

Threats and opportunities for post-closure development in dolomitic gold mining areas of the West Rand and Far West Rand (South Africa) – a hydraulic view

Part 1: Mining legacy and future threats

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Abstract

For long periods in the history of South Africa gold mining formed the backbone of an otherwise agriculturally-dominated economy, initiating rapid urbanisation in often remote and underdeveloped farming areas. This paper explores examples from a mined-out goldfield west of Johannesburg (West Rand), where consequences of mine closure can currently be observed, as well as from an active goldfield on the Far West Rand. Both areas are linked by the Wonderfontein spruit, a stream drawing much national and international media attention for its high levels of radioactive pollution. Dating back more than 120 years, the impacts of gold mining and later uranium mining on the natural environment are profound and complex, perhaps most affecting the rich groundwater resources found in the exceptionally well-karstified dolomite that underlies most of the catchment area. Mining-related impacts such as large-scale land degradation associated with dewatering of karstic aquifers and widespread pollution of surface water and groundwater systems are discussed. Based on this, potential threats and opportunities for post-mining scenarios are identified in a series of 3 papers. Part 1 of this series outlines impacts of mining, particularly on the natural water resources, and possible consequences associated with the future re-watering of currently de-watered dolomitic compartments. The need for a regionally-integrated approach to the closure of highly interconnected mines is stressed and timelines of the closure process estimated. In Part 2 the emphasis is on identifying possible opportunities for post-mining development centred mainly around the utilisation of exceptional karst features and associated water resources. Part 3 aims to quantify uncertainties associated with planning in mining-dominated environments by comparing historical predictions with factual developments.

Keywords: gold mining, West Rand, Far West Rand, dolomite, karst, dewatering, water pollution, tailings, uranium, mine closure, re-watering