# KUMBA IRON ORE LIMITED
## ORE RESERVE (AND SALEABLE PRODUCT) AND MINERAL RESOURCE REPORT 2018



**UNLOCKING OUR FULL POTENTIAL**
DISCIPLINED GROWTH FOR A SUSTAINABLE FUTURE

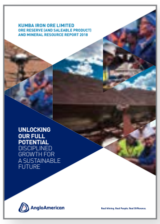
AngloAmerican

Real Mining. Real People. Real Difference.

# OUR APPROACH TO REPORTING

## Navigating our 2018 reports

Our integrated reporting suite comprises the following reports:

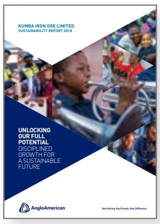


**ORE RESERVE (AND SALEABLE PRODUCT) AND MINERAL RESOURCE REPORT (ORMR)**

Reported in accordance with the South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves (SAMREC Code – 2016 edition).

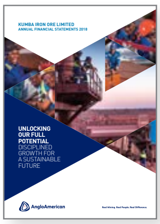
**INTEGRATED REPORT (IR)***

A succinct review of our strategy and business model, operating context, governance and operational performance, targeted primarily at current and prospective investors.



**SUSTAINABILITY REPORT (SR)***

Reviews our approach to managing our significant economic, social and environmental impacts, and to addressing those sustainability issues of interest to a broad range of stakeholders.



**ANNUAL FINANCIAL STATEMENTS (AFS)***

Detailed analysis of our financial results, with audited financial statements, prepared in accordance with International Financial Reporting Standards (IFRS).

* Published on 9 April 2019.

## CONTENT



Kumba Iron Ore, a business unit of Anglo American (its largest shareholder), is a single commodity iron ore minerals company listed on the Johannesburg Stock Exchange in the Republic of South Africa (market cap – US$6.3 billion at 31 December 2018), focusing its business on competing in the global iron ore market through premium product delivery.

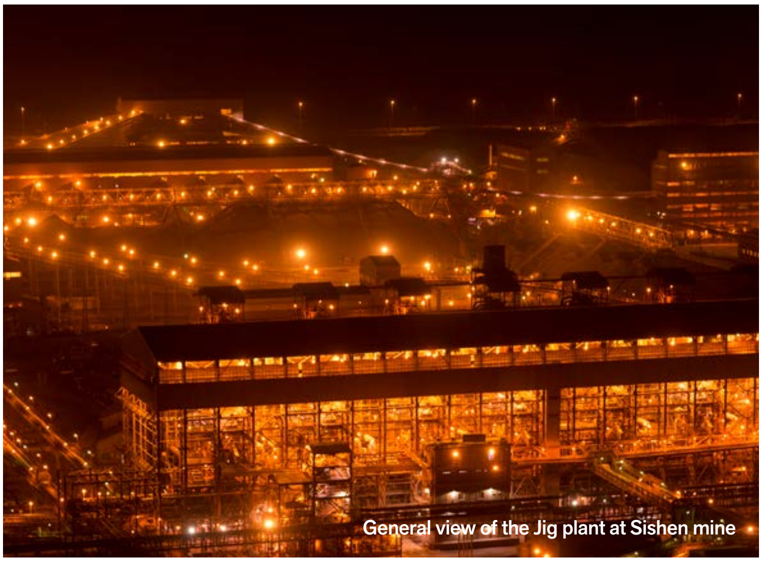
For more information see www.angloamericankumba.com

An abridged version of the 2018 ORMR Report is chaptered within the 2018 Kumba Integrated Report.
**(https://investors/annual-reporting/reports-archive/2018.aspx)**

**Feedback (jean.britz@angloamerican.com)**

Kumba appreciates any feedback regarding the competency, materiality and transparency with which its reserves and resources have been presented in this report.

# INTRODUCTION



General view of the Jig plant at Sishen mine

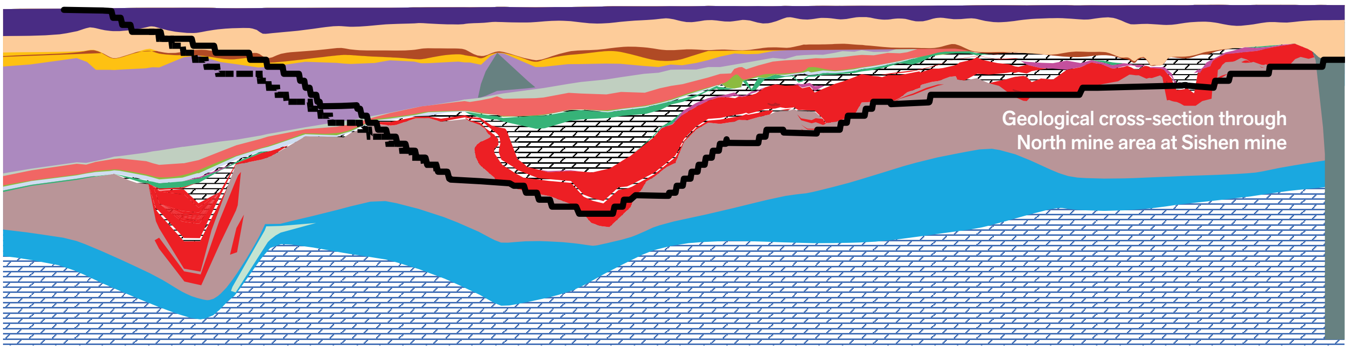
Kumba Iron Ore proudly operates two open-pit mines in the Northern Cape province of the Republic of South Africa. Kolomela mine is a predominantly direct shipping ore operation with a crushing-and-screening plant and a small-scale dense-media separation plant, while Sishen mine beneficiates its run-of-mine through large-scale beneficiation facilities, utilising dense-media separation and combined jigging (and ultra-high dense media separation for jig discard) technologies. A range of high-grade Lump and Fine iron ore products are generated, which are globally (~85%) and domestically (~15%) marketed as three Kumba blend products:

- Premium Lump @ 65.5% Fe
- Premium 20mm Lump @ 65.2% Fe
- Standard Fines @ 63.5% Fe

Both the Kolomela and Sishen mines are conventional drill and blast and truck and shovel open-pit operations with ex-pit ore at Kolomela mine hauled to designated finger stockpiles from which a run-of-mine blend is delivered, while at Sishen the run-of-mine originates directly from the pit as well as designated buffer stockpiles. The Kolomela finger stockpiling is necessary to produce the correct run-of-mine blend for the predominantly direct shipping ore operation, while at Sishen the buffer stockpiling facilitates plant feed consistency through partial blending with ex-pit ore.

Panoramic view of the Leeuwfontein pit at Kolomela mine

Kumba Iron Ore in the past 10 years has invested significantly in formulating an in-depth understanding of the genesis of the ancient supergene and hydrothermal-modified supergene iron-bearing lithologies in the narrow north-south "iron belt" between Kathu and Postmasburg in the Northern Cape province of the Republic of South Africa. The current 3D tectono-stratigraphic geological models defining the iron ore geometry (geological continuity) and associated 3D grade models (grade continuity), serve as a platform informing the mine planning, which applies state-of-the-art optimisation and scheduling techniques to derive life-of-mine plan scenarios informing business decisions.



Geological cross-section through North mine area at Sishen mine

# THE STATEMENT

Kumba Iron Ore Limited is a Johannesburg Stock Exchange listed minerals company that focuses its business (iron ore mining and exploration) in the Northern Cape province of the Republic of South Africa. It proudly operates two open-pit mines namely Kolomela and Sishen. Both operations have established infrastructure, which is applied to convert *in situ* haematite mineralisation into saleable iron ore product that earns the Company a premium in the global iron ore market. Current production output is railed across a rail-line linking the mining operations with the commodity export harbour facility at Saldanha Bay on the west coast of South Africa, from where it is shipped to the various global client destinations.

## REPORTING CODE

The 2018 Kumba Iron Ore (Kumba) online Ore Reserve (and Saleable Product) and Mineral Resource Report is a condensed version of the full 2018 in-house Kumba Ore Reserve and Mineral Resource Statement and Audit Committee Report, derived from a comprehensive amount of information compiled in the form of site-specific Reserve and Resource Statements; the latter structured to address all aspects listed in the Checklist of Reporting and Assessment Criteria Table of the SAMREC Code (2016 Edition).

