WELL, WELL, WELL – DRIFT WELL RECOMISSIONING, AN OPERATORS PERSPECTIVE

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1.0 INTRODUCTION

Tamworth is located approximately halfway between Sydney and Brisbane on the New England Highway. It is recognised as the premier commercial, industrial, agricultural and cultural inland city of New South Wales and indeed it is acknowledged by many to be the real heart of this great State. It has a population of about 40,000 people. The city water supply is all surface water, the majority of which comes from Chaffey Dam (62,000ML). Water is extracted via an intake on the Peel River about 50km downstream of the Dam. Tamworth also has a supplementary supply from Dungowan Dam (6,200ML). This water is supplied to town through a 60km 500mm dia. pipeline directly to the Calala Water Treatment Plant. In the summer 2006/07 the worst drought in 100 years had reduced Chaffey Dam's level to 20% and falling, Level 5 water restrictions were introduced and all outdoor use of water was banned and also evaporative cooler use was severely restricted. Council embarked on a program to investigate any and all alternative water sources should the drought continue. All options were considered, one of these was to refurbish the old drift wells which drew groundwater from the Peel River floodplain in town, and use them to augment the City's water supply.

Figure 1: ***Chaffey Dam at 13.9% - March 2007***

2.0 THE PARADISE DRIFT WELLS

The Drift Wells in Tamworth date back to 1930. Eighteen, 3-4 metre diameter wells were constructed on the flood plain immediately downstream of the junction of the Peel River and the Cockburn River. These wells were linked to the Main Well at the end of Paradise Bridge which then distributed the water to the City. These wells were the only supply until the mid-fifties when Dungowan Dam and the pipeline were brought into service. Their role was reduced but they were still used in high demand times and when there was trouble with the Dam or the pipeline as a supplementary source of drinking water. They were decommissioned in 1980 when Chaffey Dam and the new Calala Water Treatment Plant were commissioned.

The question in 2007 was "Is it worth recommissioning these wells?"

2.1 Drift Well Investigations

Historical pumping records of the Main Well, from 1977 to 1980, showed that the wellfield, if pumped continuously, could supply up to 12 ML a day. The average daily extraction was 7 ML and the highest yields were produced by Wells 1, 1A, 3,4,5,6 and 7. This was a significant amount of water which could help prolong water supply in the current drought. Consumption at this time with restrictions was about 15 ML per day. It was decided to test these wells to ascertain if they could still produce. Tamworth Regional Council (TRC) commissioned Sinclair Knight Merz (SKM) to analyse pumping test data collected on selected drift wells. The testing began in January 2007 (after cleaning out of the wells) to find what the sustainable yield was.

Results of this testing showed the wellfield was still capable of yielding up to 12ML. TRC also commenced a water testing program as they were concerned about water quality in the aquifer after all these years. The results for this were also positive. The Wells after a 'rest' of nearly 30 years were going to be used again.

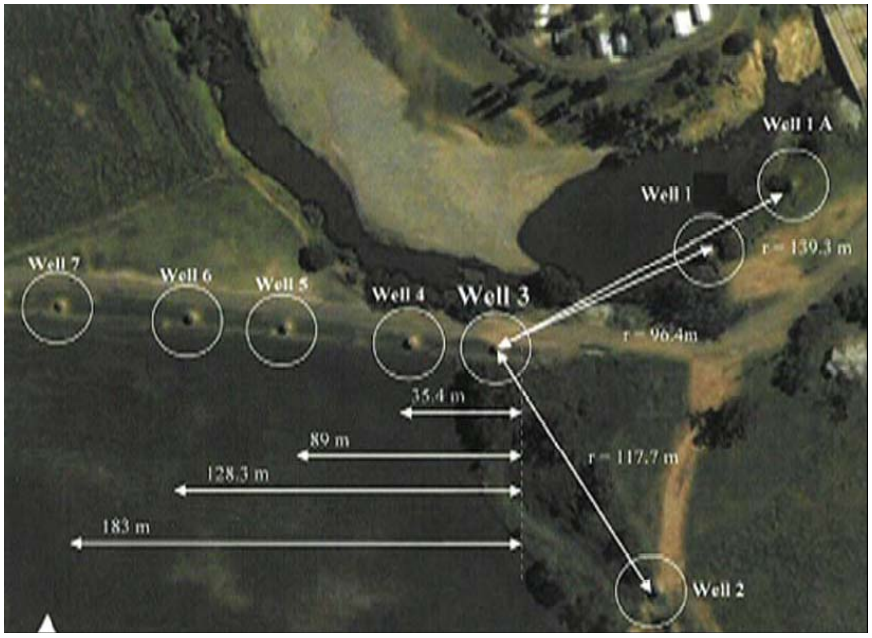

Figure 2: ***Location of Drift Wells – Paradise Bridge is in the top right hand corner***

