the entire Council began. Fortunately several areas, particularly those to the south of Toowoomba, were fully reliant on bore water, which at least for the moment did not appear to be suffering due to the drought. Other areas, including the previous Crows Nest, Jondaryan and Rosalie Shires were almost fully reliant on surface water from Toowoomba's three dams, making it all the more important that sustainable solutions were investigated.

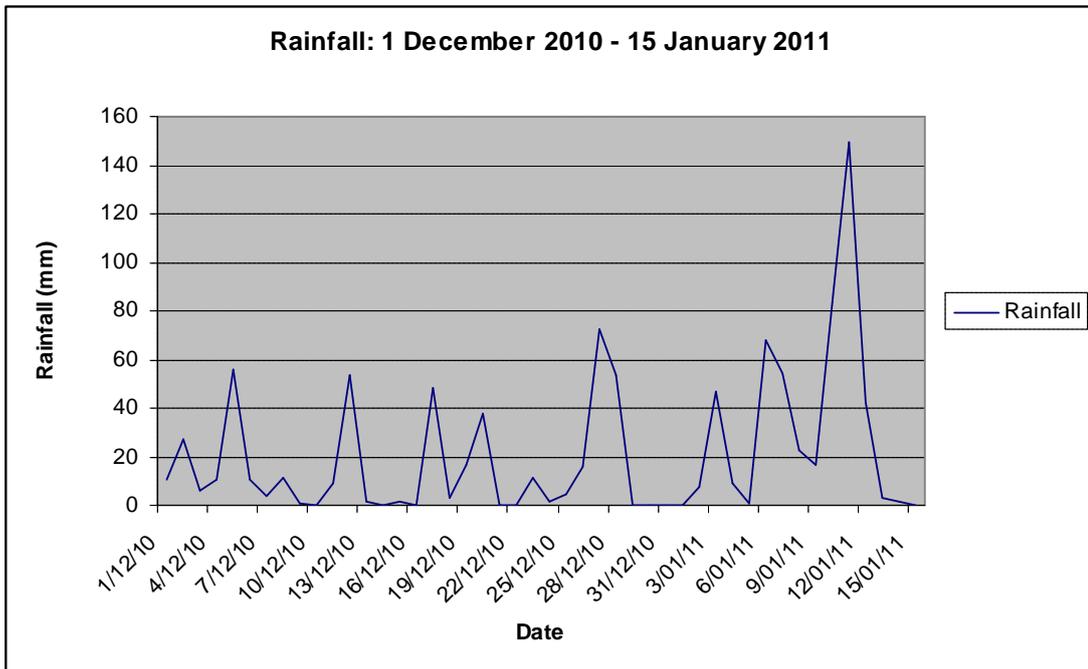
## **2.3 Rain is Coming (March 2010)**

In March 2010, 188mm of rain fell on the catchment and lifted the combined surface water storage level to 17.2%. This was the first significant rainfall event the Toowoomba dams had seen in over ten years, and as such resulted in some minor issues, in particular a number of slips on the downstream side of Cressbrook Dam wall. Upon discovery of these slips a thorough investigation was undertaken by consultants GHD, who subsequently resolved that the slips were caused by a lack of drainage on the dam berms, and that there were no structural implications. Fortunately machinery was in the vicinity finalising work on the Wivenhoe pipeline, thus repairs were able to be undertaken quickly and with minimal issues. While these slips turned out to be purely cosmetic, the lessons learned during the rectification process held us in good stead for the immense rainfall to come.

