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Geostatistical evaluation of the eastern ore field one (EF1) orebody, Rosh Pinah zinc mine, Namibia

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2018

https://hdl.handle.net/10539/25723

Kaviua, Sheron Tjiuavioye (2018) Geostatistical evaluation of the eastern ore field one (EF1) orebody, Rosh Pinah zinc mine, Namibia, University of the Witwatersrand, Johannesburg, <http://hdl.handle.net/10539/25723>

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ABSTRACT

The geometry, size and quality of a deposit are key parameters required for decision-making regarding mining methods, capital investments or divestments, economic viability and processing methods. The dissertation uses a quantitative approach to assess three geological modelling methods for orebody geometry. It applies Principal Components Analysis (PCA) in order to understand the variability and correlation in the data. The dissertation aims to determine the significance of increasing the composite size to 3 m for grade estimation and to estimate the tonnes and grades of the Eastern Ore Field 1 in-situ resource as on 31 December 2016.

A MineSight, a Leapfrog and a hybrid of MineSight and Leapfrog modelling method were assessed, aiming to reduce the modelling time. The Minesight and Leapfrog hybrid model is recommended for modelling complex sedimentary exhalative deposits. The PCA was carried out using Matlab. Based on the correlation of 0.998, the first principal component increases with increasing Ag, Zn and Pb and it correlates most strongly with Ag. The second principal component increases with Zn, with a correlation of 0.985. With a correlation of 0.927, the third component increases with Mg. A 3 m composite size is recommended for estimating EF1 because the generated block-model estimates have lower means, standard deviations, variances and numbers of extreme outliers. The 3 m composite size is closer to the SMU at Rosh Pinah, and produces a better block estimate than 1.5 m composites, the later gives more tonnes and higher grade due to the volume-variance effect, which ultimately leads to overestimation of the mineral deposit. The total in-situ EF1 resource estimated using the Ordinary Kriging interpolation method as on 31 December 2016 was 814,100 tonnes at 8.58% Zn, 3.19% Pb and 79.22 ppm Ag.