



University of Venda

SCHOOL OF ENVIRONMENTAL SCIENCES

DEPARTMENT OF MINING AND ENVIRONMENTAL GEOLOGY

**EVALUATION OF ECONOMIC POTENTIAL OF GOLD TAILINGS DAMS: CASE
STUDIES OF THE KLEIN LETABA AND LOUIS MOORE TAILINGS DAMS,
LIMPOPO PROVINCE, SOUTH AFRICA**

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Abstract

The tailings dams emanating from mining activities in the Giyani Greenstone Belt have high potential of containing gold in them. These tailings have since been left abandoned when the mines ceased operation 30 years ago. The ever increasing mining cost coupled with the recent surge in the gold price has necessitated the need to rework mine tailings. This can be achieved by determining the concentration and distribution of gold and heavy metals such as Ag, As, Cd, Co, Cu, Cr, Mn, Ni, Pb and Zn within the Klein Letaba and Louis Moore tailings dams.

Sampling of the tailings dam was undertaken with the collection of samples at a meter interval using a hand held auger drill up to a depth of 8 m at Klein Letaba and 4 m at Louis Moore. Samples collected were prepared at the University of Venda and heavy metals were analysed using atomic absorption spectrometry, whilst samples for gold analysis were sent to Set Point Laboratories in Johannesburg and were analysed using fire-assaying method. For major oxides, samples were sent to the Department of Geology, University of Pretoria, for XRF analysis. The Atterberg limit tests were also conducted on tailings at the Soillab in Pretoria.

The study established the abundance of As, Cr, Ni and Mn contained in the Klein Letaba tailings which had maximum values of 3943 mg/kg, 759 mg/kg, 731 mg/kg and 383 mg/kg respectively. Gold had a mean value of 468 µg/kg and the highest value was 740 µg/kg. At Louis Moore tailings dam, gold was found to have a mean value of 314 µg/kg and highest value of 480 µg/kg. The tonnage of gold at the Klein Letaba tailings dam was 699 kg. This was found to be economic although it is not technically possible to extract gold completely. At the Louis Moore tailings dam, it was not possible to evaluate the gold tonnage due to the extensive erosion of the tailings dam, however, the mean gold value at this dam was found to be 314.50 µg/kg with the maximum value of 480 µg/kg.

Analysis of the Atterberg test results revealed that the tailings are composed mainly of sandy and silty material and is lacking in clay. Hence tests conducted on the material to produce bricks revealed that the best combination is that of adding clay and coal waste