



RESEARCH FINDINGS 2011

Constructed wetlands can be used as biological filters.

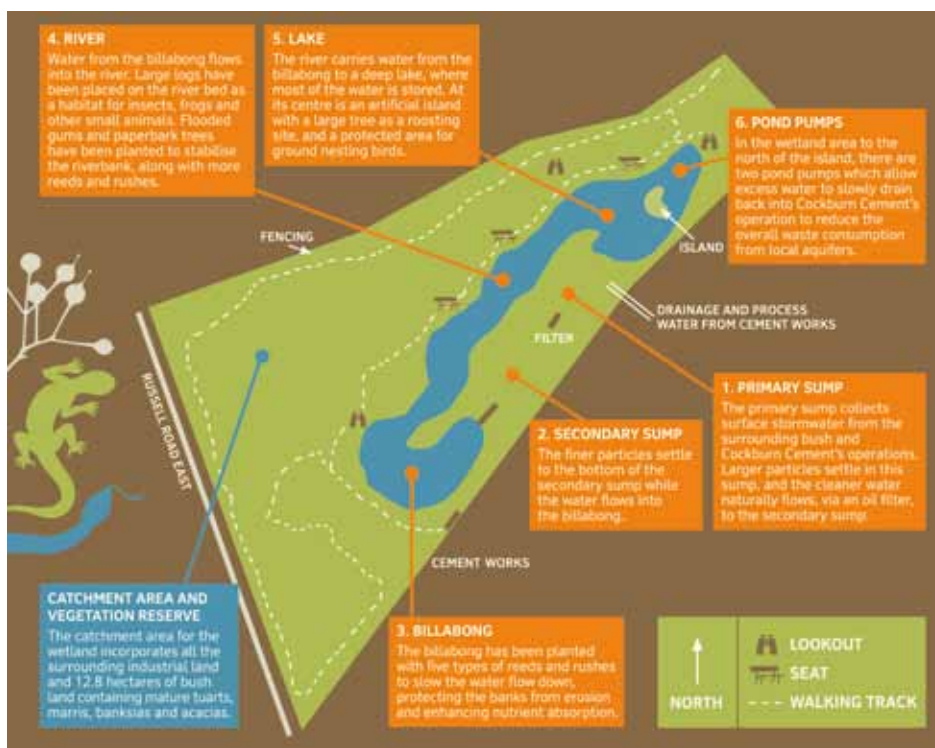
Using 'nature's kidneys' to treat alkaline waste water: the constructed wetland at Cockburn Cement Ltd.

Excerpt from: Earl Cranley (2010) *Reviewing the effectiveness of Cockburn Cement Ltd. Wetland for treating alkaline wastewater. Honours thesis, Murdoch University.*

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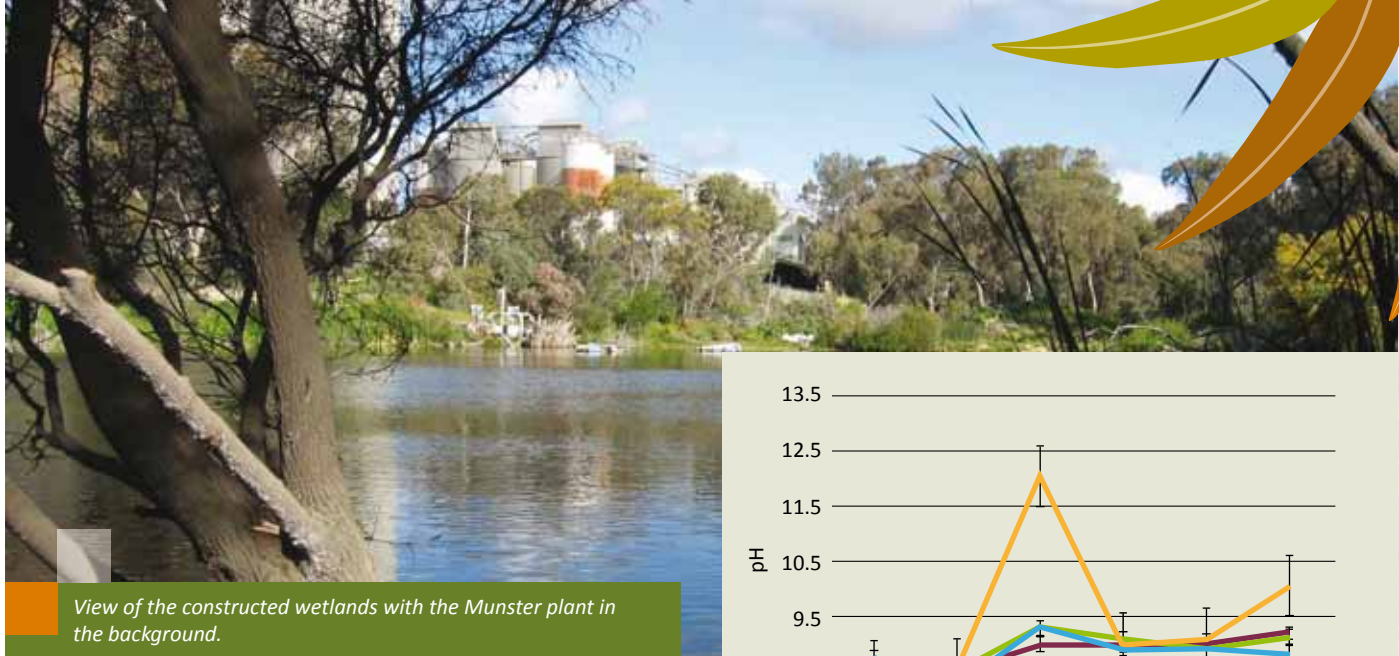
Constructed wetlands are surface or subsurface water bodies designed to include a series of physical, chemical and biological processes which recycle wastewater. However, in addition to minimising the environmental footprint and improving aesthetics of the industrial landscape, constructed wetlands and their surroundings also provide a economic, social and environmental benefits and services, including habitat for a wide range of animals and a place for people to enjoy and connect with their environment.