2.2 Water Delivery

Council now had to decide how it was going to transfer the water from the wellfield to the Water Treatment Plant. Several transport/transfer options were investigated. This included the size of components such as pump/motor assemblies, transfer pipeline (including pipeline routes) and balancing storage. At the conclusion of investigation it was decided each well would be rehabilitated and fitted with variable speed driven submersible pumping equipment, an above ground 125kL Balance Tank (adjacent to the Wellfield) and a 90kW centrifugal pumping station (variable speed controlled) delivering to the water treatment plant. The capital cost of the project ($2.25 million) was funded jointly by Council and the NSW State Government Emergency Drought Relief Fund.

Figure 3: ***Transfer Pumping Station switchboard fitted with touch screen***

2.3 Refurbishment of the "Old" Wells

Once funding and approval were in place, construction began in the autumn of 2007. TRC staff providing engineering, mechanical, electrical and building work on the project. All old pipe work, pumps and landings had to be safely removed from each of the 6 wells and new landings, electrics, telemetry, pumping machinery and pipework fitted. A new transfer pumping station and balance tank was built. Contractors constructed the pipeline to the water treatment plant. The project was completed on time and under budget. It had taken a little less than twelve months from conception to commissioning for the supplementary supply to be online again.

Figure 4: ***New Pump Station and Balance Tank***

Figure 5: ***Wells 3, 4, 5 and 6 with new pipework and access***

2.4 Pumping Well Water

Pumping tests started to the water plant in November 2007. The wells were controlled with Council's SCADA system with each well having level sensor, flow meter and variable speed drives on pumps giving excellent control. This sure beats what had to happen when last running in 1979, with an operator having to constantly check water level in every well and manually adjust pump speed. The wells were pumped at rates recommended and it was found Well 6 could not sustain flow indicated in testing. This well was taken offline and its pump put into Well 1A. For wells online at the time the flow was 105 L/sec. The wells were pumped for a few days and water samples taken for comprehensive laboratory tests when good results were received the wells were put into service. It was hoped to pump the wells continuously for 6 months to get information for a groundwater model.

Figure 6: ***Well water pumping into raw water tank at Water Treatment Plant***

2.5 Treating Well Water

Typical Raw Water Characteristics	Peel	Dungowan	Combined Wells
Turbidity	7	3	2
Colour (true)	10	20	0
Hardness (mg/L)	180	30	210
pH	7.8	7.2	7.05

There were some concerns, that as the treatment facilities were designed primarily for surface water treatment, there may be problems treating the ground water. Council employees who used to work with the wells recalled the water used to discolour when Dungowan and the wells were mixed and there were worries about the hardness of the water. While pumping trials were carried out, jar testing was performed on the raw well water. An Alum dose rate of around 15mg/L was found to be optimal. Dungowan water was also mixed with well water - no adverse reaction and the hardness was only about 10% higher than Peel River water. Well water at this time could only supply about 9ML per day (water consumption at time was 20-30ML) so another water source would have to be used with it. It was decided to mix it with Dungowan in the Balance Tank and treat it as one water. Alum was worked out on total inflow (L/sec) with the dose rate of Dungowan used which was 20mg/l. The water treated well but there were problems with the control of Dungowan flow and its large float valve. It was then decided to treat the wells on their own through the Peel side. The dose rate used was about 30mg/l and the water treated well.

2.6 Irrigator Issues

While the pumping trials were proceeding, there were storm clouds brewing and it wasn't just the ones that had started to refill the dams. The irrigators in the valley were concerned that now the drought emergency was over, the wells should not be used as it may have a detrimental effect on their licences and also reduce water yields in the aquifer.

A meeting was called by Council to inform the community (particularly the neighbouring irrigators) of Council's intention to explore the opportunity of more efficient water extraction for the benefit of the whole valley. Following the meeting, Council applied to the Department of Water & Energy (DWE) for a temporary extraction licence to prove the viability of the wellfield as an alternative water access point.