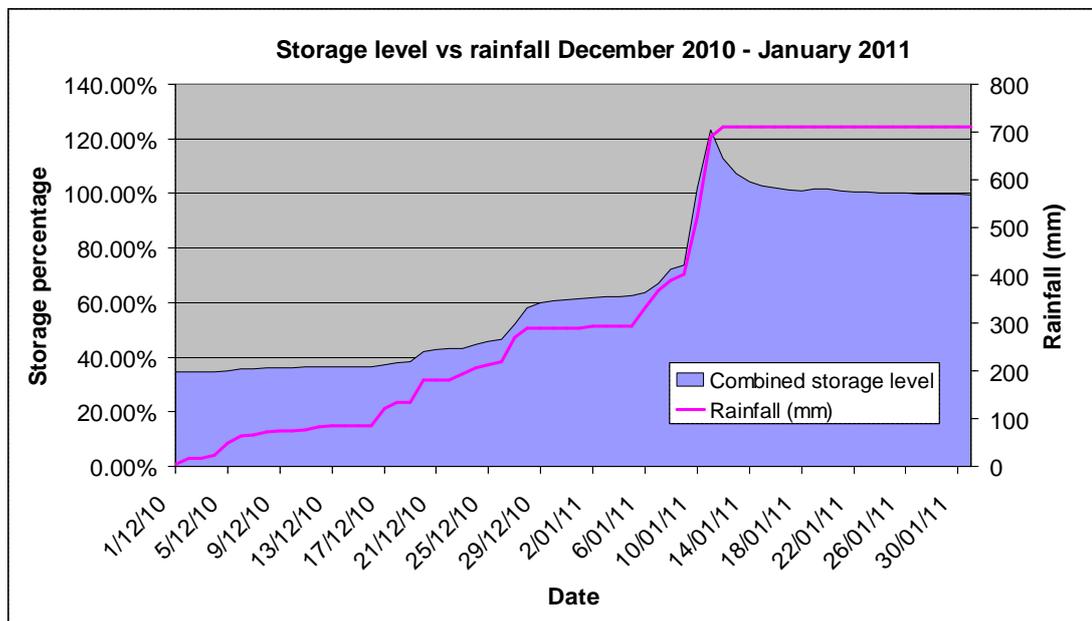
## **2.4 The Big Wet (December – January rainfall)**

In December 2010 rain began to fall consistently across the TRC catchments, with widespread localised flooding occurring in almost all towns. By mid December the catchments were fully saturated and significant runoff was evident with minimal rainfall. During this time the combined storage level at the dams was steadily rising, with the first of the dams reaching their Dam Safety alert level on Boxing Day. Figure 1 shows the consistent heavy rainfall throughout December and January.

At 2:05pm on Friday 7 January 2011, Perseverance Dam reached 100% and began to spill for the first time in ten years. By Sunday night Cooby was also spilling, and with Cressbrook level quickly rising, two Dam Safety teams were stationed around the clock at the relevant dam sites. On Tuesday the combined storage reached 100% and continued to climb (refer figure 2).



**Figure 1:** *Rainfall December – January*



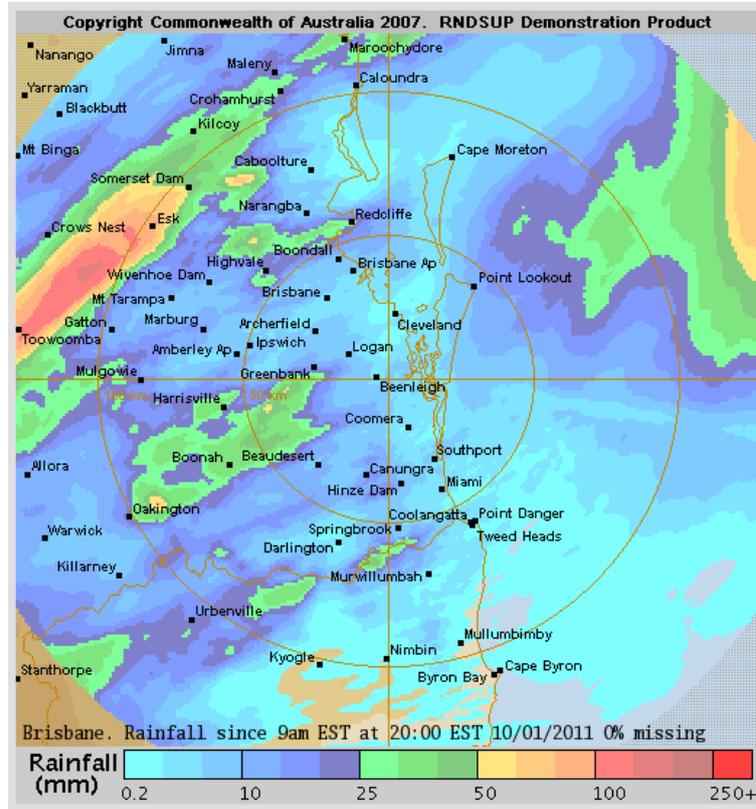
**Figure 2:** *Combined surface water storage level vs cumulative rainfall*

