DEVELOPMENT AND OPERATION OF AN EFFLUENT IRRIGATED PLANTATION

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ABSTRACT

Wide Bay Water Corporation (WBWC) has come up with a winning solution for the dispersal of their wastewater by recycling it onto a timber plantation. Currently 300,000 trees have been planted (approximately 220 hectares) with expansion to 1 million trees by 2010. A centrally controlled automated drip irrigation system using Class B effluent water from Hervey Bay's two sewage treatment plants irrigates the timber plantations.

1.0 BACKGROUND

WBWC is the first local government corporation in Queensland providing water and wastewater services to Hervey Bay. They are recognised nationally and internationally for their work in land based water reuse facilities.

Hervey Bay is one of the top ten fastest growing areas in Australia and in the past 40 years has almost doubled every decade in population to its current size of 56,000.

As with a lot of local councils in Australia the Environmental Protection Agency (EPA) is toughening its stance on effluent discharge direct to creeks and rivers especially close to the ocean. Hervey Bay was facing the same dilemma and the option was to increase the level of treatment to discharge or reuse. It is worth noting Hervey Bay is famous for its pristine environment especially the bay, Fraser Island and whale breading areas all of which attracts a lot of tourists each year and makes the region very unique.

2.0 SOLUTION

The land based reuse option was chosen with the challenge to meet EPA regulations, locate suitable area, deal with huge population growth and an outcome acceptable to the community. The first step was to undertake a full EIS (Environmental Impact Assessment) of the surrounding farms in the area especially areas close to existing Sewage treatment plants. This examined a range of issues including soil and landscape assessment, effluent characterisation and a water and nutrient balance. The water balance model was critical to determine the amount of land required, level of water quality required for each crop, and impact on climatic conditions such as evaporation and rainfall.

Once areas were designated the reuse options were determined via a number of trials including sugar cane, pasture, eucalypt plantation and tea trees. These trials showed the impact of reuse water on the soils and environment and what are the yield implications.

The effluent is reused on private turf farms, private cane farms, timber plantations, airport irrigation system, golf course and local industrial estate for irrigation purposes.

The existing two sewage treatment plants, Pulgul Wastewater Treatment Plant and Eli Creek Wastewater Treatment both discharge Class B effluent.

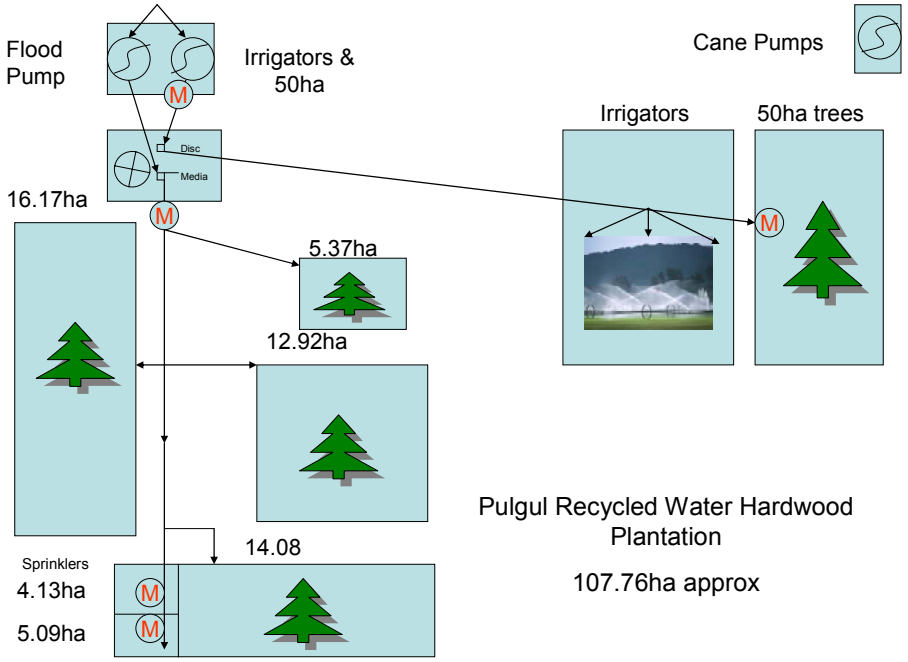

Figure 1: ***Schematic of the Pulgul Irrigation Area***

Under Queensland EPA regulations the class of water quality requires verification through monitoring of final water quality using the levels of microbiological indicators.

