

Environmental Indicators of Effective Sewage Effluent Re-use

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May, 1997

Submitted in fulfilment of the requirements for
SEN713 Research/Professional Practice Project
School of Engineering and Technology, Deakin University

Reference: Patterson, R.A. 1997. *Environmental Indicators of Effective Sewage Effluent Re-use*. Thesis for Master of Engineering, School of Engineering and Technology. Deakin University. Geelong, Victoria

ABSTRACT

Armidale City Council operates a small scale re-use scheme, irrigating pasture as part of a 24.6 ha cattle grazing operation. Since the 1960s effluent from the treatment lagoons has been used to flood irrigate an area of about 10 ha. Environmental indicators of the effects of the effluent on the soils and pasture have not been monitored and the irrigation scheme has been under-managed with respect of water or nutrient balance.

In a soil survey 42 sampling points were examined for relative changes in plant nutrients and salts from the long term re-use scheme. Plant material was analysed to determine the relative removal rates from varying vegetation densities. Effluent from the detention ponds was also analysed.

For the essential plant macro and micro nutrients a significant increase in the stored nutrients relative to the control was recorded. Nutrient increases ranged from 1200% for sodium, 700% for total Kjeldahl nitrogen (TKN), 1800% for total phosphorus (TP) to 7000% for Bray phosphorus. That salt levels generally increased down the slope indicated that soluble fractions were leached from the system. The plant density positively correlated with the levels of organic carbon, TP and TKN.

An important benefit of monitoring is that nutrients may be spread more evenly over the disposal area to maximise the production of pasture, rather than accumulate unusable quantities close to the discharge outlet. The environmental indicators which most readily provide a perspective on effective management were Bray -P, organic carbon, mineral nitrogen, exchangeable sodium percentage, pH and electrical conductivity for the soil; pH, electrical conductivity, orthophosphate, nitrate and sodium adsorption ratio (SAR) for water. Observations of plant growth, vigour and species composition indicate the outcome of management decision.

The findings indicate that the soil provided a valuable sink for nutrients, salts and heavy metals and provides a valuable nutrient removal process in wastewater treatment. After a long term re-use history the Armidale site maintains a buffer against off-site pollution without degradation of the soil environment.

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