## 2.5 January 10 Flood

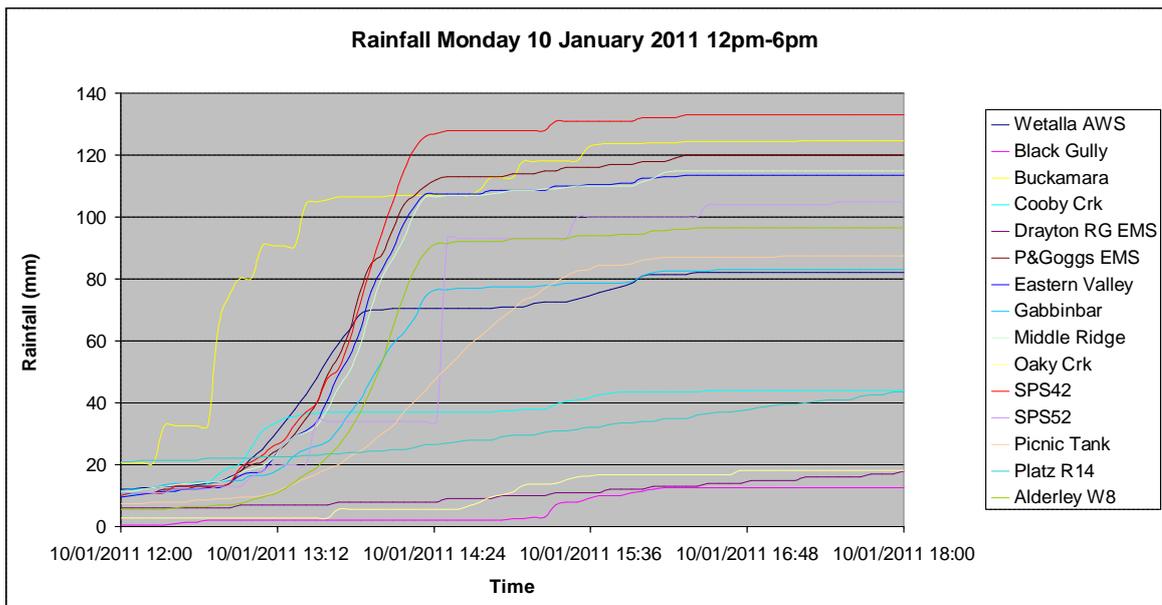
Just after lunch on January 10, 2011 Toowoomba was hit by a storm which brought with it extremely heavy rainfall across the entire catchment. Figure 3 shows a radar image of the storm, which approached from the north-east, and moved slowly across the district, flooding all in its path.

Average rainfall data for the storm (refer figure 4) within the city area has been tentatively assessed as a 1 in 200 year event, however significantly greater rainfall fell along the escarpment.

The volume of water which flowed through our East and West Creeks however, has been estimated as a 1 in 500 year event, primarily due to the completely saturated condition of the catchment prior to the storm.



**Figure 3:** Radar image of the January 10 storm



**Figure 4:** January 10 storm rainfall data

## **2.6 Infrastructure Damage**

The extreme rainfall and flooding on January 10 resulted in significant infrastructure damage across the region. Some of the major damages included:

- Several slips on Cressbrook Dam wall, similar to those which appeared in March;
- Several major water pipelines along the creek destroyed;
- A major wastewater pipeline along the creek broken;
- Flooding of Cressbrook pump station, requiring the baking of two 640kW motors;
- Flooding of several bore switchboards, requiring complete replacement.

The repairs to the pipeline infrastructure in particular has been extremely difficult due to prevailing availability of repair crews, and was significantly compounded by the damage to road infrastructure in the area. Following the flood damage to water pipelines, the water treatment plant lost 17ML from its reservoirs in just over 40 minutes. This volume of water is equivalent to over 50% of daily consumption, and required the reservoirs to be isolated at the treatment plant while temporary repairs and pipeline diversions were undertaken. This resulted in loss of water supply to a large area of the city for a number of hours.

While the damage bill to water and wastewater is yet to be finalised, it is expected to be in the vicinity of \$3-5M, and with the funding arrangement through NDRRA yet to be finalised, the flood damage is likely leave a significant bill for Toowoomba Regional Council to cover.

## **3.0 CONCLUSION**

In the past twelve months Toowoomba has come from the area's worst drought in history, to having dams overflowing and aquifers fully recharged. The rain experienced during December 2010 and January 2011 brought with it many challenges for Council staff to ensure effective water and wastewater supplies were maintained. The flooding which occurred on January 10 in particular brought staff to their limit, as they experienced an event which no one of our generation had previously seen. The lessons learned from this have been invaluable to Council staff, and despite the significant damage encountered, all are satisfied that our water supply is now secured for the foreseeable future.

## **4.0 ACKNOWLEDGEMENTS**

Special thanks to Matt Torr for his assistance in writing this paper.