

## New faces



**Shane Pope, Graduate Engineer, Auckland**

Shane completed a BE (First Class Honours), majoring in chemical and process engineering, at the University of Canterbury last year. He enjoys all kinds of sports, including soccer, volleyball, rock climbing and cycling and is a member of a 1940s-style lindyhop dance troupe.



**Rachel Landon, Water/Environmental Engineer, Auckland**

Rachel has recently returned to New Zealand after two years in the UK. She has four years experience in hydraulic modelling projects, in particular needs and options assessments of water and wastewater networks, working in both operational and consultancy roles.



**Brian Johnston, Graduate Environmental Engineer, Auckland**

Brian completed a BE/BSc at the University of Auckland focussing on environmental engineering and ecological systems. He spent summer holidays travelling, tramping, and sampling local beer and wine in the South Island before joining the Freeflow team.



**Rima Kaio, Graduate Engineer, Wellington**

Of Ngapuhi/Ngati Whatua descent, Rima graduated from Massey University with a BTech in Environmental Engineering. After completing an Outward Bound course, Rima worked at Tauranga District Council, before moving to Wellington to join Beca. In his spare time, Rima enjoys Toastmasters and accompanying his wife Catriona to plays, movies and restaurants.



**Iain Smith, Environmental/Civil Engineer, Wellington**

Iain graduated from Canterbury in 1998 with a BE (Environmental). He has spent the last two years in the UK working off and on for the Babcie Group and travelling through Europe and the Middle East. He enjoys travelling, playing cricket, footy snowboarding and consuming European beers in his spare time!

## New places



**Sarah Dye, Graduate Engineer, Wellington**

After a year in the Auckland office, Sarah has relocated to the capital to continue with hydraulic modelling work and get into some detailed drainage design.



**Alan Campbell, Melbourne**

Also a former resident of the City of Sails, Alan relocated to the land of Oz late last year. He's now working on a number of industrial and municipal wastewater projects.



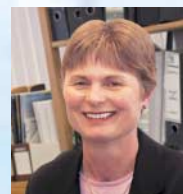
**Andrew Corbett, Graduate Engineer, Christchurch**

Andrew grew up and attended University in Auckland and after spending the summer overseas returned to Christchurch to start his career as a Civil Engineer with Beca. He reports having (too) many recreational interests from fishing to surfing and snowboarding and he recently attempted to play golf.



**Janet Petersen, Senior Environmental Engineer, Auckland**

A recent appointee to CASANZ (the Clean Air Society of Australia and New Zealand) committee, Janet has over twelve years experience in environmental and resource management, including air quality, risk assessment and GIS. She joined us from NIWA and also brings practical air discharge consent processing experience from a secondment to Environment Canterbury.



**Prue Harwood, Senior Environmental Engineer, Dunedin**

Prue joined us from Otago Regional Council, where she was responsible for processing, compliance monitoring and enforcement of air discharge applications. She also advised on the air plan and managed the regional ambient air monitoring programme. Prue's process engineering background gives her a valuable understanding of industry needs.

## Contact us

*CH2M Beca Ltd is a joint venture company consisting of CH2M HILL Inc and Beca Carter Hollings & Ferner Ltd. Its purpose is to perform water, waste, stormwater and environmental work in New Zealand. Beca International Consultants Ltd (Beca) performs similar work in conjunction with CH2M HILL and a number of other co-consultants and partnering organisations.*

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09-20034000114010

# Watermark



## Editorial

While the actual events are now fading into memory as new projects come to the fore, it is still important to acknowledge our most significant accomplishments since the last issue of

Watermark. The opening of Manukau Wastewater Treatment Plant and subsequent industry recognition of the associated foreshore restoration through the IPENZ Arthur Mead Environmental Award were both cause for celebration.

On 4th April a substantial crowd gathered at the outfall pumpstation on the shores of Puketutu Island to commemorate the opening of the new plant and the return of the harbour. For Beca and CH2M Hill the event marked – almost to the day – a decade long involvement in both 'Wastewater 2000' (the investigation, predesign and consenting phase) and 'Project Manukau' (the design, construction and restoration phase).

The project reflects Watercare's massive commitment and investment on behalf of the Auckland region. It is also a great testament to CH2M Beca's technical leadership as Watercare's advisors and designers and the contribution of our subconsultant and contractor partners.

The area between Puketutu Island, Mangere Lagoon and the Otautua Stonefields has gone through an interesting cycle. The 1960s' conversion of the 500 hectares of tidal seabed surrounding the eastern half of Puketutu Island into oxidation ponds was a major achievement in itself. At



that time, the environmental benefits of moving Auckland's main raw sewage discharge from the Waitemata Harbour (at Orakei Point where Kelly Tarltons is now) to a modern facility at Mangere were as dramatic and significant as the upgrade of the plant and the removal of the ponds after almost 40 years of service.

Today, the filtration and disinfection power of the southern hemisphere's largest UV plant ensures the twice-daily tidal discharge of effluent is of tertiary quality and has allowed the harbour around Puketutu Island and the Mangere Lagoon to be restored to its former status. New shell beaches protected by rocky headlands (see above) provide a valuable community resource and a superb natural habitat.