The Kumba Reserve and Resource Report therefore aims to meet the required minimum standards as set out in 'The South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves (SAMREC Code – 2016 edition)'. It is incorporated in the Company's business processes via a Reserve and Resource Reporting policy (website: http://www.angloamericankumba.com/sd_policies.php). The policy is supported by reporting procedures and templates, which channel the reporting requirements down to a site-specific level, to ensure that Kumba meets section 12.11 of the Johannesburg Stock Exchange Listings Requirements.

The extent of the content in this Reserve and Resource Report demonstrates Kumba's commitment to the Material, Transparent and Competent reporting of its Ore Reserves and Mineral Resources.

## REPORTING BASIS

The Ore Reserve (and Saleable Product) and exclusive Mineral Resource figures are stated on a 100% basis, irrespective of attributable shareholding. Kumba's attributable ownership in operations and projects is, however, stipulated per site in the Ore Reserve (and Saleable Product) and Mineral Resource tables as listed in this statement.

The Ore Reserves and exclusive Mineral Resources is not an inventory of all mineral occurrences identified, but is an estimate of those, which under assumed and justifiable technical, environmental, legal and social conditions, may be economically extractable at current (Ore Reserves) and has reasonable prospects for eventual economic extraction (Mineral Resources).

The term "Ore Reserves" in the context of this report has the same meaning as 'Mineral Reserves', as defined by the SAMREC Code. In the case of Kumba, the term 'Ore Reserves' is preferred because it emphasises the difference between these and Mineral Resources.

## ORE RESERVE: ECONOMICS

A long-term price line (Platts 62% index) and exchange rate, adjusted with Kumba-based forecasts of Lump and Fe premiums, deleterious element specifications and freight tariffs were agreed and forms the basis of Ore Reserves and Mineral Resources presented in this document. The latter is applied to site-specific mining block models, in combination with a forward extrapolation of current site-specific budgeted cost figures, to derive a set of pit shells for each site during the annual pit optimisation process. A so-called optimal (revenue factor ~1) shell is chosen for each site and engineered into a pit design or layout, which spatially envelopes the currently economically mineable Ore Reserves.

The Ore Reserves are furthermore derived from the *in situ* Measured and Indicated Mineral Resource portion occurring within the approved pit layouts only, through the modification thereof into run-of-mine, to account for site-specific mining efficiencies and other design, technical, environmental, legal and social aspects. The resultant Proved and Probable Ore Reserves are further modified into Saleable Product, considering site-specific beneficiation capacity and efficiencies, the latter in relation to specific ore types planned for beneficiation.

Cut-off grades are also assigned to ensure site-specific run-of-mine schedules that ensure the sustainable delivery of Saleable Product that complies with client product specifications.

# THE STATEMENT CONTINUED

## MINERAL RESOURCE: REASONABLE PROSPECTS FOR EVENTUAL ECONOMIC EXTRACTION

Mineral Resources are declared exclusive of (in addition to) Ore Reserves. Apart from cut-off grades, which consider the current or at least concept-approved foreseen beneficiation processes, Kumba spatially distinguishes Mineral Resources from other Mineral occurrences by applying a shell (1.6 x revenue factor "optimistic" shell). The latter is derived during the annual pit optimisation process conducted on the latest site-specific three-dimensional mining block models, considering mining bench configurations etc. The resource shell is then subsequently applied to the geological block models, defining the classified ore occurring inside the resource shell as the resultant Mineral Resource portion considered to have reasonable prospects for eventual economic extraction.

The proviso is that the iron ore price corresponding with a 1.6 revenue factor pit shell must have been historically achieved in the global iron ore market. This process therefore considers site-specific beneficiation, mining practices as well as relevant pricing and cost.

Inferred Mineral Resources considered in life-of-mine plans are separately indicated in the exclusive Mineral Resource Statement, with the extrapolated Inferred portion and long-term stockpile portion of the Mineral Resources quoted in the footnotes of the exclusive Mineral Resource Statement.

## SECURITY OF TENURE

All of the Ore Reserves and Mineral Resources as stated occur within mining and prospecting rights which have been notarially executed by Sishen Iron Ore Company Proprietary Limited (76.3% owned by Kumba Iron Ore Limited) and have not expired at the time of reporting. In the case of the Ore Reserves, the associated reserve life does not exceed the expiry date of the applicable right.

No material risk to security of tenure is perceived based on the Broad-Based Socio-Economic Empowerment Charter for the Mining and Minerals Industry as gazetted on 27 September 2018.

## POINT OF INTEREST

Production at Sishen commenced in 1953, primarily providing iron ore for consumption at domestic steel mills. Further exploration conducted during the 1960s led to a significant increase in the reserve base and, coupled with the completion of the Sishen-Saldanha railway line in 1976, production had increased through the facilitation of iron ore exports. Up to date (65 years) it is estimated that Sishen mine has produced in excess of 1 billion tonnes of iron ore product, with its planned Saleable Product (including modified Inferred Saleable Product) output for the next 14 years estimated at 416 Mt.

The Kumba Reserve and Resource (R&R) figures are derived from interpretation and estimation processes, informed by forward looking assumptions, which may not materialise as expected.

By their nature, the R&R figures as quoted in this report are therefore subject to a number of risks and uncertainties that could cause actual figures to differ from estimated figures.

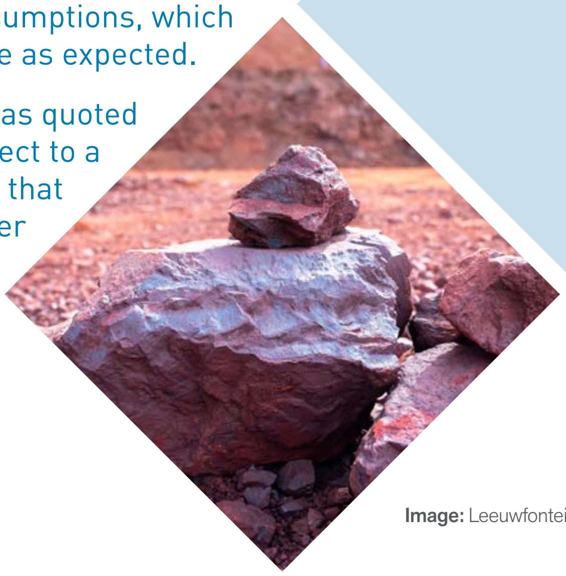


**Image:** Leeuwfontein pit at Kolomela mine.

# SALIENT FEATURES

## What stood out in 2018?

Since 2014, Kumba has implemented deliberate strategic actions to protect and grow its business. These strategic thrusts can be broadly categorised into three focus areas and periods:

- **Survival and resetting the base (2014 to 2015):** In response to a rapidly declining iron ore price (please refer to chart on page 5), Kumba had to strategically redesign the Sishen and Kolomela pits to reduce mining costs (waste stripping) and realign with the prevailing market conditions. While this resulted in lower costs it also materially impacted annual production as well as the life-of-mine.
- **Stabilisation and positioning for growth (2016 to 2018):** The Company revised its strategy to optimise the business, through the Anglo American operating model, technology, productivity improvements, continued cost reduction and price maximisation through delivering niche products.
- **Benchmark performance and growth (2018 to 2022):** Following a strategic review of the business, Kumba launched a full potential business transformation programme – *Tswelelopele* which aims to (by 2022):
  - Horizon 1 – significantly improve our margin through achieving benchmark productivities, maximising our resource utilisation (increasing yield and lump : fine ratio), cost control and obtaining the maximum price for our superior iron ore products.
  - Horizon 2 – to grow and sustain our core business which is the mining and beneficiation of high-grade ore bodies in the Northern Cape province of the Republic of South Africa. The focus in this horizon is extending our life-of-mine through incorporating the operational improvements realised in Horizon 1, development of low-grade beneficiation technologies and exploration in the Northern Cape.

The 2018 Reserve and Resource Statement is a culmination of the strategy and work from 2014 to 2018. The following salient features are highlighted:

- Saleable Product increased by 10% year-on-year, taking into account annual depletion.
- Ore Reserves were replenished by 112.1 Mt in 2018 (before the effect of 50.4 Mt of depletion in 2018 is accounted for), and as a result the reserve life at Sishen increased from 13 to 14 years while Kolomela remained stable at 14 years.
- Year-on-year significant lowering of ex-pit stripping ratio at both operations.
- The geological risk associated with the life-of-mine plans has been reduced at both operations because of the continued focus on on-lease exploration.
- Good progress with mining right amendments.
- Clean bill of health received from independent external auditors after review of the Kolomela Ore Reserve and Mineral Resource estimation and reporting processes.

