REMOVING PHOSPHORUS FROM WASTEWATERS USING ANDESITIC TEPHRA SUBSOILS

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Many rivers and streams within the Manawatu-Wanganui region experience blooms of periphyton growth during periods of high sunlight intensity and extended periods of stable flows. Phosphorus (P) enrichment promotes the growth of aquatic weeds and algae when P is growth-limiting. Point-source discharges, primarily from domestic sewage treatment plants (STPs), are a major cause of elevated dissolved reactive phosphorus (DRP) concentrations during low flow conditions at many river-monitoring sites within the Manawatu-Wanganui region. The removal of DRP from domestic sewage is problematic, particularly for smaller towns, as many wastewater treatment options for DRP are either cost-prohibitive or largely ineffective. Therefore, there is a need for a new, cost-effective method for DRP removal at STPs.

Soils and parent materials derived from andesitic tephra with relatively high P absorbing capacities have potential as relatively low cost substrates for use in active filters for P removal. Soils formed from andesitic tephra are abundant in the central North Island. In addition, once the P adsorbing capacity of tephra is exhausted, it has potential for re-use as a soil amendment.

The P absorption capacities of a range of different tephra subsoils have been measured. Of the tephra assessed, the Okato tephra (<2 mm particle size fraction), collected from the North West of the Taranaki Region, had the highest P absorbing capacity, absorbing nearly 8 g P/kg tephra with an average removal efficiency of 97%. For a STP servicing a community the size of Taihape, it is estimated that a filter with 232 m^3 of Okato tephra would have the potential to remove approximately 1,670 kg P from wastewater, which corresponds to treatment of about 18 months of discharge. If DRP removal was only required during the summer and early autumn months, then the life of the filter could be extended to about 3.5 years. Future research at a pilot scale is being conducted to further assess the feasibly of tephra filtration systems.

Editor's Note: An extended manuscript has not yet been submitted for this presentation.