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Finding the optimal dynamic anisotropy resolution for grade estimation improvement at Driefontein Gold Mine, South Africa

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ABSTRACT

Mineral Resource estimation provides an assessment of the quantity, quality, shape and grade distribution of a mineralised deposit. The resource estimation process involves; the assessment of data available, creation of geological and/or grade models for the deposit, statistical and geostatistical analyses of the data, as well as determination of the appropriate grade interpolation methods. In the grade estimation process, grades are interpolated/extrapolated into a two or three – dimensional resource block model of a deposit. The process uses a search volume ellipsoid, centred on each block, to select samples used for estimation. Traditionally, a global orientated search ellipsoid is used during the estimation process. An improvement in the estimation process can be achieved if the direction and continuity of mineralisation is acknowledged by aligning the search ellipsoid accordingly. The misalignment of the search ellipsoid by just a few degrees can impact the estimation results. Representing grade continuity in undulating and folded structures can be a challenge to correct grade estimation. One solution to this problem is to apply the method of Dynamic Anisotropy in the estimation process. This method allows for the anisotropy rotation angles defining the search ellipsoid and variogram model, to directly follow the trend of the mineralisation for each cell within a block model. This research report will describe the application of Dynamic Anisotropy to a slightly undulating area which lies on a gently folded limb of a syncline at Driefontein gold mine and where Ordinary Kriging is used as the method of estimation. In addition, the optimal Dynamic Anisotropy resolution that will provide an improvement in grade estimates will be determined. This will be achieved by executing the estimation process on various block model grid sizes. The geostatistical literature research carried out for this research report highlights the importance of Dynamic Anisotropy in resource estimation. Through the application and analysis on a real-life dataset, this research report will put theories and opinions about Dynamic Anisotropy to the test.