Other salient features of the 2018 Reserve and Resource Statement:

- The prospecting right for the Zandrivierspoort project, an undeveloped low-grade magnetite deposit in the Limpopo province, will expire in 2020. *Sishen Iron Ore Company* is in discussions with its joint venture partner *ArcelorMittal SA* on future options. The project has not progressed beyond a concept study level.

## REPLENISHING ORE RESERVES AND SALEABLE PRODUCT WITHOUT COMPROMISING INCOME MARGINS AND SAFETY

The aim set early in 2018 is to convert ~390 Mt of current exclusive Mineral Resources to Ore Reserves in the near future and extend the reserve life, with the ambition to do so without compromising the Company's income margin or drive for zero harm. In line with the Horizon 1 and 2 strategy outlined above, Kumba has realised an increase in Ore Reserves of 56.5 Mt (8%), with an associated 56.2 Mt (10%) increase in Saleable Product in 2018. Accounting for the annual run-of-mine production in 2018 of 51.9 Mt and corrections of 3.7 Mt (under-estimation of forecast production for Q4 of 2017 at the time of reporting), the total Ore Reserve replenishment already achieved in 2018 equates to 112.1 Mt.

# SALIENT FEATURES CONTINUED


## YEAR-ON-YEAR DECREASE IN EX-PIT STRIPPING RATIOS

In 2018 Kumba realised a significant reduction in its stripping ratio at both operations:

- Kolomela – following a focused exploration programme targeting the conversion of Inferred Mineral Resources to Measured and Indicated, the life-of-mine (LoM) stripping ratio has reduced from 4.5 : 1 to 4.1 : 1 in 2018.
- Sishen – in 2018 a slope optimisation project was completed which resulted in a reduction in the LoM stripping ratio from 3.89 : 1 in 2017 to 3.4 : 1 in 2018.

## ON-LEASE EXPLORATION LOWERED GEOLOGICAL RISK OF BUSINESS PLAN BY REDUCING THE AMOUNT OF MODIFIED INFERRED MINERAL RESOURCES IN THE LIFE-OF-MINE PLANS

The continued focus on on-lease exploration has paid dividends to Kumba. The modified Inferred Mineral Resources considered in the Kolomela life-of-mine plan (LoMP) have been reduced from 22% in 2016 to 8% in 2017 and subsequently to 2% in 2018; similarly, for Sishen mine the modified Inferred Mineral Resources considered in its LoMP have been reduced from 5% in 2017 to 2% in 2018. This is a solid achievement which significantly reduces the geological risk the Company is exposed to.

## GOOD PROGRESS WITH MINING RIGHT AMENDMENTS

The section 102 application to amend the Sishen mining right to incorporate adjacent prospecting rights as was granted by the Department of Mineral Resources of the South African Government in 2017, was notarially executed on 29 June 2018. The right has subsequently been submitted for registration in the Minerals and Petroleum Titles Office.

On 14 October 2018, Sishen Iron Ore Company Proprietary Limited (SIOC) was granted consent in terms of section 102 of the Mineral and Petroleum Resources Development Act (MPRDA) to extend its Kolomela mine's mining right by the inclusion of the prospecting right properties which it applied for.

## ASSURANCE

An external independent audit (including a one-week site visit) of the 2017 Kolomela Resources and Reserves by Golder Associates Africa concluded the following:
"*Golder is satisfied that the technical inputs to the Kolomela Mineral Resources and Mineral Reserves in the areas reviewed are supportable. Golder supports the general approach and processes for the Mineral Resource and the Mineral Reserves declaration at Kolomela. In Golder's opinion, the choice of the methodology and processes applied meet or exceed industry standard as was similarly evidenced at the Sishen Iron Ore mine in 2017. Golder has also reviewed key inputs and parameters in relation to these processes and the modifying factors supporting the Mineral Reserves and is supportive of the parameters and assumptions applied.*"

# HIGH-LEVEL OVERVIEW OF KUMBA'S SALEABLE PRODUCT, ORE RESERVES AND MINERAL RESOURCES

The status of the foundation on which Kumba's business is based and continuously developed is considered to be firm.

## SALEABLE PRODUCT

Kumba Iron Ore treats or beneficiates its run-of-mine at its mining operations through crushing-and-screening, and various dense media separation (DMS) processes as well as jigging to produce Lump and Fine iron ore products. The respective 2018 LoMP product grade targets are set to limits to ensure that scheduled Saleable Product conforms to required market conditions in terms of grade and size specifications of clients, which mainly use the Kumba iron ore product as a supply in various processes to produce steel.

Saleable Product is derived through the application of fundamental and empirically derived beneficiation algorithms to the scheduled Ore Reserves, considering the various site-specific types of run-of-mine, site-specific beneficiation capacity efficiencies.

### SALEABLE PRODUCT SUMMARY (from a 100% ownership perspective)

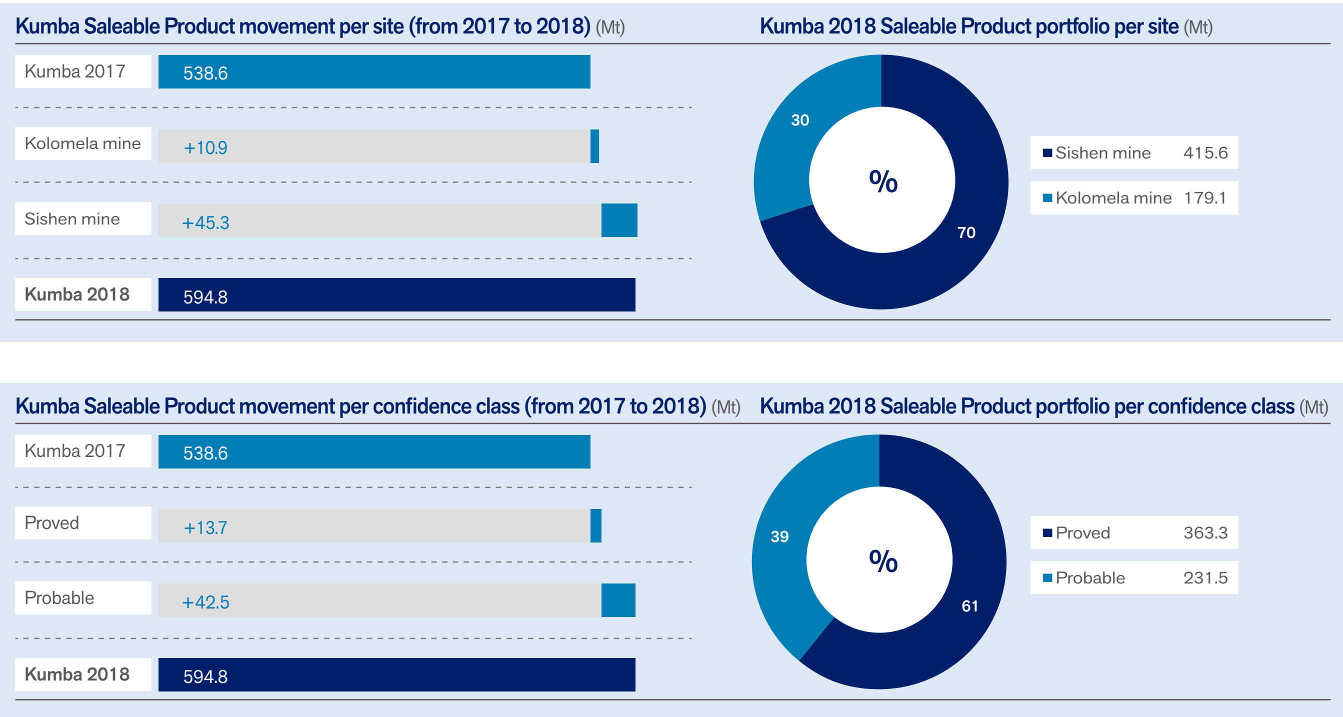



FIGURE 1: **KUMBA IRON ORE 2018 (VS 2017) SALEABLE PRODUCT SUMMARY**

As at 31 December 2018, Kumba Iron Ore plans to produce 594.8 million tonnes of Saleable Product at an average beneficiated grade of 64.5% Fe from its two mining operations over its remaining reserve life:

- Kolomela 179.1 Mt @ average 64.6% Fe
  [The 2018 Kolomela LoMP plan schedule delivers an average 60% Lump (64.8% Fe) and 40% Fines (63.2% Fe) Saleable Product.]
- Sishen 415.6 Mt @ average 64.4% Fe
  [The 2018 Sishen LoMP schedule delivers an average 71.8% Lump and 28.2% Fines Saleable Product. Three different Lump (different top-size and Fe) and four different Fines (different Fe) products are produced on-site.]