The pace of the rehabilitation has surprised everyone – none more so than the planners, engineers and managers involved in this monumental, 10 year long project. We join with many others in Manukau City and the Auckland region in offering congratulations to Watercare on achieving its vision and securing a wastewater solution that should serve the region well for the future.

Garry Macdonald  
Director of Environmental Engineering

## Award fever

As well as winning the IPENZ Arthur Mead Environmental Award for the Manukau foreshore restoration, CH2MBeca was pleased to see two of its other projects receive industry honours.

Seaview Wastewater Treatment Plant project was one of four Beca group winners in this year's ACENZ Awards. It received an Award of Merit for its successful integration of

new secondary treatment facilities with existing sewage network elements to provide a modern wastewater treatment system for the Hutt Valley (left).

And congratulations to our design-build partner Brian Perry, who won the Supreme Award in the \$1-\$5 million small project category at this year's Caltex Construction Awards for Waihi Wastewater Treatment Plant (right).



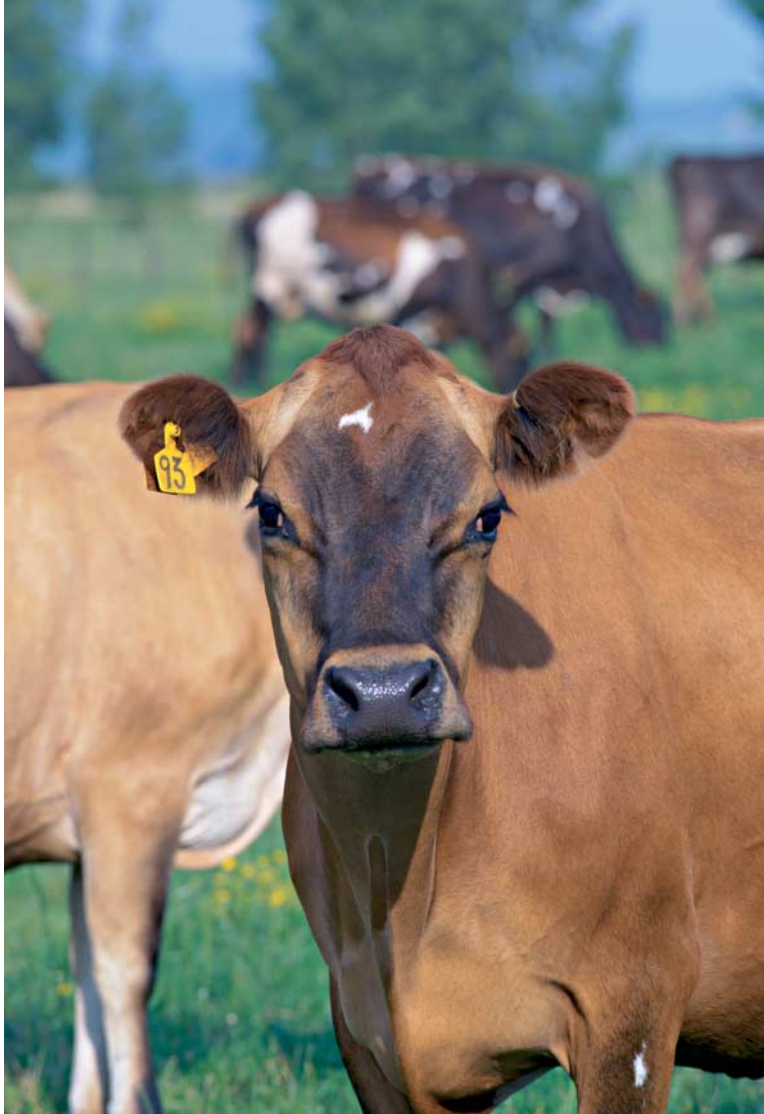
## Nailing the N issue

Environmentally friendly waste disposal is an increasingly important issue for many New Zealand companies. At Hautapu (a New Zealand Milk Products plant just out of Cambridge manufacturing cheeses and other milk protein products for export) CH2M Beca helped NZMP to reduce nitrogen levels in factory wastewater so it could be used to irrigate the company's paddocks.

The project combined resources from NZMP, Fonterra Research Centre (FRC), CH2M Beca and Beca's specialist food and beverage engineering subsidiary IFBS. "FRC trials showed that biological treatment using a sequential batch reactor (SBR) could remove nitrogen and other byproducts from the plant's wastewater to allow its safe re-use on pasture," says Senior Process Engineer Ashish Deshpande. "However, nitrogen removal was only in the range of 50 to 60% - not enough to meet objectives. We reviewed the process design using GPS-X dynamic simulation software, which revealed that the SBR should be capable of removing more than 80% of the nitrogen."

CH2M Beca deduced that the performance gap might be due to a micro-nutrient deficiency in the wastewater. Laboratory tests proved this to be true and addition of micro-nutrients achieved the desired results, with the system now achieving 95% nitrogen removal. "This emphasises the value of using computer modelling for design stage optimisation. As a result, the team delivered a cost-effective and efficient solution for Hautapu's specific wastewater treatment needs."

