



University of Venda

Economic Evaluation of Gold-Sulphides Mineralization within the North Leader Conglomerate at N0:5 shaft of Blyvooruitzicht Gold Mine, South Africa


Name of Student: Ntiyiso Ally Mahlaule

Student Number: 11503085

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Supervisor : Dr. F. Amponsah-Dacosta
Department of Mining and Environmental Geology
University of Venda

Co-supervisor : Dr. N. Q. Hammond
University of Limpopo

Signature.....

Supervisor

08/09/2015

Date

Signature.....

Co-supervisor

08/09/2015

Date

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ABSTRACT

South African mining industry and gold mining sector in particular has played significant role in growing the economy of the country. Witwatersrand (Wits) hosts the world's largest gold reserves. Blyvooruitzicht Gold Mine (BGM) operates within the West Wits Line of the Wits Supergroup. Three main conglomerates; namely, North Leader (NL), Carbon Leader (CL) and Middelvlei Reef (MR) have been identified at BGM. The (CL) and MR have been intensively studied and were regarded as major economic horizons. Studies on NL so far have shown that the grades are generally less than 0.5 g/t and these grades were not accurately delineated. The results were based on drillhole data which tends to undervalue the true reef grades later obtained in development sampling. It has also been established that no sufficient exploration was carried out regarding the NL and less attention was given to its economic potential.

The main purpose for this research was to investigate gold mineralization and associated minerals or elements within the North Leader conglomerate in order to develop a more detailed understanding of the North Leader, build resource model and evaluate its economic potential for future exploitation. The research approach used include diamond drilling, core logging, sampling, fire assay, ore microscopy, electron probe microanalysis (EPMA), X-ray diffraction analysis (XRD), X-ray fluorescence (XRF), mineral resource modeling and economic resource valuation.

The evaluation results based on development sampling revealed that North Leader gold grades range from 1.98 to 3.85 g/t with an average of 3.15 g/t and increase towards the north. The ore zones were delineated based on grades variations and mode of distribution. The results indicate that North Leader has economic potential for future exploitation. The gold mineralization of the North Leader is amenable for underground extraction. The mineral resource model and the grade distribution have assisted in determining an appropriate cut-off grade of 3.0 g/t gold for this project

considering a gold price of US\$1,200 per ounce of gold and a gold recovery of 85 percent.

Ore definition was done based on mineral evaluation results and the resource was classified as measured. Choice of mining method was suggested to be sequential grid mining method due to erratic nature of the grade as well as the safety of this method. The strength of the rock drilled was also found to be one of the contributing factors towards grade loss. Geochemical and mineralogical analysis results indicate that silica and alumina are the most abundant oxides in all analyzed samples.

Based on the findings of the research, it was concluded that the North Leader has economic potential to warrant future exploitation. Further studies are recommended for structural geological modeling of North Leader and geotechnical engineering for support design in order to supplement this initial mineral resource modeling. The proposed work program should involve core drilling to investigate the lateral and depth continuity of gold mineralization in relation to structural geology with a view of supporting this initial mineral resource evaluation.