The Sishen products are co-located with the Kolomela products at the Saldanha export harbour to deliver the following products:

- Premium Lump @ 65.5% Fe
- Premium 20mm Lump @ 65.2% Fe
- Standard Fines @ 63.5% Fe

# HIGH-LEVEL OVERVIEW OF KUMBA'S SALEABLE PRODUCT, ORE RESERVES AND MINERAL RESOURCES CONTINUED

## YEAR-ON-YEAR MOVEMENT

A 10% increase of 56.2 Mt is noted for the overall Kumba Saleable Product compared to 2017.

- Kolomela 6% (10.9 Mt) year-on-year increase:
  Primarily because of a 7% year-on-year increase in Ore Reserves (scheduled plant feed), off-set by a 0.6% year-on-year decrease in the average planned yield due to a change in the direct shipping ore (DSO) to DMS ratio of 95 : 5 in 2017 to 94 : 6 in 2016.
- Sishen 12% (45.3 Mt) year-on-year increase:
  Primarily because of a 9% year-on-year increase in Ore Reserves or scheduled plant feed, complemented by an overall planned average yield year-on-year increase of 2.3% because of improvements in the efficiencies in the beneficiation plants; the largest driver the Jig (+modular UHDMS) plant with a yield increase from 64.7% in 2017 LoMP to 69.5% in the 2018 LoMP, and increased product from the UHDMS modular expansion project commissioned in 2018.

The decrease in the overall Proved to Probable Ore Reserve ratio from 66 : 34 in 2017 to 61 : 39 in 2018 is the result of the introduction of the in-house derived Sample Representivity Index parameter at Sishen mine to spatially measure borehole sample representivity and its impact on Mineral Resource and subsequent Ore Reserve and Saleable Product estimate confidence.

## KUMBA SALEABLE PRODUCT PROFILE (including modified and beneficiated Inferred Mineral Resources)

The Kumba combined (Sishen and Kolomela) planned Saleable Product profile is indicated in **Figure 2**.

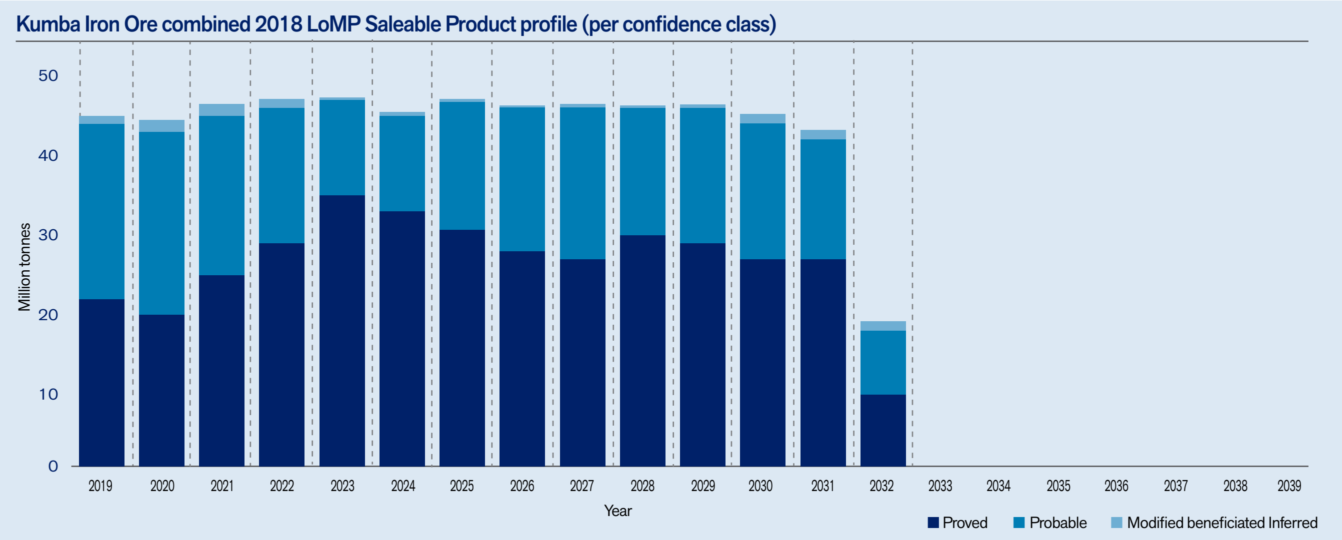



FIGURE 2: **KUMBA IRON ORE COMBINED SALEABLE PRODUCT PROFILE** (including modified beneficiated Inferred Mineral Resources)

# HIGH-LEVEL OVERVIEW OF KUMBA'S SALEABLE PRODUCT, ORE RESERVES AND MINERAL RESOURCES CONTINUED

## ORE RESERVES

Kumba's Ore Reserves are the economically mineable and beneficiable part of its Measured and Indicated Mineral Resources, planned for mining making use of existing infrastructure and technology. It includes diluting materials and allowances for losses, which occurs when the material is mined and is defined as economically extractable by the latest life-of-mine plans, which include the application of modifying factors and considers Kumba's latest view of or foreseen economic parameters in terms of long-term pricing and exchange rate as well as cost.

Where new infrastructure and/or technology are considered, Ore Reserves are only declared once a pre-feasibility or feasibility study has been approved by the relevant Anglo American and Kumba Iron Ore Investment Committees.

### ORE RESERVE SUMMARY (from a 100% ownership perspective)

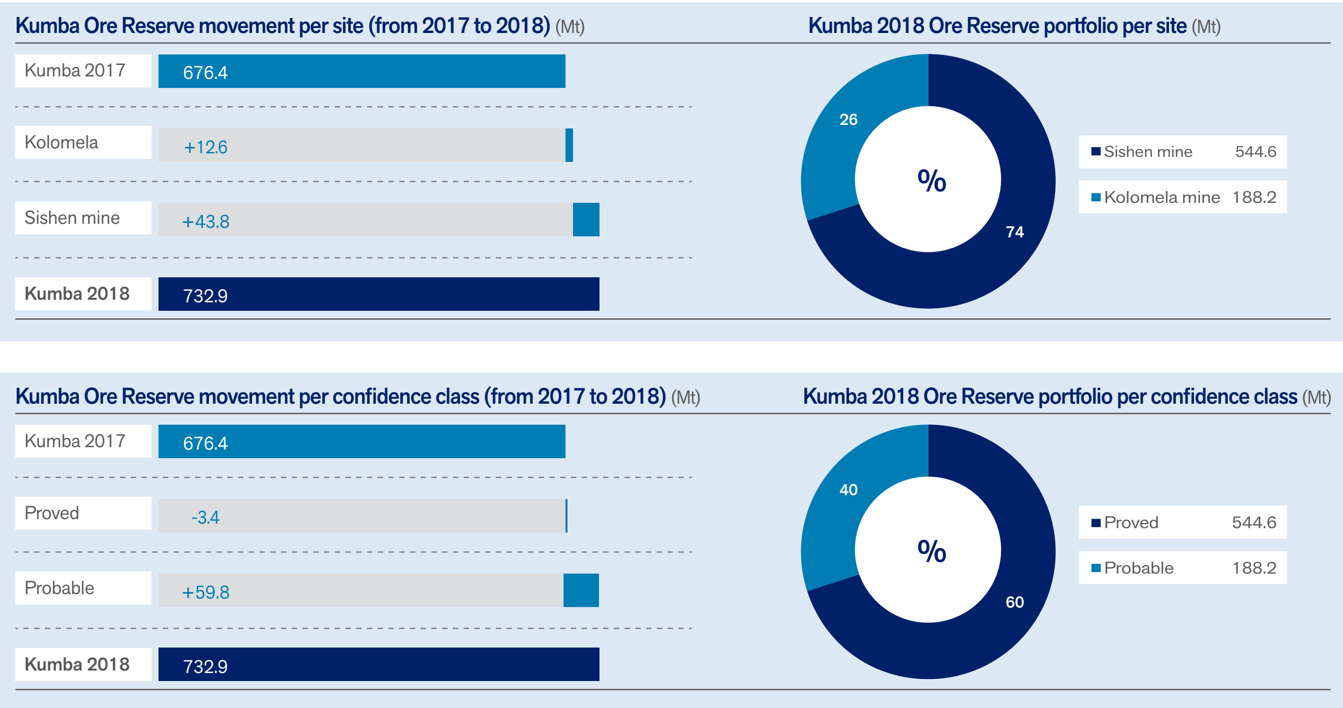



FIGURE 3: **KUMBA IRON ORE 2018 (VS 2017) ORE RESERVE SUMMARY**

As of 31 December 2018, Kumba Iron Ore, from a 100% ownership reporting perspective, had access to an estimated haematite Ore Reserve of 732.9 million tonnes at an average unbeneficiated or feed grade of 59.1% Fe from its two mining operations:

- Kolomela 188.2 Mt @ 63.9% Fe (against a 50.0% Fe cut-off grade)
- Sishen 544.6 Mt @ 57.5% Fe (against a 40.0% Fe cut-off grade)

# HIGH-LEVEL OVERVIEW OF KUMBA'S SALEABLE PRODUCT, ORE RESERVES AND MINERAL RESOURCES CONTINUED

## YEAR-ON-YEAR MOVEMENT

An 8% increase of 56.5 Mt is noted for the overall Kumba Ore Reserves compared to 2017.