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## Safe sipping

While most of us take it for granted that tap water poses no risk to our health, securing a safe drinking water supply is still an issue for some small and remote New Zealand communities. CH2M Beca has been helping the Ministry of Health (MoH) address this problem by evaluating a pilot project to deliver safe drinking water in the Hokianga district.

With additional support from funds such as the ASB Trust, the MoH financed the installation of treatment systems for two communities and 33 marae. CH2M Beca was then contracted by MoH to evaluate the project and to help inform the government's decision to develop a sanitary works subsidy scheme (SWSS). While the primary focus of the SWSS is wastewater treatment, many of the lessons learned from the water treatment pilot are about how to appropriately fund, resource and implement schemes to aid small, rural, disadvantaged communities and are relevant to various infrastructure services.

The review covered all aspects of project delivery including the consultation approach, contracting and construction methods, the suitability of technology used (both in terms

of its ability to produce potable water and its ease of repair given that responsibility for this task would largely fall to local hands due to isolation from main centres), cost and affordability, resources available and systems in place for future operation and maintenance. ESR (a subconsultant to CH2M Beca) provided input into the evaluation in terms of public health improvements.

Paul Prendergast from the Ministry believes the CH2M Beca team brought the range of skills and disciplines to the evaluation necessary for the successful completion of the project. Paul says, "From our point of view it has teased out the lessons learned from the pilot and these will be invaluable for the future success of the Sanitary Works Subsidy Scheme". The project was recently awarded second place in the inaugural national Health Innovation Awards, a joint ACC/Ministry of Health initiative celebrating the outstanding efforts dedicated health providers make to New Zealanders' treatment, care and recovery.

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## Transmission Gully goes greener

This year Transit is continuing planting in land retirement areas\* containing a proposed alternative route to the coastal stretch of SH1 north of Wellington. Beca has contributed to the Transmission Gully project in varying roles since 1995. In 2001 Beca completed a report for Transit on general planting and management regimes for the retirement areas. This report, produced in collaboration with the Department of Conservation, Wellington Regional Council and Porirua City Council, was followed by more specific plans for five of the 11 retirement areas.

Transit Project Manager Gavin Gregg says the work Beca is carrying out is very important. "It will help avoid some of the adverse environmental effects associated with large earthworks. These potential effects could include soil erosion and sediment run-off, which may damage in-stream habitats. The planting is also enhancing the environment along the route and is a condition of the designation."

In 2001, part of an area behind the Pauatahanui Golf Course was planted with 5,000 plants. Transit planted a further 40,000 plants in spring 2002 and Transfund has

\* A retirement area is a zone 'retired' from active grazing (or other uses) so that vegetation can re-grow and help mitigate the effects of sediment runoff during construction.

approved funding of \$243,000 for planting in 2003. This year's programme covers 44,300 m<sup>2</sup> (the largest area to date) and will complete planting of the first five areas.

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Above: As a result of the planting programme, flax is flourishing in retirement area 7. Nursery-raised using regionally sourced seed, the plants being used include over 40 different species - from relatively common Karamu and Manuka to lesser-known names such as Akiraho and Tarata.

## Modelling impact of rain on a 'plane'



Predicting peaks in sewage flows is important if you want related infrastructure to cope. CH2M Beca's modelling skill recently helped Timaru District Council (TDC) accurately estimate sewage flows to assist with the design of a new tunnelled gravity trunk sewer, which will bypass and replace the larger of Timaru's ageing pump stations.

The common approach to predicting sewage volumes is to make a 'dry weather' estimate based on population and simply multiply it by a factor to forecast wet weather flows. "This can be a useful rule of thumb for sizing wastewater treatment plants," says CH2M Beca's Sarah Dye "but it is not ideal for designing sewer systems (especially in small catchments) because the amount of stormwater entering the system depends on local rainfall, the age, condition and type of pipes, the permeability of

the soil and so on." To complicate the matter, TDC's proposed gravity driven system will be on a relatively flat grade, resulting in low sewage speeds. This means that accurate low flow predictions are also important to understand possible maintenance implications.

CH2M Beca developed a model of Timaru's main trunk network using data from an extensive flow-monitoring programme. "We commissioned sub-consultants to install four temporary rain gauges and 33 temporary flow gauges and monitored flows constantly for two months," continues Sarah. "During this time, there were three significant storms, which enabled us to determine the system's response to rainfall at each gauge site." Using unit hydrographs, CH2M Beca developed a method of predicting wet weather sewer flows that separately identified and allowed for the fast response of direct rain inflows to the sewers and the slower response of infiltration through the soil.

The calibrated model has been used as a design tool to help refine pipe sizes for Timaru's main trunk sewer renewal project and it will also be used to assist design of pump station upgrades. In addition, TDC is using results from the hydrograph analysis in a district-wide inflow/infiltration study to determine where its network is most vulnerable to the effects of rainfall and target improvements to these areas.

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