Figure 7: ***Well 1A with Balance Tank in background during flood, November 2008***

2.7 Water Licence

TRC applied for and received a temporary licence to pump for nine months from July 2008 to confirm the sustainable level of groundwater extraction from the bore field and predict the impacts on river flow and groundwater levels throughout the aquifer.

Sinclair Knight Merz were commissioned to build a computer Hydrological Model. The test pumping and the Model building and calibration are ongoing into 2009. The objective is to confirm the extraction yield that can be sustained without detrimentally impacting existing licence holders.

Figure 8: ***Well 1 - very close proximity to Peel River***

2.8 Plant trials

The extraction testing program, commencing in July 2008, was to run the wells continuously for periods of one month. This required the wells running on their own to the plant at night. Some problems were found at such a low flow through the plant - total

9ML/day (designed for a minimum of 15ML) but adjustments were made that sorted out problems.
During this time it was noticed the well water had very little colour and turbidity making the treatment look strange and not floc properly.

During this testing, Well 1A was bought online increasing the total wellfield extraction to 115 L/sec or 10 ML/day. While extraction is occurring detailed measuring of the surrounding aquifer is undertaken (including purpose built observation bores with continuous data logging monitoring).

2.9 Raw Water Strategy

Most communities have only one source of water so it is now a luxury to have 3 with a dam pipeline, river system and underground water Tamworth has all bases covered. In general terms, Dungowan is used up to 21ML/day as it has least energy costs and also low chemical use. When consumption is between 20 and 30ML/day, Dungowan and the wells are used and above 30ML/day Peel and Dungowan are used with the wells switched off.

But when problems arise with Dungowan often getting blue green algae and Peel River having no water, the wells have been activated. In these situations, while not quite emergencies, the wells have proved very handy.

3.0 CONCLUSIONS

Writing now, in Jan 2009, both Chaffey and Dungowan Dams are full so the Paradise Wells role as an emergency water supply has changed. These circumstances now mean testing will continue on the effect they have on groundwater in the Peel valley. Results will determine if they can become a permanent part of water supply or only be used in emergencies.

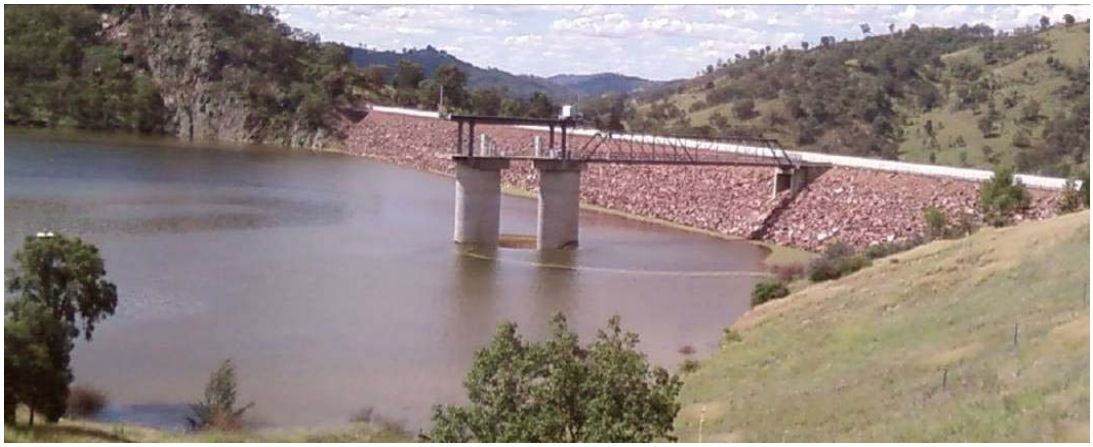

Figure 10: ***Chaffey Dam, Tamworth, spilling In November 2008.***

Talking to older residents of Tamworth they can remember the media saying "No more water restrictions, the Dungowan Pipeline has reached Tamworth". This was also repeated when Chaffey Dam was built "We have drought proofed the city, no more restrictions ever". These claims seem a bit silly now but no one back then would have heard of climate change. This shows us circumstances can always change so the more options available the better. This is why we need the upgrade of Chaffey to 100 GL and

the wells to be used as a permanent part of the water supply, to give Tamworth a little more security. Who knows what changes we will experience over the next 30 years before the next "emergency".