- Kolomela 7% (12.6 Mt) year-on-year increase:
  The primary aspect that resulted in a year-on-year increase of the Kolomela Ore Reserves is the continued focus on on-lease exploration, which made available additional Measured and Indicated Mineral Resources for conversion to Ore Reserves.

  This Ore Reserve increase is associated with a year-on-year decrease in the associated ex-pit stripping ratio from 4.5 : 1 to 4.1 : 1.

- Sishen 9% (43.8 Mt) year-on-year increase:
  Most of the annual increase can be attributed to an optimisation of the pit slopes of the Sishen pit design based on advances made in the spatial geotechnical modelling field, enabling a better spatial understanding of pit slope failure mechanisms, allowing for optimisation of pit slope designs.

  This Ore Reserve increase is associated with a decrease in the ex-pit stripping ratio from 3.89 : 1 in 2017 to 3.4 : 1 in 2018.

The decrease in the overall Proved to Probable Ore Reserve ratio from 65 : 35 in 2017 to 60 : 40 in 2018 is the result of the application of the in-house derived Sample Representivity Index parameter to spatially estimate borehole sample representivity (based on its QA/QC metadata) and its impact on Mineral Resource and subsequent Ore Reserve estimation confidence.

## KUMBA RUN-OF-MINE PROFILE (including modified Inferred Mineral Resources)

The Kumba combined (Sishen and Kolomela mine) planned run-of-mine profile is indicated in **Figure 4**.

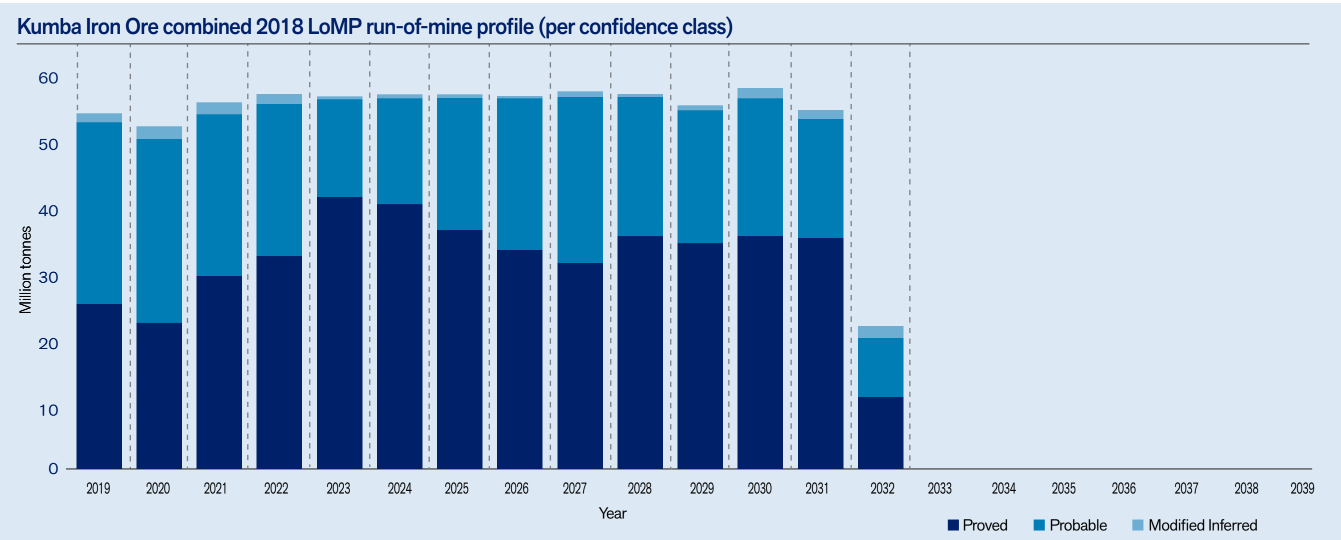


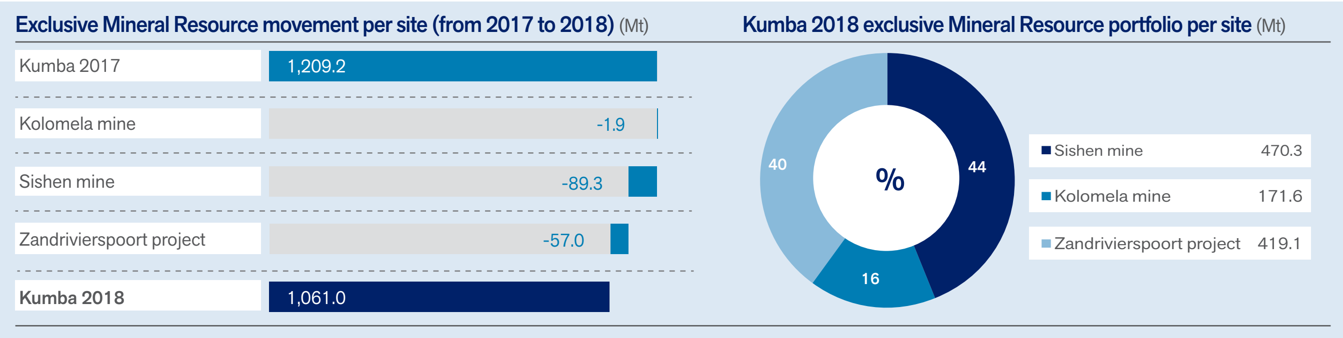

FIGURE 4: **KUMBA IRON ORE COMBINED RUN-OF-MINE PROFILE** (including modified Inferred Mineral Resources)

# HIGH-LEVEL OVERVIEW OF KUMBA'S SALEABLE PRODUCT, ORE RESERVES AND MINERAL RESOURCES CONTINUED

## MINERAL RESOURCES

Kumba's Mineral Resources are the *in situ* iron ore of which the form, grade and quantity are spatially defined. In addition, long-term iron ore stockpiles of which the average grade is above the site-specific cut-off grades are also declared as Mineral Resources. It is not an inventory of all mineral occurrences identified, but is an estimate of those, which under assumed and justifiable technical, environmental, legal and social conditions have reasonable prospects for its eventual economic extraction as per Kumba's current understanding of its value chain and market conditions. The location, quantity, grade, continuity and other geological characteristics of the Mineral Resources are known, interpreted and estimated from specific geological evidence and knowledge, including sampling.

