

Investigation into metal contamination of the Berg River, Western Cape, South Africa

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Abstract

A recent decline in water quality of the Berg River, Western Cape, South Africa, has led to the investigation into the degree of metal pollution in the river system. This study was conducted over a period of one year, from May 2004 to May 2005. The nitric acid digestion technique was used to extract metals from water, sediment and biofilm samples collected at various points (Site A – agricultural area, Site B – informal settlement and Site C – Newton pumping station) along the Berg River. Metal concentrations were determined using inductively coupled plasma atomic emission spectrometry (ICP-AES). The highest mean metal concentrations recorded were as follows; water samples, $6 \text{ mg}\cdot\text{l}^{-1}$ for Al, $14.6 \text{ mg}\cdot\text{l}^{-1}$ for Fe and $18.8 \text{ mg}\cdot\text{l}^{-1}$ for Mn; sediment samples, $17\,448.8 \text{ mg}\cdot\text{kg}^{-1}$ for Al and $26\,473.3 \text{ mg}\cdot\text{kg}^{-1}$ for Fe; biofilm samples, $876.8 \text{ mg}\cdot\text{l}^{-1}$ for Al and $1\,017.5 \text{ mg}\cdot\text{l}^{-1}$ for Fe. The increased availability, or noteworthy incidence of Al and Fe, could be due to the leaching of metals into the river water from waste and household products associated with the informal settlement and the subsequent settling on sediment. No guidelines were available for metals in biofilms. The highest recorded concentrations in water were for Site C (agricultural area). Recorded concentrations in water fluctuated throughout the study period for most of the metals analysed, but Al and Fe were consistently above the recommended guidelines as stipulated by the Department of Water Affairs and Forestry and the Canadian Council of Ministers of the Environment.

Keywords: metals, river systems, sediment, biofilm, inductively coupled plasma atomic emission spectrometry (ICP-AES)