The cement and lime manufacturing processes at Cockburn Cement Pty Ltd. (CCL) in Munster requires a significant amount of water for various industrial processes such as slurry manufacture, heat exchange and dust control. Water has traditionally been pumped from bores and finally disposed of in settling and evaporation ponds. In 1996, CCL established a constructed wetland to reduce environmental impacts and to recycle wastewater on site (Figure 1). The constructed wetland consists of two sumps, a winding billabong containing sedges and rushes, and a storage wetland. The wetland area was revegetated with native plants. The surrounding four hectare area is made up of *Eucalyptus/Banksia* woodland.



Dr Katinka Ruthrof and Earl Cranley monitoring water samples at the constructed wetland.

Figure 1 The Cockburn Cement Ltd. Constructed wetland consists of two primary sumps, a winding billabong and a storage wetland (Wetland brochure, Cockburn Cement Ltd.).



Fourteen years after its establishment, a review into its treatment performance was undertaken to investigate the efficiency of the wetland to ensure that the water improvement objectives of this constructed wetland were being achieved.

Methods & Results

To assess performance of the wetland in water quality improvement, six water samples were taken at four strategic points across the wetland over a 12 month period from October 2009 to September 2010. Water pH, conductivity, total nitrogen, phosphorous and calcium were assessed. These results, combined with a review of the shape, the rate of inflow, and pre-treatment additions were undertaken in order to recommend methods of improving the wetland's treatment efficiency.

The study showed that the constructed wetland was not functioning as efficiently as possible in terms of improving water quality, which was likely due to a combination of factors. Firstly, it is likely that the alkaline (high pH) wastewater flowing into the system (Figure 2) reduced the capacity for nutrient removal. Secondly, parts of the second sump are showing signs of short circuiting and stagnant water.

Conclusions & Recommendations

Modifications to the constructed wetland may be undertaken to allow for a greater, more uniform flow through the system (especially sump 2). A number of recommendations could improve the treatment performance of the constructed wetland at Munster, as well as future constructed wetlands. These include:

- All inlet points be directed to the first sump, rather than to either sump, as is currently the case;
- Maintaining adequate flow rates by widening or resizing inlet points;
- Increasing the density of vegetation plantings at key points (e.g. the billabong in this case) to increase the filtration process and efficacy of the wetland;

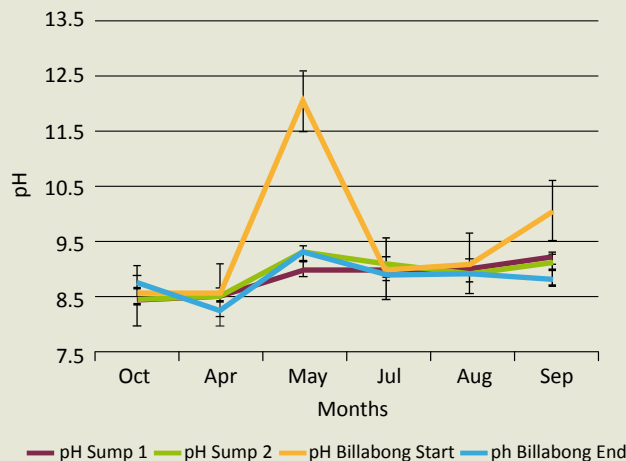


Figure 2 The pH readings (+ SE) at Cockburn Cement constructed wetland according to the four sampling points, measured over the 12 month period from October 2009 to September 2010.

- Inflow pretreatment be reviewed (particularly in terms of wastewater pH), based upon economic and ecological considerations; and
- Finally, it is recommended that a long term monitoring program be established for the wetland using the data collected in this study as baseline data.

Monitoring of ecosystem health of the wetland and surrounding woodland is also being investigated, such as the diversity and abundance of fauna, in particular birds, that use the site.

The realisation of the benefits of low cost recycling systems such as constructed wetlands will become even more important in the near future for industries facing rising costs of production, as well as increased environmental and social responsibility. Long term monitoring of such projects can ensure their initial environmental goals are achieved.

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