### EXCLUSIVE MINERAL RESOURCE SUMMARY (from a 100% ownership perspective)



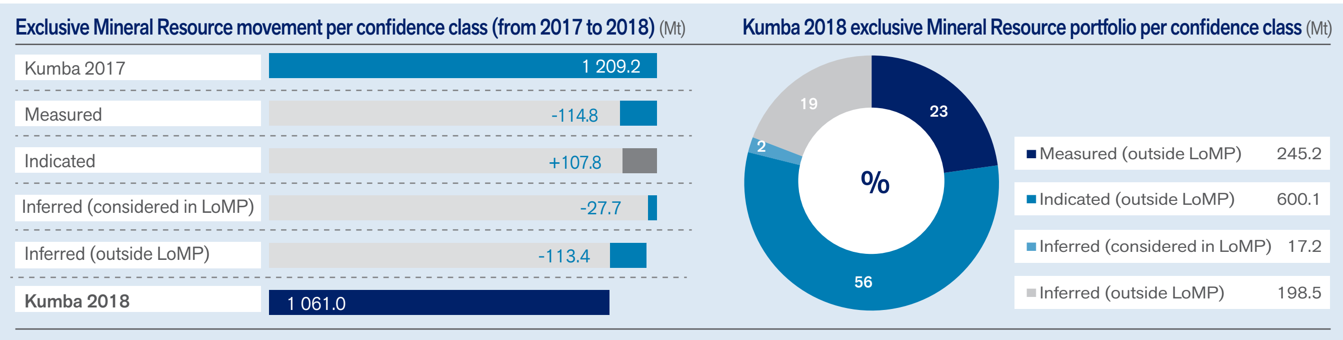




FIGURE 5: **KUMBA IRON ORE 2018 (VS 2017) EXCLUSIVE MINERAL RESOURCE SUMMARY**

As at 31 December 2018, Kumba had a remaining exclusive (in addition to Ore Reserves) Mineral Resource base estimated at 1.06 billion tonnes, of which 641.9 Mt, at an average *in situ* grade of 56.2% Fe can be assigned to the Kumba mining operations. The Zandrivierspoort (prospecting right) magnetite deposit, contributes 419.1 Mt @ 35.4% Fe to the Kumba Mineral Resource base.

**Haematite ore bodies:**

- Kolomela mine 171.6 Mt @ average 62.3% Fe (against a 50.0% Fe cut-off grade)
- Sishen mine 470.3 Mt @ average 54.0% Fe (against a 40.0% Fe cut-off grade)

**Magnetite ore bodies:**

- Zandrivierspoort project (post-concept) 419.1 Mt @ average 35.4% Fe and 39.5% magnetite content (against a 20.2% Fe cut-off grade)

# HIGH-LEVEL OVERVIEW OF KUMBA'S SALEABLE PRODUCT, ORE RESERVES AND MINERAL RESOURCES CONTINUED

## YEAR-ON-YEAR MOVEMENT

A 12% net decrease of 148.2 Mt is noted for the overall Kumba Mineral Resource compared to 2017.

- Kolomela — 1% (1.9 Mt) year-on-year decrease:
  Primarily because of geological model updates based on new borehole information and the subsequent upgrade of Inferred and Indicated Mineral Resources to Measured Mineral Resources, the latter in turn being converted to Ore Reserves.
- Sishen — 16% (89.3 Mt) year-on-year decrease:
  The material year-on-year decrease is primarily the result of the removal of a portion from the low-grade Mineral Resource portfolio. Geometallurgical test work conducted as part of the Sishen low-grade project pre-feasibility study has shown the Flagstone lithology portion of the low-grade Mineral Resources to demonstrate poor beneficiation characteristics, rendering the material to have a high risk in terms of achieving reasonable prospects for eventual economic extraction, as a high ratio of high-grade run-of-mine is required for blending with this material to achieve Saleable Product grade specifications.
- Zandrivierspoort — 12% (57.0 Mt) year-on-year decrease:
  Mainly attributable to a change in the economic assumptions of the project resulting in a smaller resource shell size because of smaller price-to-cost margins based on a revised business case where pig-iron is produced instead of a magnetite concentrate.

The change in the overall Measured to Indicated to Inferred exclusive Mineral Resource ratio from 30 : 41 : 29 in 2017 to 23 : 57 : 20 in 2018, is the result of the application of the in-house derived Sample Representivity Index parameter to spatially estimate borehole sample representivity (based on its QA/QC metadata) and its impact on Mineral Resource confidence.

# PURPOSE

This statement describes the foundation for Kumba Iron Ore's long-term business as per the Company's current understanding, thinking and planning.

It is the objective of this statement to declare the Kumba Ore Reserves (and Saleable Product) and exclusive Mineral Resources as at 31 December 2018 and compare it with the corresponding 31 December 2017 figures. In addition, it aims to provide all relevant detail in support of the statement to explain how the Ore Reserve and Mineral Resource estimates were derived and what aspects thereto may be material for investment decisions.

It must be noted that the Mineral Resource and Ore Reserve figures presented in this statement are estimates, and although it has been derived to the best possible knowledge of the competent persons, it is inherently subject to some level of uncertainty and inaccuracy. The respective Competent Persons, however, take full responsibility for the Mineral Resource and Ore Reserve declarations.

This statement in essence is the collective view of the Ore Reserve and Mineral Resource competent persons and strives to deliver a transparent and material view of the Kumba Ore Reserves and Mineral Resources to inform all relevant stakeholders.


**Image:** (Left) Signage of the sacred covenant safety code along the road to the entrance at Kolomela mine. (Right) Otladisa Mokhutsane, a laboratory technician in the quality control laboratorium at Kolomela mine.

# LOCATION

## Location of operations and exploration projects is dictated by geology

All the Kumba sites for which Ore Reserves and/or Mineral Resources were declared in 2018 are located within the Republic of South Africa (**Figure 6**). As is the case with all mineral companies, the location of operations and exploration projects is dictated by geology. The Kumba operations (Kolomela mine and Sishen mine) are located in the Northern Cape province. The Zandrivierspoort exploration project is located in the Limpopo province.

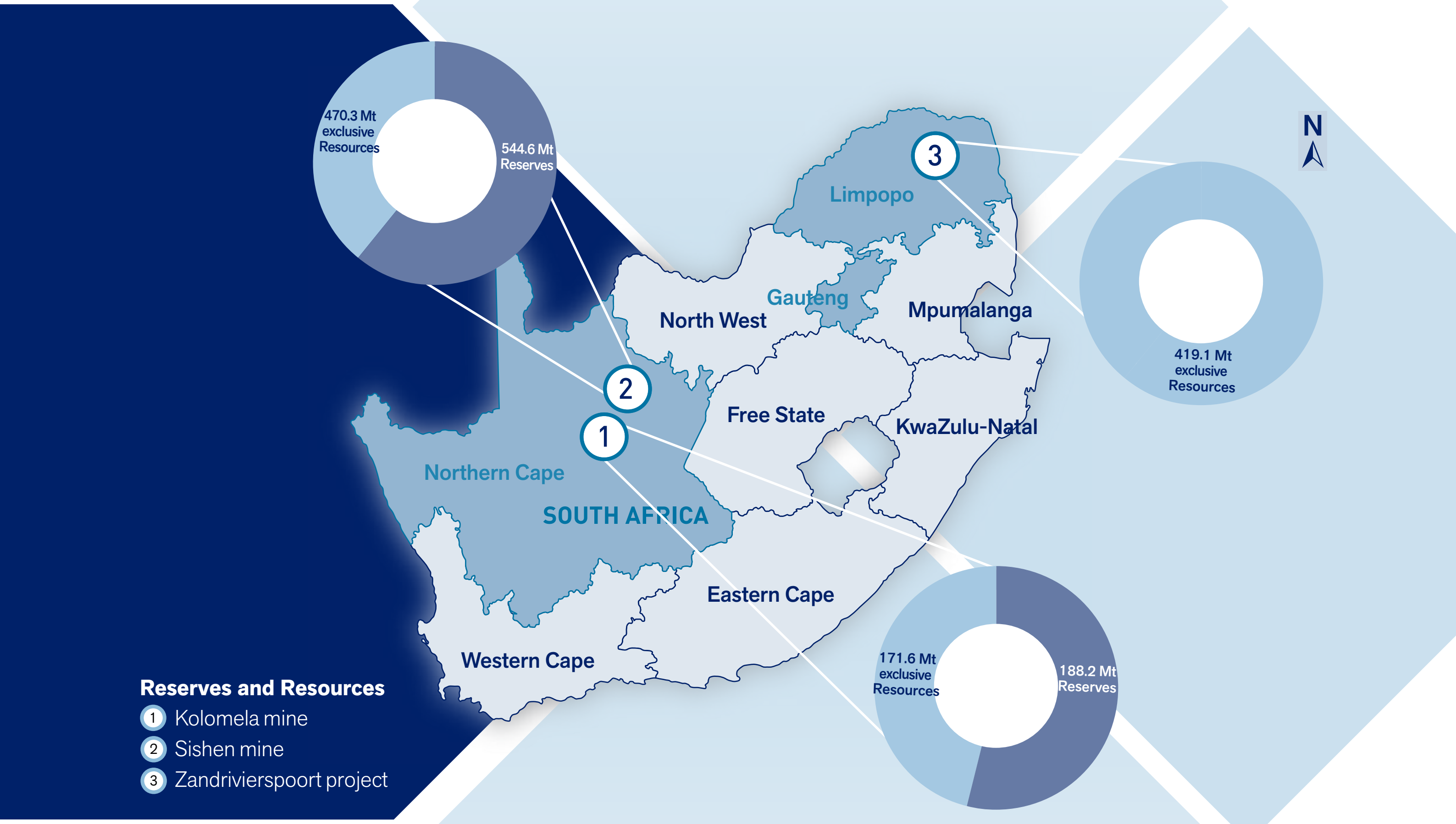



FIGURE 6: **GEOGRAPHIC LOCATIONS OF KUMBA OPERATIONS AND PROJECTS FOR WHICH ORE RESERVES AND MINERAL RESOURCES HAVE BEEN DECLARED**