2.1 Timber Plantations

'Innovation is the cornerstone of our business,' said Mr Waldron WBWC CEO, *'and we chose the eucalypt plantations because they were far and away the most innovative solution. The trees would be watered when we had surplus to the requirements of the cane and turf farms. And the trees are drought hardy natives so they wouldn't suffer if they were not watered for stretches at a time.'*

Figure 2: ***Aerial view of Pulgul WWTP and tree plantations***

He said the benefits of the program, which have won a Federal Government for Innovation in Irrigation, were both financial and environmental.

The trees which have been planted include grey gum, grey box, forest red gum, grey ironbark, Gympie messmate and spotted gum.

2.2 Irrigation System

Netafim has been involved in all stages of the development spanning over 10 years. Initial work was done in the trials to determine dripper flow rates and spacings, run lengths, dripper types and filtration requirements.

The latest project in late 2006 was on the new farm called Bunya and an expansion on Pulgul totalling 220 hectares. These projects used Netafim Uniram 17, 20 & 25mm 2.3l/hr @ 0.9m spacing (4m row spacing between trees) with an application rate of 0.62mm/hr.

The 2.3l/hr Uniram dripperline was chosen as the filtration area, dripper passage and basin area of the dripper has increased our capability to handle dirty water far beyond previous Netafim drippers and well beyond other similar products in the market. Effluent water quality is rarely constant and product selection to eliminate the potential threat of clogging is essential.

Denis Herron, WBWC Principal Executive Officer stated *'the reason for using drip was the sites had poor drainage, water high in nutrients and required a low application rate. However most importantly sustainable optimisation and system efficiency is the key. We needed to have flexibility and management of the system at all times- no other form of irrigation could give us that. This was highlighted in our trials when we compared drip to other forms of irrigation such as irrigation machines.'*

The design done by Netafim Design office had some challenges with difficult block shapes, run lengths and trying to reduce flush valves required and poorly draining soil types.

Figure 3: ***Bunya Farm Pumps and Distribution Pipes***

Dirk Murrell, Netafim Queensland State Manager said, *'the design of this system was key to its success, we had to deal some challenges especially dealing with the water quality. Our approach was to listen to what the client required especially as the system had to*

have flexibility of applying effluent in varying capacities.'
Along with dripperline selection, filtration was also critical to the project as Class B effluent was used for the drip irrigation. An Arkal Galaxy 12 (130 micron) automatic disc filtration system was chosen on Bunya Farm designed for a 380m³/hr flow rate.

Figure 4: ***Bunya Farm Filters***

The Galaxy is particularly cost effective on larger flow rates and has a regulated volume for blackflush allowing for short and environmentally friendly use of flush water to clean the filter element.

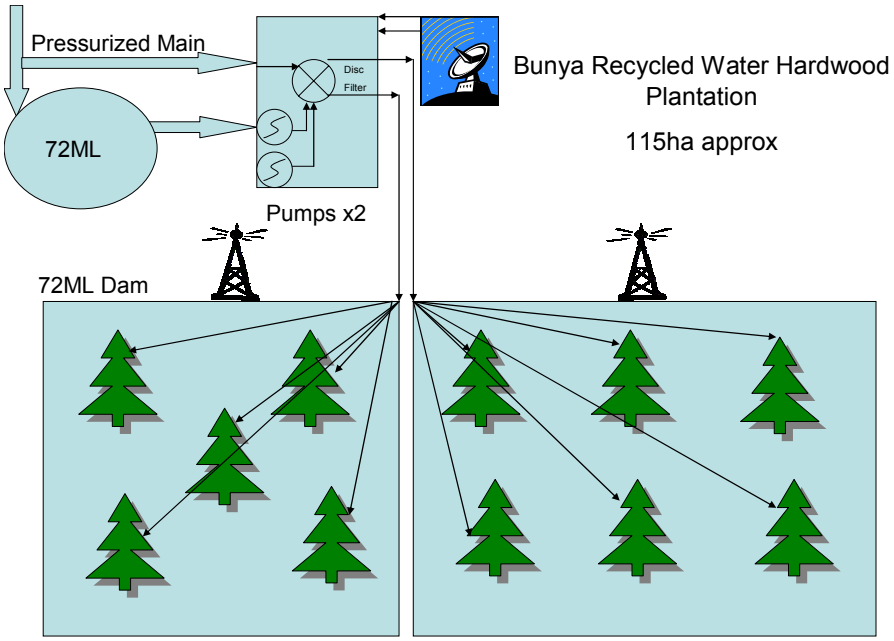

Figure 6: ***Bunya Farm irrigation layout Schematic***

2.3 Automation and Monitoring

Careful consideration was given to choosing the type of Automation system.

