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The investigation of an optimal sampling scheme for Styldrift I mine by applying geostatistical, practical and economic parameters

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ABSTRACT

The success of a new mining project is highly dependent on the evaluation of the grade estimate and reconciliation of the planned versus actual achieved grade, which are both realised by means of underground sampling. Styldrift I is a new mine of the Royal Bafokeng Platinum operations that warrants the investigation of an optimal sampling scheme. The Merensky Reef, which is currently being mined, is highly variable by nature and features a transition zone between regional facies types in the study locality. The research study applied an elementary geostatistical method to analyse and identify an optimal sample spacing option that is practical to implement. The estimation error of kriging variance is used as a measure of confidence to test various sampling patterns in a drill hole sampling analysis. Existing sample data was validated and quality checked using statistical methods to model the spatial continuity which is the key component to geostatistics. The regional facies further subdivided into local facies types was an important consideration in applying the geostatistical analysis correctly in terms of understanding the small scale variation. The two local facies types showed unique population characteristics and were therefore evaluated separately. Estimates were conducted and tested for six practical sample spacing options configured for the bord and pillar mining layout. Analysis of the kriging variance results was successful in selecting two optimal sampling options (8 m x 8 m and 16 m x 16 m); however the determinant consideration was an implicit cost benefit comparison that was used to select the optimal sampling scheme of 16 m x 16 m that met the technical, practical and financial requirements for Styldrift I.