ONE YEAR ON FROM THE FILLING OF TOOWOOMBA REGIONAL COUNCIL'S SURFACE WATER STORAGES AND THE ASSOCIATED IMPACTS ON THE MT KYNOCH WATER TREATMENT PLANT

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ABSTRACT

One year on from the filling of Toowoomba Regional Council (TRC) surface water storages, dam levels have fallen and risen on numerous occasions corresponding with the various rain events throughout the year. This has caused some significant changes in the raw water quality and the impacts on the operation of the Mt Kynoch Water Treatment Plant.

In this paper the following areas will be covered:

- Water Treatment Plant Overview
- Surface Water Supply Overview
- Affects and Impacts to WTP process
- Changes and solutions made to manage and treat Raw water quality and increasing sludge content in lagoons.

1.0 INTRODUCTION

One year on from Toowoomba's One in a Hundred rain event that filled our 3 surface water storages (Cressbrook, Perserverance and Cooby), the Mt Kynoch WTP operators have learned a significant amount of new information about raw water quality and the corresponding effects on the Mt Kynoch WTP. Now a year on since the fill event our storages have fallen and risen and overtopped our spillways with each rain event. This has constantly changed our raw water quality and the operation of the Mt Kynoch WTP.

2.0 WTP OVERVIEW

The Mt Kynoch WTP is a 68 ML/day production plant. As Toowoomba was in drought for such a long time, the Toowoomba public have learned to conserve water and as a result the plant treats anywhere from 15 to 30 ML/day. Average flows through the plant during the day are 160L/s to 200L/s. At night, flows through the WTP vary between 250L/s to 400L/s and the WTP can treat a maximum flow of 740L/s.

This is achieved by receiving water from the Perserverance/Cressbrook and Cooby mains. The WTP can run two types of filtration. One is conventional filtration and the other is contact filtration. Conventional treatment is primarily used for dirty raw water events (high turbidity and colour) and contact filtration for cleaner water events (turbidity generally below 5 NTU and colour <10 HU).

The primary coagulant used is Polyaluminium chloride or Magansol 589 which is currently dosed at 14 mg/L and a secondary coagulant anionic polymer or Lt 25 which is dosed at 0.03 mg/L. This is used as a filter aid to assist deep bed penetration of the floc. Lt 25 is also used as the settling aid to settle out our backwash water. The plant utilises a Pre and Post Chlorine dosing system for disinfection and oxidizing Fe and Mn. The WTP uses a Backwash Recovery Tank for settling out backwash water from the filters and currently can only handle one backwash from the filters at a time.

Sludge from this tank is then sent to a balance tank were it is stirred and mixed continuously and then pumped to the sewer system at 3 L/s. The waste stream is sent via the sewage transport main to the TRC Wetalla reclamation plant. The cleaner water on top is sent back to the head of the WTP. The system also includes two lagoons to settle out the sludge from the settling tank sludge draw off valves and run any water on top of lagoons back to the head of WTP for treatment again. Operators at the WTP have the option of using Powdered Activated Carbon when BGA is present in the raw water and lime is also able to be utilised for Alkalinity correction. Fluoride is also added to the final water supply before any customer off takes.

3.0 SURFACE WATER SUPPLY OVERVIEW:

The surface water supply consists of 3 dams - Cooby, Perserverance and Cressbrook. These dams supply water to the WTP through three supply mains. Two duplicated mains for the Perserverance/Cressbrook dams pump water to two large reservoirs called Peachey Reservoirs near Perserverance dam and the water is then gravity fed the 40 km to the plant. Cooby has its own separate main line and doesn't pump into the raw water storages.

The flow is controlled through a flow control valve at a valve house located near the WTP. There is also another supply that will supply water to Toowoomba from the Wivenhoe dam pump station. The water from Wivenhoe dam can be pumped the 38Km into the back of Cressbrook dam wall when the dam gets below 40%. The total flow of the Wivenhoe pipeline is 620L/s.

All the raw water pumping from the dams is undertaken using off-peak power with pumps running from 9pm through to 7am to utilise cheaper pumping costs.

Table 1: ***Toowoomba Dams Capacity***

Dam	Capacity (ML)
Cooby	23 100
Perserverance Dam	32 000
Cressbrook	83 000

The volume in storage (percentage full as at end March 2012) are 98% at Cooby and 100% at each for Perseverance and Cressbrook. With the constant rain events that Toowoomba has received since 10 January 2011, dam levels have dropped and risen constantly. Water has been running over the spillways on numerous occasions. An indication of the dam levels from January 2011 through to March 2012 are provided in Table 1.

The raw water quality has changed each time there has been rain and each event affects the WTP in different ways.

An indication of the quality of the raw water in the form of turbidity and colour is provided in Table 2.

