

Origin of acidity in coal mined voids, Western Australia

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Ewington 2 Lake is a coal mined void in Collie Basin. It is acidic (pH 4.3). Australian Coal Association Research Program supported research in evaluating this lake for the sources of acidity.

Geology around the Lake consists of Permian sandstone, siltstone and coal. The sediments are high in $\text{SiO}_2 + \text{Al}_2\text{O}_3$, but low in CaO and MgO . However, $\text{Fe}_2\text{O}_3 + \text{K}_2\text{O}$ vary widely. Coal seams in the area contain pyrite and are about 3m thick with ca 15m overburden.

The shallow groundwater flows to NE, influenced by local topography and geology. The pH of lake water and groundwater is 4.2-5.7. However pH of groundwater decreases towards the lake. The rainwater in the area is more or less neutral. Hence, it appears that acidic lake water is not dispersed substantially.

TDS in groundwater is low ranging 200-500ppm. Whereas Lake has a mean TDS of 612ppm. Both groundwater and lake water are saline and have similar ionic contents. They have low SO_4 (<50ppm), Fe (<1ppm), Al (<0.01-1.7ppm) and Ca (<5ppm). Isotope analysis indicates high evaporation from the lake as well slow mixing of groundwater, rain, runoff and the lake.

In situ oxidation of sulphides in coal and waste dumps produces acidification of water. The low contents of SO_4 , Fe, Al in waters may be attributed to precipitation of their relevant hydroxides (ferrihydrite, goethite, gibbsite) in lake bottom sediments.