

Environmental Impacts after 124 years of mining on the Witwatersrand Goldfields of the Egoli Region

By Morris Viljoen

A long history of gold mining in the Egoli region has led to a legacy of serious environmental consequences. Many of these stem from the earlier days of mining when there was little if any regard for negative environmental consequences of mining procedures. Due to the presence of narrow but widespread gold-bearing reefs, extensive underground development was necessary together with large areas of stoping. This has led to unstable ground in shallow undermined areas and the alienation of such ground as well as providing a huge aquifer for poor quality mine water, which is rising and will eventually decant on surface, as it already is, on the West Rand, leading to huge pollution problems.

One of the most obvious impacts of Precious mining activities is the erosion by wind and water of unprotected tailings dumps. This was particularly evident in earlier days of mining when dust pollution during windy days was a serious problem. A very successful programme of vegetating and stabilising the dumps was initiated by the Chamber of Mines of South Africa and during the sixties and seventies most dumps were rehabilitated, largely solving the dust problem. With the retreatment of tailings dams which commenced in the late seventies and continues up to the present time, many dumps were re-exposed thereby recreating numerous point sources for dust pollution. Of particular concern is the massive dust pollution from the upper parts of the three major depositional dumps on Crown Mines where the recently treated material is being deposited.

Rounded gold-bearing detrital pyrite was deposited 2-9 billion years ago in an anoxygenic environment. Having now been exhumed and exposed to an oxygen-bearing atmosphere (in tailing dumps and underground mine workings), the mineral oxidises by a process termed efflorescence to form water soluble hydrous ferric and ferrous sulphates, the source of dissolved solids and acid mine drainage. Such contamination leads to serious pollution of underground water and of streams running through mining areas. Most mine water is now treated with lime (and oxygen) which increases the pH allowing iron to precipitate and making it amenable to flocculation and separation as a reddish brown iron hydroxide sludge. This material could be a potential source of red ochre and gypsum (hydrous calcium sulphate) together with a range of other salts, from the polluted water, leaving behind clean water. Remaining salts in the water of the Klipriver catchment are largely removed by wetland vegetation and the buffering effect of dolomite formations, south of Johannesburg before the water reaches the Vaal river. Eventual removal and rehabilitation of tailings dam footprints has and will allow for a range of new building projects on this valuable land in central Egoli.