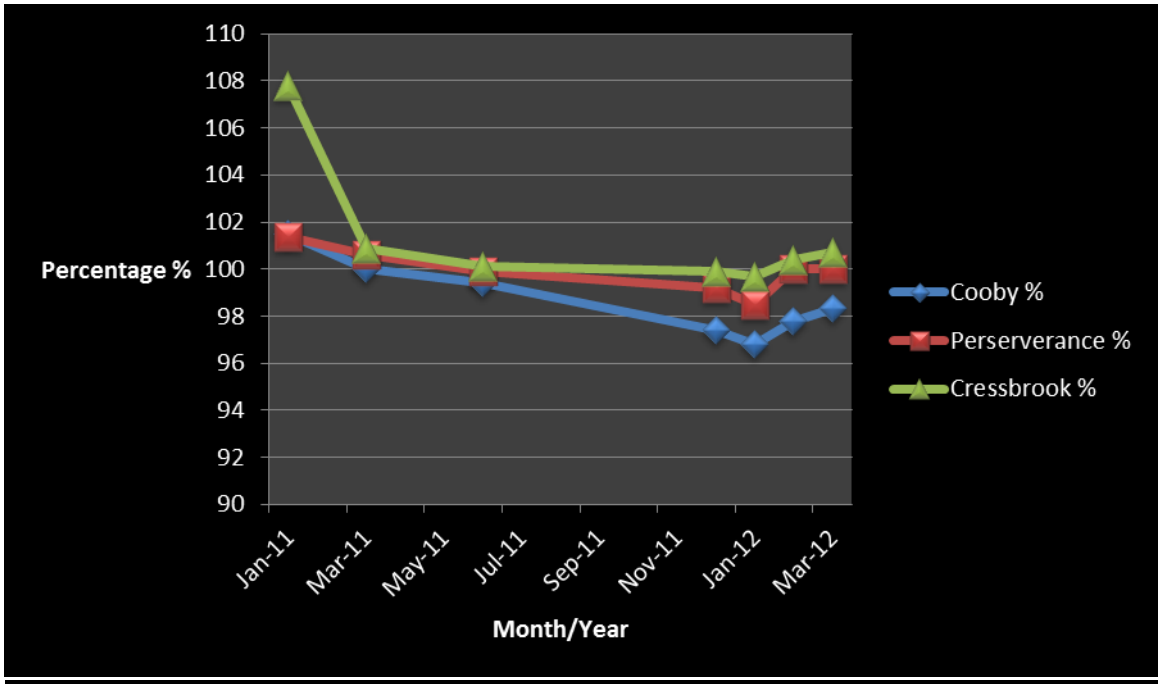

Figure 1: ***Monthly dam level percentage***

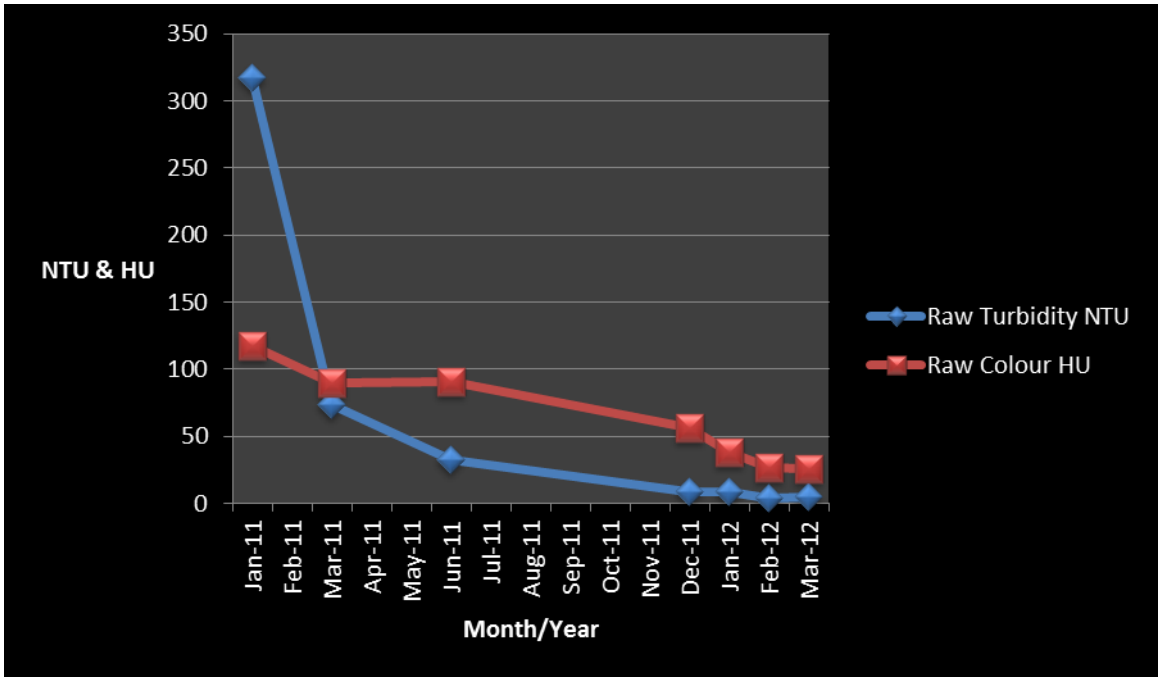

Figure 2: ***Average Raw Water Quality***

4.0 AFFECTS AND IMPACTS TO WTP PROCESS

A year on from the January 2011 flood, the WTP is still running in the conventional filtration mode rather than in contact filtration mode to cover the ever changing raw water quality from our three dams. Lime dosing occurs when raw water has low alkalinity or when the negative charge in the raw water changes.