The WGS84 latitude/longitude geographical coordinate map references of the Kumba entities for which Ore Reserves and/or Mineral Resources have been declared in 2018 are listed below:

### 1 Kolomela mine

- Kolomela mine in the Northern Cape province near the town of Postmasburg

**(28°23'30.05" S and 22°58'46.88" E)**

### 2 Sishen mine

- Sishen mine in the Northern Cape province near the town of Kathu, which accounts for the bulk of Kumba's production

**(27°44'02.29" S and 23°00'39.95" E)**

### 3 Zandrivierspoort project

- The Zandrivierspoort project, approximately 25km northeast of Polokwane in the Limpopo province

**(23°40'17.65" S and 29°35'41.08" E)**

# ATTRIBUTABLE OWNERSHIP

Kumba has access to its Ore Reserves and Mineral Resources through Sishen Iron Ore Company, in which it has 76.29% attributable ownership.

Kumba Iron Ore, a business unit of the Anglo American plc Group as the major shareholder, has access to its iron ore Reserves and Resources through Sishen Iron Ore Company Proprietary Limited (SIOC). SIOC is the entity to which the mining and prospecting rights have been granted. The relevant Kumba Iron Ore ownership structure is illustrated in **Figure 7**.

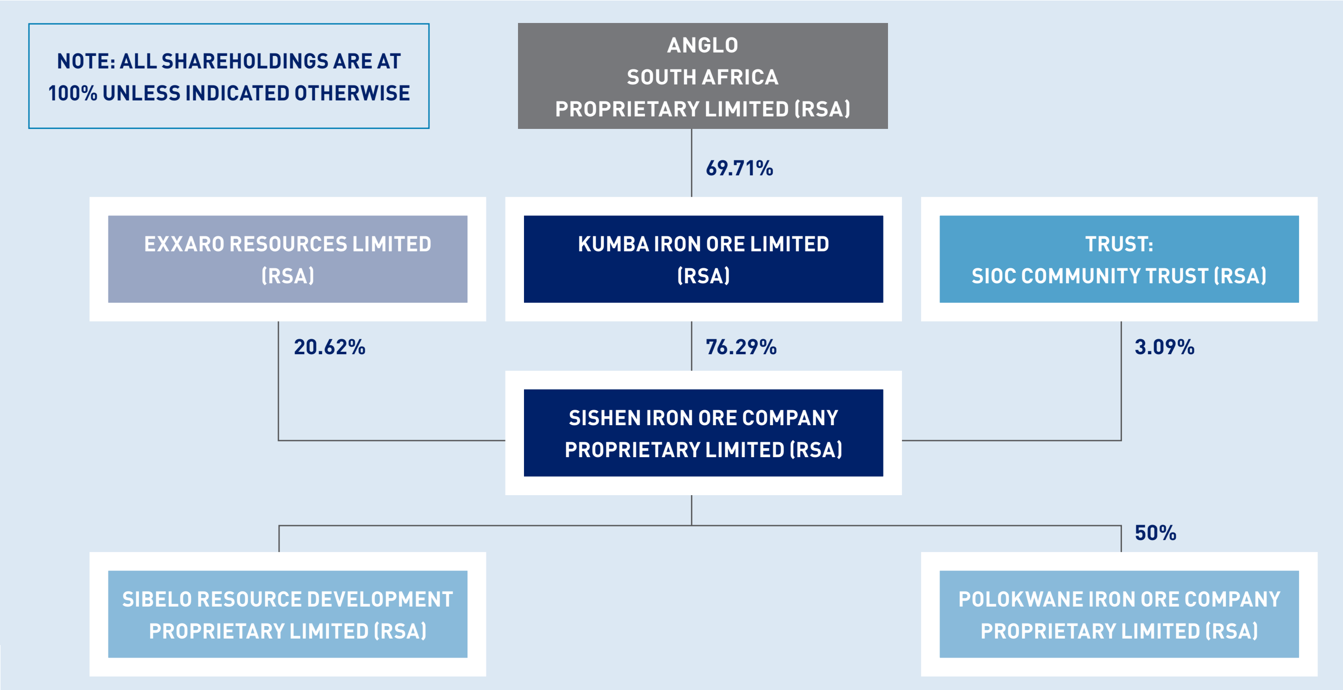



FIGURE 7: **KUMBA IRON ORE OWNERSHIP STRUCTURE** (at the time of reporting)

For this statement, all Ore Reserve (and Saleable Product) and Mineral Resource estimates, whether Kumba Iron Ore's attributable ownership in the specific mineral asset is less than 100% or not, are reported as 100%; with the percentages attributable to Kumba Iron Ore indicated in the relevant tables. The overall proportion attributable to Sishen Iron Ore Company (SIOC), Kumba Iron Ore (KIO) and Anglo South Africa (ASA) is summarised in **Table 1**.

TABLE 1: **SIOC, KIO AND ASA MINERAL ASSET OWNERSHIP** (at the time of report compilation – 31 October 2018)

| | % owned by SIOC | | % owned by Kumba Iron Ore | | % owned by other | | % owned by AA plc via KIO[1] | |
|---|---|---|---|---|---|---|---|---|
| Mineral asset | **2018** | 2017 | **2018** | 2017 | **2018** | 2017 | **2018** | 2017 |
| Kolomela mine | **100.0** | 100.0 | **76.3** | 76.3 | **23.7** | 23.7 | **53.2** | 53.2 |
| Sishen mine | **100.0** | 100.0 | **76.3** | 76.3 | **23.7** | 23.7 | **53.2** | 53.2 |
| Zandrivierspoort project[2] | **50.0** | 50.0 | **38.2** | 38.2 | **61.8** | 61.8 | **26.6** | 26.6 |

1 The holding company Sishen Iron Ore Company (SIOC) is 76.3% owned by Kumba Iron Ore, and in turn Kumba Iron Ore is 69.7% owned by Anglo South Africa (as at 31 October 2018 – time of report compilation).
2 Zandrivierspoort is a 50 : 50 Joint Venture between *ArcelorMittal SA* and *SIOC* in a company called *Polokwane Iron Ore Company*.

# SECURITY OF TENURE

## Kumba's right to mine and prospect

All Ore Reserves (and Saleable Product) and Mineral Resources (in addition to Ore Reserves) quoted in this document are held under notarially executed mining and prospecting rights granted to Sishen Iron Ore Company Proprietary Limited (SIOC) in terms of the Mineral and Petroleum Resources Development Act No 28 of 2002 (MPRDA) by the Department of Mineral Resources (DMR) of the South African Government. Kumba holds a 76.3% share in SIOC (at the time of reporting).

### STATUS OF MINING RIGHTS

SIOC is the holder of mining rights for both its operations and the rights are of sufficient duration to enable the complete execution of the life-of-mine plans from which the Ore Reserves and Saleable Product have been derived. In terms of the MPRDA, SIOC also has the exclusive right to extend the period of these mining rights if so required.

The status of the mining rights are as follows:
**Kolomela mine** was granted a mining right for iron ore on 18 September 2008 for a 30-year mining period. An application to amend the supporting mining work programme (MWP) has been lodged in 2015 and a further amendment application to cater for, *inter alia,* the increase in production levels as per the 2016 LoMP, was lodged on 31 January 2017, which application was subsequently approved on 7 July 2017. The approval of this made the application lodged in 2015 (see above) redundant.

On 14 October 2018, SIOC was granted consent in terms of section 102 of the MPRDA to extend its Kolomela mine's mining right by the inclusion of the Heuningkranz prospecting right properties which it applied for.

