Abstract

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Title

Biomanipulating diatom growth to reduce Total Phosphorus and Cyanobacteria density

Description

An eighty five hectare raw water storage dam was treated using Diatomix®, manufactured by AlgaEnviro Pty Ltd (Australia) to reduce the macro-nutrient concentration and as a consequence, the cyanobacteria density. Attempts to reduce the blue-green algae (cyanobacteria) growth in the storage dam had previously been via an aeration curtain to maintain mixing and reduce stratification. Product addition was via five solar powered dosing units, installed on small floating platforms around the waterbody, adding a total of 8 – 14 Litres of product per week. During the first 15 months of treatment, the rate of total phosphorus reduction was 100% faster than the rate during aeration only. The rate of reduction of cyanobacterial cells was nearly 300% faster than with aeration only.

The suspended diatom cell count did not increase to levels that would be considered problematic for operational activities (Diatoms $\bar{x}$ = 897 cells/mL), but the average diatom cell count did increase by more than 300% over the average diatom counts prior to treatment with the product. Given the low suspended diatom cell count, the majority of diatom growth is assumed to occur within periphyton and benthic assemblages (not monitored).

Diatoms take up silica during growth and the concentration of reactive silica reduced during the use of the product, with the reduction trend being similar to that of nitrogen. The reactive silica concentration reduced from ~15 mg/L down to ~8.7mg/L over 15 months of treatment.

Silica reduction (total mass) was greater than nitrogen and phosphorus reduction would predict using the Redfield ratio. For reductions to agree with the Redfield ratio, the result suggests that a greater mass of nitrogen and phosphorus was taken up from an unmonitored source, most likely the benthic zone. This has important implications for long-term waterbody management, and excess nutrient storage in the benthic zone.