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The application of geostatistics in coal estimation and classification

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ABSTRACT

This study set out to assess a multiplicity of related questions regarding the applicability of geostatistical principles, practices and techniques to the estimation, classification and reporting of Coal Resources. Two cases, i.e. Case A and B were selected for the study. Both areas are in the Witbank Coalfield. A few exercises were undertaken to investigate whether a technique such as Ordinary Kriging (OK) could be better suited. The second part of the problem statement is to evaluate whether the current drill hole spacing recommended by the SANS 10320:2004 standard is appropriate for the considered cases.

In terms of drill spacing, the South African National Standard (SANS 10320:2004) provides that for a Measured, Indicated and Inferred classification, samples should be spaced at 200 m (minimum of 8 samples), 282 m (minimum of 4 samples) and 564 m (minimum of 1 sample) respectively. By quantifying the precision associated with estimating the two cases at different drill grids, it was shown that for both Cases A and B, a Measured Resource can be classified by using drill holes that are spaced approximately 1000 m apart. It was established that precision results associated with the global estimation variance are only applicable to the area in which the study was undertaken i.e. the findings are not globally applicable although rough approximations can be deduced.

For short-term mine planning purposes, further drilling may and is usually required. The guidelines provided in the SANS standard for separation distances are evidently too stringent for both Cases A and B. Therefore, a drill spacing of 500 m, 1000 m and 4000 m should be considered as being more appropriate than the current overly tight spacing.

With regard to the use of OK, the findings of this study clearly show that the current Growth Algorithm (GA) technique commonly used by South Africa coal estimators is more appropriate than other alternatives as it outperforms both OK and Inverse Distance Weighting (IDW) whether on a global or local scale. The current estimation method used for these cases is therefore appropriate.

The current drill grids are too small for global estimation and reporting and thus there is possible overspending if the required estimation precision is between 5 and 10 %. At the current drill spacing, precision is around 2 % within ‘Measured’ areas, which is more than what is required to produce predictable long-term plans.