

Hastings WwTW

challenging project overcomes technological, sociological, political and economic issues

by Derek Allen

In New Zealand, the Maori people have a strong influence over any decision affecting the land. Maori are deeply offended by discharge of human wastes, particularly to natural waters and also land. Historically, in Maori settlements, human wastes were disposed of to land and Kaumatua (tribal elders) decided how many years needed to pass before Papatuanuku (primal father of the Maori) had transformed the wastes into non-human form. For wastewater treatment engineers this presents a significant challenge.



Hastings WwTW - finished site

Courtesy of Veolia Water Solutions & Technologies, part of VWS (UK) Ltd and Hastings District Council

Challenge

From 1998 onwards, various treatment options for Hastings WwTW, New Zealand, were proposed, but were rejected during public consultation periods because they did not address the needs of the Tangata whenua (Maori residents).

In addition, the ground conditions on the original sewage treatment plant site presented a number of potential problems including settlement and liquefaction/cyclic softening, if earthquakes were to occur. More recently, factors such as environmental impact, carbon footprint and whole life costs of the process options have also entered the equation. So the challenge was to find appropriate technology that would satisfy all the requirements; technological, sociological, political and economic.

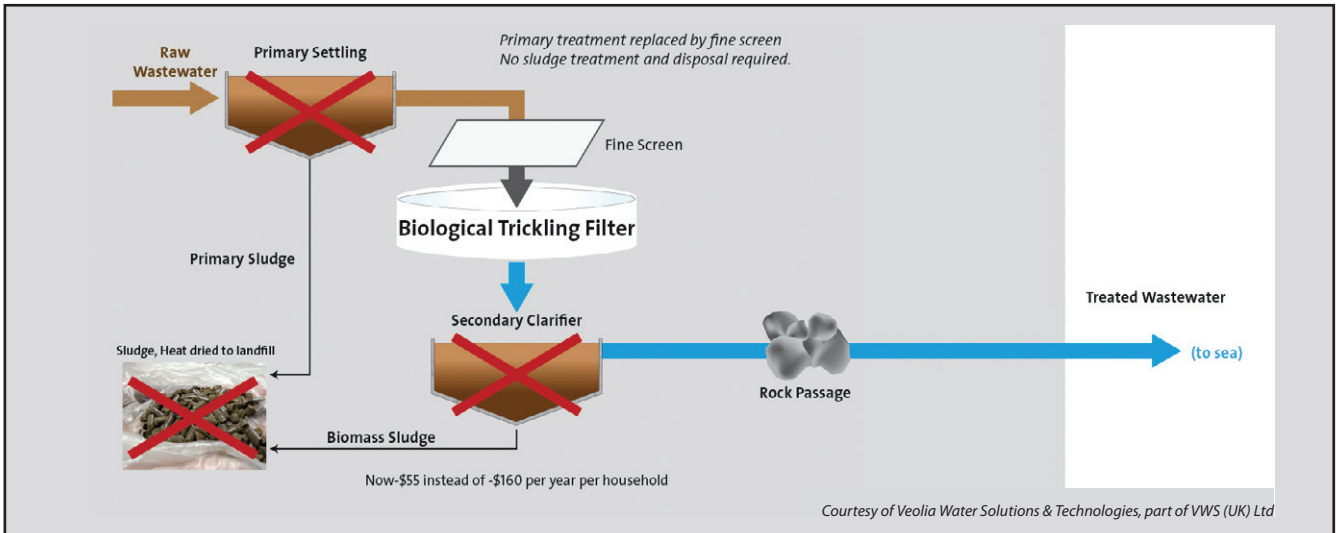
A solution was eventually found following long discussions between Hastings District Council, the Tangata whenua, consulting engineers

MWH New Zealand and specialist process plant contractors Veolia Water Solutions & Technologies (VWS). Following an "optioneering" exercise, the treatment scheme that was finally adopted is the Low Rate Biological Trickling Filter (BTF) process, which uses micro-organisms to convert solid and dissolved human and other organic wastes into carbon dioxide, water and excess cell (plant) biomass. While this is not new technology – dating back to the 1980s – it uses a low-loaded trickling filter to achieve high levels of BOD₅ removal and nitrification, with low production of waste sludge.

Process

The Veolia low-loaded trickling filter process provided a significant whole life cost saving against alternative treatment processes that were evaluated:

- No primary settlement, secondary clarifier or sludge treatment required – this saved on sludge treatment and



disposal, saving Hastings District Council money on their annual operating costs and significant savings on the whole life costs of the project.

- 10.5 million pieces of light-weight 'high efficiency' random polypropylene media were installed in the BTF's.
- Utilising light-weight media meant the filters could be designed at 10 metres deep, which reduced the number of the concrete tanks from 3 to 2, which saved on specialist support columns required for the civil structures and the associated issues of poor ground conditions.
- The plastic media is manufactured in New Zealand, thereby employing labour from the local population.

Carbon footprint issues

- The plastic media is manufactured from recycled raw materials and can be recycled at the end of its life-cycle. Polypropylene is virtually inert so lasts many years.
- The state of the art speed controlled power driven distributors can be recycled at the end of their life-cycle, and are designed to ensure that the filters always operate at their optimum performance.
- Trickling filters require minimal energy input.
- No sludge disposal costs, and no energy input for primary or secondary clarification.

Veolia worked closely with the end client. A joint study involving personnel from Veolia, Hastings District Council and MWH took place in Navarra, Spain, for over 6 months. An existing plant, using the same technology as proposed for the Hastings project, was monitored using a state of the art 'Scan' system. Readings from the



Hastings Biological Trickling Filter - Courtesy of Veolia Water Solutions & Technologies, part of VWS (UK) Ltd and Hastings District Council

plant covering all modes of operation were taken every 5 seconds, and the data was sent by modem to a team of process scientists for analysis. The study data was used to compile an extensive report that was studied by the partnership prior to a joint agreement on the selected process train.

The project meets the need to reduce the carbon footprint by providing a solution that does not require any primary treatment. The process therefore produces no primary sludge that would otherwise require treating and disposal, and uses less energy. The use of recycled materials in the media manufacture is another of the environmental benefits.

Conclusion

As an engineering project, the Low Rate BTF process from Veolia is an outstanding success in technological, sociological, political and economic terms.

- **Technologically:** it has used an appropriate process which meets the required effluent quality, is sustainable, and efficient with low energy consumption.
- **Sociologically:** it has overcome the cultural objections so important to the Maori population.
- **Politically:** it has utilised local resources in New Zealand.
- **Economically:** In purely economic terms, the originally consented scheme including primary treatment would have cost the community an extra NZ\$1m per year. The effluent quality is better too. To treat the sewage to the same quality using a traditional configuration would have cost an extra NZ\$2m per year.

The project was well managed from inception through to the consultation and consenting phases. The new cost-effective wastewater treatment system at Hastings is continuously monitored by HDC personnel who advise that the quality of the effluent produced in the biological trickling filters is excellent.

This was a very innovative project taking account of the social and cultural issues, at the same time considering the aspirations and wishes of the local Maori people, with particular regard over the discharge of human wastes to the sea. The project also meets the need to reduce the carbon footprint by providing a solution that uses less energy and recycled media among other environmental benefits. This process solution from Veolia Water Solutions & Technologies is now used as a 'blue print' for similar schemes within New Zealand.

The Editor & Publishers would like to thank Derek Allen, Biological Solutions Business Manager with Veolia Water Solutions & Technologies for preparing the above article for publication.

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