TOOWOOMBA WASTEWATER INFRASTRUCTURE PROJECT (TWIP)

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ABSTRACT

The Toowoomba Regional Council (TRC) was formed in 2008 with the amalgamation of Toowoomba City Council and 7 surrounding shires. TRC operates with an annual budget approaching $550m and an asset base totalling $3.2b. Approximately 1,600 full time staff are employed covering a geographical area of nearly 13,000 km^2. Potable water is supplied to over 135,000 people, with 44,000 sewer connections including 1,600 trade waste generators producing 7,400 ML of waste water per year.

In March 2009 TRC considered a number of recommendations under the "Toowoomba Regional Sewage Strategy (GHD)" to upgrade or replace aging Wastewater Treatment Plants across the region. The focus of the report was to build a new Water Reclamation Facility (WRF) to accommodate the wastewater treatment requirements in the southern regions. This facility was to be located at Wyreema and was known as the Southern Regional WRF. Phase two of the scheme was to pump wastewater from central and northern regions to Toowoomba's primary WRF Wetalla. This phase included construction of a sludge thickener capable of much better supernatant recovery and directing thickened sludge from the Mt Kynoch Water Treatment Plant to Wetalla via a gravity sewer. These projects were grouped together into a single contract and was known as the Toowoomba Wastewater Infrastructure Projects (TWIP)

1.0 DISCUSSION

1.1 Southern Regional WRF

Planning and design commenced on the Southern WRF (SWRF) to build a 3.4 ML/d Modified UCT BNR WRF, based on a scaled version of the existing Wetalla WRF. The plant would receive waste water from Westbrook and surrounding areas from a newly constructed 2,950 ET pump station via a 300mm pipeline approximately 10km in length. The construction of the SRWRF would allow TRC to decommission the existing Westbrook STP. The existing plant was a temporary plant built of poly tanks and rotating disc secondary treatment and was failing to meet licence discharge requirements. Westbrook STP had no formal discharge point in the form of a permanent watercourse. Final effluent from the existing Westbrook STP was pumped into a lagoon and used for irrigation on surrounding cropping land. At the end of the planning stage the SRWRF was estimated to cost $25M to construct.

1.2 End of the SWRF

The TRC project team were working on the planning and design phase of two major projects in parallel, both the SRWRF and the pumps and pipes portions of the TWIP. Coincidently, as the planning and design stage was 80% complete, Toowoomba received one of the largest rain events on record causing the January 2011 flood. The flood event caused significant damage to the Oakey STP that previously had not been considered as part of the TWIP. The Project team weighed options of extending the TWIP to receive flows from Oakey for discharge at Wetalla.

This option was accepted, given the existing plant was struggling to maintain licence requirements similar to Westbrook, with the added element of being built on a flood plain. The proposed cost to include Oakey sewage in the TWIP was estimated $7.5M, considerably more cost effective then purchasing land in a non - flood prone area and constructing a new WRF suitable for 9,000 EP. The decision had the operational benefit of disposing effluent through the Wetalla WRF licence and 3rd party effluent users.

The concept of extending the TWIP to include Oakey soon turned attention to the SRWRF, due to critical review of the 2009 Regional Sewerage Strategy Study. The strategy study was found to have underestimated costs for treatment, and over estimated costs for pumps and pipes, which had significant impact on the report recommendations.

The concept of pumping wastewater to Wetalla compared to building the SRWRF was therefore investigated. The project team soon had an estimated cost for the concept and found the capital expense to pump wastewater from Westbrook to Wetalla to be $7.5M, considerably cheaper than constructing a WRF with a capital expense of $25M. The decision to cease work on the SRWRF and incorporate all works into the TWIP was accepted by Council. The project team now had a clear decision to focus on and work progressed.

1.3 TWIP

The scope to construct TRC's TWIP changed considerably with the deletion of the SRWRF. The scope now included 7 individual SPS and rising main systems schemes. The schemes linked together to form the TWIP.

1.4 Highfields Sewage Transfer Scheme

A new 3,000ET (Stage 1) pump station was built at the existing Highfields STP site. The discharge mains consist of a dual DN 300mm and DN 375 mm pipeline approximately 11.5 km in length. The pipelines are valved to use the mains individually or in combination to deal with the expected high population growth levels in Highfields. The pump station is fitted with 105 kW pumps discharging at 150 L/s. The STP's bioreactor was converted into a 2 ML emergency storage tank suitable for 4 hours ADWF at Stage 2 development (approx. 6,000ET). The Highfields SPS includes Magnesium Hydroxide dosing for septicity control in the 11km rising main.

1.5 Glenvale Sewage Pumping Scheme

A new 6,600 ET pump station was built on an existing pumping site in Glenvale. The pump station has a static lift of 90 m with a DN 450mm pipeline 2.9 km in length. The pump station is fitted with 290 kW pumps discharging 210 L/s

1.6 Westbrook Sewage Transfer Scheme

A new 2,950 ET pump station was built on a Greenfield site. The pump station has a static lift of 35m with a DN375 pipeline approximately 14.5km in length. The pump station is fitted with 215kW pumps discharging 160 L/s.

The Westbrook SPS includes Magnesium Hydroxide dosing for septicity control in the 14.5 km rising main.

1.7 Western Trunk Transfer Scheme

Construction of 4 new sewage pump stations including;

- Oakey 9,000 EP (215 kw pumps duty/standby at 110 L/s)
- Kingsthorpe 11,000 EP (215 kw pumps duty/standby at 140 L/s)
- Gowrie Junction 13,800 EP (215 kw pumps duty/standby at 165 L/s)
- Kooringa Valley 24,500 EP (290 kw pumps duty/standby at 260 L/s or duty/duty at 460 L/s – required when Westbrook and Gowrie Junction discharge to Kooringa Valley at the same time)

The Western Trunk Transfer Scheme consists of varying rising mains from DN 300 to DN 450 mm pipe and gravity mains up to DN 750 mm. Magnesium Hydroxide dosing facilities are provided at the Oakey and Kingsthorpe SPS's for septicity control in combined 30 km of rising main between Oakey and Wetalla.

1.8 Mt Kynoch WTP Sludge Thickener

An new DN 11m x 5m deep sludge thickener was constructed, utilizing the existing wash water settling tank into a flow balancing tank, and installation of a DN200 HDPE wash water rising main from the balance tank to the thickener and a DN200 HDPE supernatant return gravity main to the existing settling lagoon supernatant pump stations. Mechanical and electrical upgrades included fitting variable speed drives for wash water feed to the thickener and supernatant return to the plant inlet works.

Variable speed control allows several operating modes to be used, including supernatant return as a fixed flow rate, or as a fixed percentage of the incoming raw water.

The new sludge thickener has made the existing sludge lagoons redundant, however they are available in emergency situations if needed. Considerable benefits have been achieved now the sludge thickener is operational. Operators no longer have to wait for backwash water to settle and return via the old supernatant system. During dirty water events, filter backwashes can now be activated as soon as the previous filter has completed a backwash cycle.

2.0 CONCLUSION

Construction of the TWIP commenced in September 2011, with practical completion granted in August 2013. All sites are now pumping wastewater to Wetalla where final effluent is discharged as "class C" effluent. Approximately 9 ML/day of final effluent from Wetalla is processed through an AWTP and sold to consumers as "class A" effluent. This effluent is used for power generation and coal mine wash water. Water Operations staff are working on fine tuning the Magnesium Hydroxide dosing sites for optimal efficiency while maintaining adequate odour retention. Overall the project has been considered an operational and financial success.

3.0 ACKNOWLEDGEMENTS

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