Operators have done numerous jar tests at different dose rates during these periods.

Operators have tested the raw water with our primary coagulant, in some cases with lime added and some without lime. Operators found that along with a 40 mg/L coagulant dose rate when the raw water charge had changed, the lime helped to give the raw water its correct charge back again. Also, when the lime dosing was running, there was a higher than usual solid content coming out of the draw off valves from the settling tank, as we could not get the coagulant to floc up the raw water coming into the plant. The extra solids then caused us dramas with our sludge lagoons.

After Jan 10th, Lagoon 2 was dried, desludged and then put back online to allow No 1 lagoon to dry out. The extra solids from the lime dosing were filling Lagoon 2 with sludge and lime very quickly. The operators didn't want to put Lagoon 1 back on line as it was in the process of drying so we had to persevere as long as possible with Lagoon 2 until the contractor could get in and start desludging Lagoon 1. When that work started, the contractor discovered that many years ago, the underdrains were damaged in a previous delsudging job and the sludge was still very wet.

With the sludge still being wet, but needing to be removed, Council trucks had to carry smaller loads to landfill for disposal so sludge didn't slop over sides of truck when going around corners or going up or down hills on its way to the landfill. As the excavator dug deeper, the sludge got wetter and liquid and sludge was seeping out back of tail gates of the truck onto roads. As there was nowhere else to place the sludge to dry, the decision was made to stop carting to landfill and carry as much sludge to a small temporary lagoon at the back plant until it was full. When that lagoon was full, the desludging ceased on Lagoon 1 as there was too much carry over water in the top of Lagoon 2. This was causing treatment problems when it was returned to the head of the WTP mainly by unsettling the recovery tank reducing filter runs times.

Lagoon 1 was placed back online with only half of the lagoon desludged and Lagoon 2 was taken offline to dry out again. At this time, contractors had started worked on the new sludge thickener for the plant and the backwash recovery tank pumps had to be decommissioned for works to commence the project. Backwash water was also sent to Lagoon 1 which filled rapidly. The drying process in Lagoon 2 was slower than expected because rain events kept getting it wet again. The lime dosing system caused other problems including restricting or blocking the dosing lines and an acid dose in the mixing tank in the morning and afternoon was necessary to keep lines free and keep the lime dosing to correctly assist the coagulant in forming floc when required.

5.0 CHANGES AND SOLUTIONS MADE TO MANAGE AND TREAT RAW WATER QUALITY AND INCREASING SLUDGE CONTENT IN LAGOONS

Operators had a theory that vegetation that was now under water was rotting and each bit of rain was sending it towards the surface dam intakes and changing the charge of the water. To test the theory, we changed to lower level intakes at the dams where the water wasn't as high in Fe and Mn or blue green algae. This approach worked and the lime dosing was able to be turned off and hasn't had to be used since. This change has reduced the sludge content coming out of the draw off valves and we were able to reduce the dose rate for the coagulant down to 14 mg/L from 40 mg/L. Operators are running all backwash and settling tank draw water into Lagoon 1 while Lagoon 2 dries out.

6.0 CONCLUSIONS

Operators are now just waiting on the contractors to complete the new sludge thickener works which will put the lagoons out of action and they will be only used in case of emergencies. The new thickener will enable operators to perform multiple backwashes at a time, an improvement from the old backwash recovery tank that could only handle one backwash at a time. The thickener will also be able to process the sludge from the settling tank draw off valves which currently goes to the lagoons. The sludge from the thickener will be pumped to sewer and be processed at the Wetalla reclamation plant and the supernatant will continue to be pumped back to the head of plant.

Currently, Lagoon No 2 is still drying and hasn't been able to dry properly with the constant rain that we have been receiving. Work is still proceeding with the new sludge thickener but if Lagoon 1 fills up to quickly and interferes with the treatment process, we will try and juggle flows between the two lagoons until the sludge thickener works are finished. Operators are just playing the waiting game now for the raw water colour and turbidity to drop so that the plant can be set to run in contact filtration mode allowing us to run a lower coagulant dose rate which we usually run about 80% of the time, instead of using the conventional treatment process.

7.0 ACKNOWLEDGEMENTS:

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