

Investigation into the metal contamination of the Plankenburg and Diep Rivers, Western Cape, South Africa

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Abstract

Metal contamination in the Plankenburg and Diep Rivers (Western Cape) was investigated over a 12 and 9 month period, respectively. Aluminium (Al), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), nickel (Ni) and zinc (Zn) concentrations were determined using the nitric acid digestion method and analysed by inductively coupled plasma atomic emission spectrometry (ICP-AES). For both rivers the Al and Fe concentrations were higher than that for all the other metals analysed for in sediment and water samples. The highest concentrations recorded in the Plankenburg River were 13.6 mg·ℓ⁻¹ (water – Week 18, Site B) and 15 018 mg·kg⁻¹ (sediment – Week 1, Site C) for Al, and 48 mg·ℓ⁻¹ (water – Week 43, Site A) and 14 363.8 mg·kg⁻¹ (sediment – Week 1, Site A) for Fe. The highest concentrations recorded in the Diep River were 4 mg·ℓ⁻¹ (water – Week 1, Site A) and 19 179 mg·kg⁻¹ (sediment – Week 1, Site C) for Al, and 513 mg·ℓ⁻¹ (water – Week 27, Site A) and 106 379.5 mg·kg⁻¹ (sediment – Week 9, Site C) for Fe. For most of the metals analysed the concentrations were higher than the recommended water quality guidelines as stipulated by the Department of Water Affairs and Forestry, the Canadian Council for the Ministers of the Environment and the accepted ‘world average’. Point sources of pollution could not be conclusively identified, but runoff from both industrial and residential areas could have contributed to the increased concentrations. Metal concentrations should be routinely monitored and the guidelines should be updated and revised based on the current state of the rivers and pollution sources.

Keywords: ICP-AES, metal contamination, Plankenburg- and Diep River water, sediment, water and sediment quality guidelines