Some of the challenges were that the temporary site office had no mains power, the system had to be flexible enough to cope with future expansion, not only in the number of control valves and sensors, but geographically and topographically. It had to be simple enough to operate on a day to day basis for the system operators, yet include all the powerful logging, alarm reporting, accumulation and management tools required by upper management. The field units had to operate in full capacity in the unlikely event that the central communication system was interrupted.

The Netafim Irrinet Central Control system was chosen & installed. It consisted of a Central Base unit which is interfaced to a PC for ease of programming, viewing system status, water usage, graphing and SMS alarming, as well as graphical mapping and additional management programs. Currently the base unit manages the RF communications to three, UHF radio linked field units (Irrinet XL's) which are installed at each of the main pumping sites. Additional sensors were installed to monitor water flow, pH and dam levels. Remote infield valve control and water meter monitoring was automated by Piccolo XR's. The Piccolo XR's utilize a low power licensed UHF radio, latching output technology and store & forward (repeater) communications. This combination allows low cost, yet simple and reliable communication to the remote fields.

A Netafim Irriwise wireless monitoring system was also installed at the Bunya site to record local environmental factors, such as a weather station to monitor temperature, humidity, solar radiation, wind speed, rainfall and ET.

NetaSense soil moisture probes were installed at keys sites to monitor the effects of irrigation, localized rainfall, drainage and plant uptake in the soil profile.

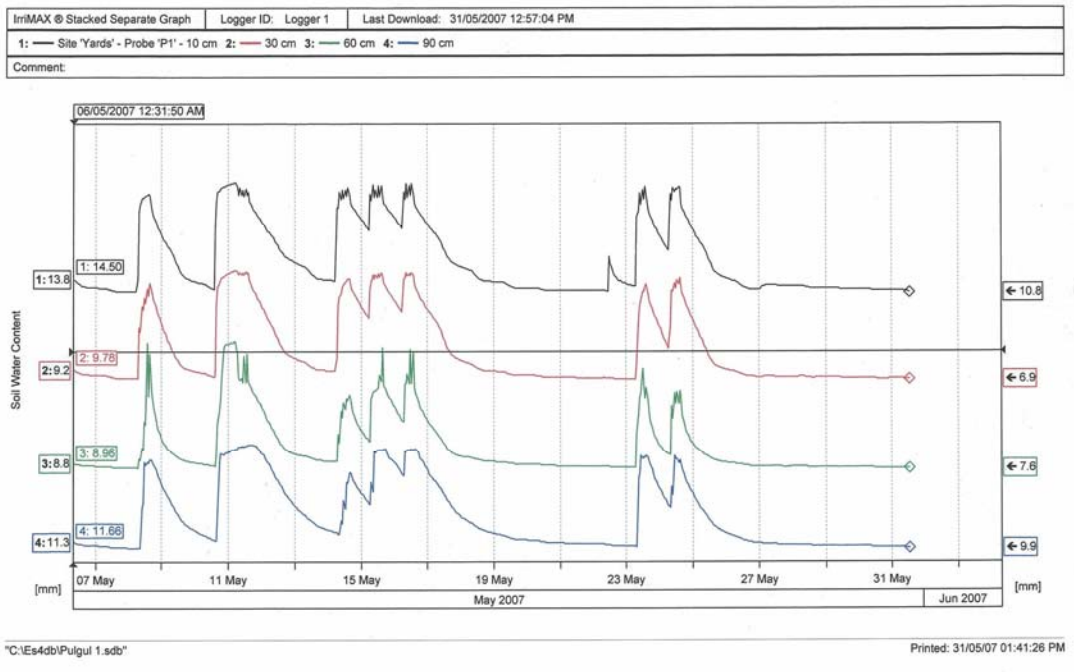

Figure 7: ***NetaSense soil moisture probe data***

Low cost water meters were also installed on the dripper lines to report irrigation timing, duration and quantity. The Irriwise system also acts as a continuous shelf auditing

system, logging, graphing and issuing alarms when set levels are breached.

3.0 FURTHER INFORMATION

For more information please contact Netafim at netinfo@netafim.com.au
or,
WBWC www.widebaywater.qld.gov.au
or,
Advanced Pumping and Irrigation (principle contractor) www.advpump.com.au