

Accepted Manuscript

Ore-Structure Relationships at Sishen Mine, Northern Cape, Republic of South Africa, Based on Fully-Constrained Implicit 3D Modelling

I.J. Basson, C.J. Anthonissen, M.J. McCall, B. Stoch, J. Brits, J. Deacon, M. Strydom, E. Cloete, J. Botha, M. Bester, D. Nel

PII: S0169-1368(17)30107-5

DOI: <http://dx.doi.org/10.1016/j.oregeorev.2017.04.007>

Reference: OREGEO 2174

To appear in: *Ore Geology Reviews*

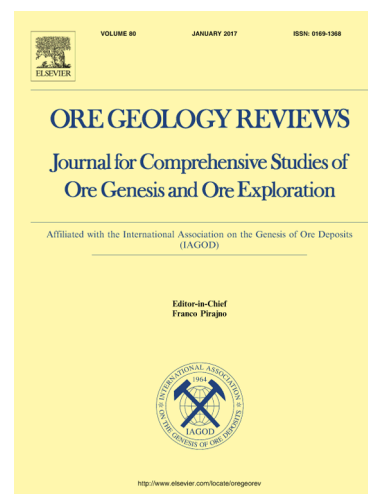
Received Date: 14 February 2017

Revised Date: 24 March 2017

Accepted Date: 6 April 2017

Please cite this article as: I.J. Basson, C.J. Anthonissen, M.J. McCall, B. Stoch, J. Brits, J. Deacon, M. Strydom, E. Cloete, J. Botha, M. Bester, D. Nel, Ore-Structure Relationships at Sishen Mine, Northern Cape, Republic of South Africa, Based on Fully-Constrained Implicit 3D Modelling, *Ore Geology Reviews* (2017), doi: <http://dx.doi.org/10.1016/j.oregeorev.2017.04.007>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Ore-Structure Relationships at Sishen Mine, Northern Cape, Republic of South Africa, Based on Fully-Constrained Implicit 3D Modelling

I.J. Basson¹, C.J. Anthonissen¹, M.J. McCall¹, B. Stoch¹, J. Brits³, J. Deacon², M. Strydom³, E. Cloete²,
J. Botha², M. Bester³, D. Nel³

¹ Tect Geological Consulting, Unit 3 Metrohm House, Gardner Williams Ave, Somerset West, South Africa

² Sishen Iron Ore Company (Pty) Ltd., Private Bag X506, Kathu, 8446, South Africa

³ Kumba Iron Ore, Corporate Office, Centurion Gate, 124 Akkerboom Road, Centurion, 0157, South Africa

Abstract

A fully-constrained, implicit, 3D geological model of Sishen Mine reveals the original, pre-mining geometry of ore bodies, host rocks to mineralization and major structures. There are several overlapping controls, at a variety of scales, on the position, depth and geometry of laminated and conglomeratic ore. Most of these controls are structural or may be reconciled with the kinematic history of this part of the Maremane Dome. A series of near-horizontal sections, through the entire 3D model, demonstrates the manner in which these controls overlap and interact. First-order or large-scale controls comprise broad domes, interference between broad folds and N-S trending grabens or half-grabens. Domes show preservation of laminated ore around their rims, outside of which conglomeratic ore occurs. Second-order controls comprise grabens and half-grabens, which are often bounded by strike-persistent normal faults, which show fault drag on their western flank due to inversion, along with preservation of BIF-related supergene ore and conglomeratic ore. A type example is the thick, deep, linear ore to the west of the Sloep Fault. Third-order controls on the preservation of mineralization comprise downthrown blocks to the north of reactivated E-W, SE/ESE- or NE/ENE-trending conjugate faults. Uplift to the south could be attributed to the 1.15-1.0 Ga NNW-directed Lomanian (Namaqua-Natal) Orogeny. Palaeosinkholes comprise fourth-order controls, which are superimposed on higher-order controls. Palaeosinkholes, which form the focus of the bulk of current mining, comprise deep, conical depressions with anomalous thicknesses of chert, chert breccia and haematite. Due to their limited size, the steepness of all units and the often chaotic nature of detached and slumped blocks in their centres, these volumes reflect longstanding models on palaeosinkhole development and thereby ore control.

Keywords: Maremane Dome; Transvaal Supergroup; Sishen; structural control

1. Introduction

Sishen Mine is the largest iron ore mine in the Republic of South Africa. It is situated on the northern end of a range of hills, with 60 km of strike along the western limit of the Maremane

Download English Version:

<https://daneshyari.com/en/article/5782430>

Download Persian Version:

<https://daneshyari.com/article/5782430>

[Daneshyari.com](https://daneshyari.com)