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2017

http://hdl.handle.net/10539/23518

Magnus, Elaine Elizabeth (2017) Alternative methods for coal resource classification of the geologically complex Witbank Coalfield, University of the Witwatersrand, <http://hdl.handle.net/10539/23518>

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ALTERNATIVE METHODS FOR COAL RESOURCE CLASSIFICATION OF THE GEOLOGICALLY COMPLEX WITBANK COALFIELD

ABSTRACT

The Australasian code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, of the Joint Ore Reserves Committee (JORC) sets out minimum standards, recommendations and guidelines for Public Reporting in Australasia. (JORC, (2012)). The Committee for Mineral Reserve International Reporting Standards (CRIRSCO) created a set of standard international definitions for reporting Mineral Resources and Mineral Reserves based on the evolving JORC code's definitions (CRIRSCO, (2013)).

CRIRSCO's members are National Reporting Organisations (NRO's) which are responsible for developing mineral reporting codes for Australia (JORC), Canada (CIM Standing Committee on Reserve Definitions), Chile (National Committee), Europe (PERC), Russia (NAEN), South Africa (SAMCODES) and USA (SME) (JORC, (2012)).

The NRO's for; South Africa (SAMREC), Australia (JORC) and Canada (CIM Standing Committee on Reserve Definitions) published supporting standards for Coal Resource and Reserve Classification and Reporting namely, South African National Standard: South African Guide to the Systematic Evaluation of Coal Resources and Coal Reserves (SANS10320:2004), the Australian Guidelines for the Estimation and Classification of Coal Resources (Australian Guidelines (2014)) and the GSC Paper 88-21: A Standardized Coal Resource/Reserve Reporting System for Canada (Hughes, et al., (1989)).

With the objective to identify the most appropriate Coal Resource Classification approach for the Witbank Coalfields in South Africa, Coal Resource Classification methods applied elsewhere in the world were investigated, these countries include Canada and Australia.

SANS10320:2004 relies on a minimum drillhole spacing dependant on two different coal seam deposit types, whereas the Australian Guideline for the Estimation and Classification of Coal Resources (2014) provide a guide as to which geological aspects need to be considered when classifying a coal deposit into the appropriate confidence category, and no fixed drillhole spacing is recommended. The Canadian Standardized Coal Resource/Reserve Reporting System (1989) differs from the afore mentioned standards in that it is a prescriptive method

based on specific levels of geological complexity, governed by specific fixed parameters. None of the other Coal Reporting codes/standards use a broad sweeping fixed drillhole spacing to classify Coal Resources as in South Africa.

It is noted from experience as well as by Coal Resource Classification methods used elsewhere in the world that the use of proposed fixed drillhole spacing, such as currently in use in SANS10320:2004, is an unsatisfactory method for assessing the uncertainty and variability associated with coal deposits. The Coal Resource Classification methodologies utilised on a local scale in South Africa, were investigated to establish how mining houses manage and assess the variability in their Coal Resources. Fourteen mines operating throughout the Witbank coalfield were compared, it was found that although the Coal Resource Classification of the governing code requires a 350m drillhole spacing for highest level of confidence, the mines drill to a much smaller grid for increased confidence. Despite this, the mines still report on the SANS10320:2004 minimum standard in the public domain. A map was created based on the average drillhole spacing drilled per mine. From this it was deduced that there are zones of higher coal seam variability which required a closer spaced drilling grid to derive sufficient geological confidence in the estimates. Based on these deductions four zones of comparable continuity/variability, were identified. The zones identified by means of geological investigation and those identified by differences in variability as perceived by the Competent Person (CP) correlate. The highest variability and smallest drillhole spacing is located toward the western portion of the coalfield whereas the lowest variability with the largest drillhole spacing is located toward the east.

The geologically complex Witbank coalfield was divided into four geo-zones/domains based on the depositional environment, basement rocks and post depositional influences. It is evident that a suitable Coal Resource Classification approach; which considers the characteristics of the geozones are followed. The question of which other classification methods are appropriate if not a predetermined drillhole spacing is addressed by this research.

Statistics on relevant variables can provide a measure of uncertainty and therefore reliability in the estimates, for this reason three methods of uncertainty and probability characterisation were investigated. Of the three, namely; Non-linear estimation approach, conditional simulation (CS) and global estimation variance (GEV), the latter was deemed the

most appropriate. GEV forms the basis of Drillhole Spacing Analysis (DHSA) and was applied to a mid-sized coal mine within the western portion of the Witbank coalfield. The analysis did not result in robust Coal Resource classification of estimates but rather provided more insight into the variability of the deposit. The results of DHSA are easily manipulated and are open for interpretation, it is therefore suggested as a valuable exercise/tool for understanding and assessing coal seam variability and to be used as a guide in Coal Resource classification.

Onsite practical geological information should not be underestimated and geostatistics should always confirm the geology. A purely mathematical approach to Coal Resource classification would be a gross oversight, a combination of geological factors in association with statistical inferences is suggested. A scorecard method with associated weights is proposed to improve the confidence in the Coal Resource classification.