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2019

https://hdl.handle.net/10539/29919

Kgomanyane, Joel Thabo. (2019). Characterisation of rock mass rating (RMR) parameters by geostatistical analysis Orapa Mine Botswana. University of the Witwatersrand, https://hdl.handle.net/10539/29919

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CHARACTERISATION OF ROCK MASS RATING (RMR) PARAMETERS BY GEOSTATISTICAL ANALYSIS AT ORAPA MINE, BOTSWANA

ABSTRACT

The focus of this research project is on the application of geostatistics to evaluate the rock mass rating (RMR) parameters for Orapa AK1 kimberlite pipe. The RMR parameters evaluated are Uniaxial Compressive Strength (UCS), Fracture Frequency per Metre (FFPM), Rock Quality Designation (RQD) and Dry Density (DD). When applied appropriately, these RMR parameters have the potential to enhance and inform conventional geological models, blast designs and metallurgical plant performances. Compared with other assessment methods such as using the global mean of the RMR parameters, the geostatistical estimates resulted in a more accurate and robust assessment of the geotechnical variables studied herein.

Ordinary Kriging has been applied to estimate the RMR values at unsampled locations for the different rocktypes of the Orapa AK1 Kimberlite pipe. Variogram models were generated for the above RMR parameters within the different rocktypes both in the horizontal and vertical directions including an estimate for the nugget effect. The resulting block estimates were compared with sample data for all RMR parameters and bench plots for each rocktype were generated and analysed. Furthermore, geostatistics revealed that, RMR parameters have spatial correlation and these are strongly influenced by the geological environment of the AK1 Kimberlite at Orapa mine in Botswana.

It is concluded that the evaluation of the rock mass rating (RMR) parameters using geostatistics is an important future requirement for the success of any mining project. It is recommended that geological and geotechnical data processing and interpretation should be coupled with geostatistical modelling at project pre-feasibility studies to enhance the conventional methods used in geoscience mining projects. The geostatistical estimation approach provides a more reliable and accurate method (low kriging variance) by taking into account the spatial continuity of variables under study as compared to simple averaging of geotechnical parameters for a given volume of rock mass.