Outstanding mining right amendment applications include:
- 2014 – section 102 application to amend clause 8 of the Kolomela mining right to cater for the ArcelorMittal SA transaction. Clause 8 of the mining right requires of the holder of a mining right to dispose of the mineral it mines at "arm's length" prices. The domestic ArcelorMittal SA contract requires of SIOC to dispose of iron ore at a set price which is not necessarily market related. Subsequently, SIOC applied for clause 8 to be amended accordingly to cater for the ArcelorMittal SA transaction.
- 2015 – section 102 application to amend the Kolomela mining right to substitute the Regulation 42 plan with an approved SG diagram.

**Sishen mine** was granted a mining right for iron ore and quartzite on 11 November 2009 for a 30-year mining period. The mining right area was extended in 2014, following a section 102 application to incorporate the old Transnet railway properties transecting the mining area from north to south, granted by the DMR on 28 February 2014. An outstanding 21.4% undivided share in the mining right was also granted to SIOC in 2016, making it the sole owner of the right to mine iron ore and quartzite within the mining right area.

SIOC submitted a section 102 application to incorporate the adjacent prospecting right areas into the existing Sishen mining right on 1 July 2016. This application was granted to SIOC on 25 June 2017, and the right was subsequently notarially executed on 29 June 2018.

There are no outstanding mining right amendment applications for Sishen mine.

**Thabazimbi mine:** On 12 October 2018 Kumba and ArcelorMittal SA advised the market that all the conditions precedent to the transfer of Thabazimbi mine (the mine), together with the mining rights, to ArcelorMittal SA have either been fulfilled or waived.

The employees, assets and liabilities as well as the mining rights and the assumed liabilities for the mine transferred at a nominal purchase consideration from Sishen Iron Ore Company Proprietary Limited (*SIOC*) to Thabazimbi Iron Ore Mine Proprietary Limited (a wholly owned subsidiary of ArcelorMittal SA), previously ArcelorMittal SA Operations Proprietary Limited on 1 November 2018.

### STATUS OF PROSPECTING RIGHTS

Kumba has declared Mineral Resources on one prospecting right, referred to as the Zandrivierspoort project (50 : 50 joint venture between *SIOC* and *ArcelorMittal SA*), an undeveloped low-grade magnetite deposit in the Limpopo province. The prospecting right is held by SIOC. It initially expired on 17 November 2011 but a renewal application was granted for the period 22 March 2017 to 21 March 2020. *Sishen Iron Ore Company* is in discussions with its joint venture partner *ArcelorMittal SA* on future options. The project has not progressed beyond a concept study level.

# COMPETENCE

Kumba considers its relevant technical specialists as competent to declare Ore Reserves and Mineral Resources in accordance with the SAMREC Code – 2016 edition, to provide the decision maker with a transparent and material insight into the Company's Ore Reserve and Mineral Resource status at a given point in time.

The Ore Reserve and Mineral Resource estimates were prepared by or under the direct supervision of Competent Persons as defined in the SAMREC Code (2016 edition). All Competent Persons have sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which they are undertaking. All the Competent Persons consent to the inclusion in this statement of the information in the form and context in which it appears. All Competent Persons (**Table 2, Table 3** and **Table 4**) informing the 2018 Kumba Ore Reserve (and Saleable Product) and Mineral Resource Statement assumed responsibility by means of signing a Competent Person appointment letter, kept by the Company's Principal – Mineral Resources & Geometallurgy, at Kumba's Centurion Gate Office in Pretoria, South Africa.

## TABLE 2: CORPORATE RESPONSIBILITY – LEAD COMPETENT PERSONS

### Republic of South Africa – Kumba corporate office

| Business unit | Field | Name | Title | Employed by | Professional organisation | Registration number | Years' relevant experience |
|---|---|---|---|---|---|---|---|
| Kumba Iron Ore | Mineral Resources | Jean Britz | Principal Mineral Resources & Geometallurgy | Sishen Iron Ore Company Proprietary Limited | SACNASP Professional Natural Scientist | 400423/04 | 14 |
| | Ore Reserves* | Theunis Otto | Head Mining Engineering | Sishen Iron Ore Company Proprietary Limited | ECSA Professional Engineer | 990072 | 14 |

*The term "Ore Reserves" in the context of this report has the same meaning as "Mineral Reserves", as defined by the SAMREC Code. The term "Ore Reserves" is preferred because it emphasises the difference between these and Mineral Resources.

## TABLE 3: MINING OPERATION RESPONSIBILITY

### Republic of South Africa – Kumba Iron Ore operations

| Operations | Field | Name | Title | Employed by | Professional organisation | Registration number | Years' relevant experience |
|---|---|---|---|---|---|---|---|
| Kolomela mine | Mineral Resources | Hannes Viljoen | Section Manager, Exploration and Resource Geology | Sishen Iron Ore Company Proprietary Limited | SACNASP Professional Natural Scientist | 400245/10 | 11 |
| | Ore Reserves | Grant Crawley | Senior Mining Engineer | School of Rock | ECSA Professional Engineer | 20130120 | 8 |
| Sishen mine | Mineral Resources | Fanie Nel | Principal, Geodata | Sishen Iron Ore Company Proprietary Limited | SACNASP Professional Natural Scientist | 400220/06 | 10 |
| | Ore Reserves | Derek Esterhuysen | Principal Mining Engineer | Sishen Iron Ore Company Proprietary Limited | ECSA Professional Engineer | 20040033 | 10 |

# COMPETENCE CONTINUED

## TABLE 4: PROJECT RESPONSIBILITY

**Republic of South Africa – Kumba Iron Ore projects**

| Projects | Field | Name | Title | Employed by | Professional organisation | Registration number | Years' relevant experience |
|---|---|---|---|---|---|---|---|
| Zandriviersport project | Mineral Resources | Stuart J Mac Gregor | Head of Geosciences | Sishen Iron Ore Company Proprietary Limited | SACNASP Professional Natural Scientist | 400029/09 | 12 |
| | No Ore Reserve declared in 2018 | | | | | | |

The Lead Competent Persons for Ore Reserves and Mineral Resources as appointed in 2018 can without any qualifications state that:

- The Ore Reserve and Mineral Resource figures presented in this statement are considered to be a true reflection of the Ore Reserve and Mineral Resource estimates as at 31 December 2018 for Kumba, and that public reporting is based on site-specific Reserve and Resource Statements that have been carried out in accordance with the minimum standards and guidelines of the SAMREC Code (2016 edition) as verified and to the best of the knowledge of the Competent Persons.
- The Ore Reserve and Mineral Resource figures quoted in this statement have been reviewed by a panel of peers, including technical specialists from Anglo American.
- The Lead Competent Persons have not been unduly influenced by Kumba Iron Ore or any person commissioning the Ore Reserve and Mineral Resource Statement and is of the opinion that all critical assumptions are documented, and adequate disclosure is made of all material aspects that the informed reader may require, to make a reasonable and balanced judgement of the Ore Reserve and Mineral Resource figures.
- The Lead Competent Persons have sufficient experience relevant to the style and type of mineral deposit under consideration and to the activity which is being undertaken to qualify as a Competent Person as defined in the SAMREC Code (2016 edition).
- The Lead Competent Persons consent to the inclusion in the Kumba Iron Ore Integrated Report as well as in the AA plc R&R Report and R&R summary section of the AA plc Annual Report, of the public R&R information (as defined in the Kumba R&R policy and reporting procedure documents) in the form and context in which it appears in this statement.

Kumba appreciates any feedback regarding the competency, materiality and transparency with which its Ore Reserves and Mineral Resources have been presented in this statement.

**Feedback:** (jean.britz@angloamerican.com)

# GOVERNANCE

Kumba, through Anglo American plc, applies a rigorous scheduled governance programme to ensure representative Ore Reserve (and Saleable Product) and Mineral Resource reporting.

Applicable codes and policies are uniformly applied throughout Anglo American plc (AA plc) via a governance document, ie the AA plc group technical standard (AA_GTS_22), which holistically governs Resource and Reserve reporting for all the AA plc business units, of which Kumba Iron Ore forms part.

Kumba internalised the SAMREC Code and its policy and the relevant AA plc group standards by deriving a reporting procedure (KUMBA IRON ORE MINERAL RESOURCE AND ORE RESERVE REPORTING PROCEDURE) applicable to iron ore as a commodity and the opencast mining thereof, that stipulates adherence to the former. The procedure is revised annually, with refinements proposed by an official Resource and Reserve Reporting Work Group, with changes annually communicated to the executive management of Kumba.

The Kumba Reserve and Resource Reporting governance framework is summarised in **Figure 8**.

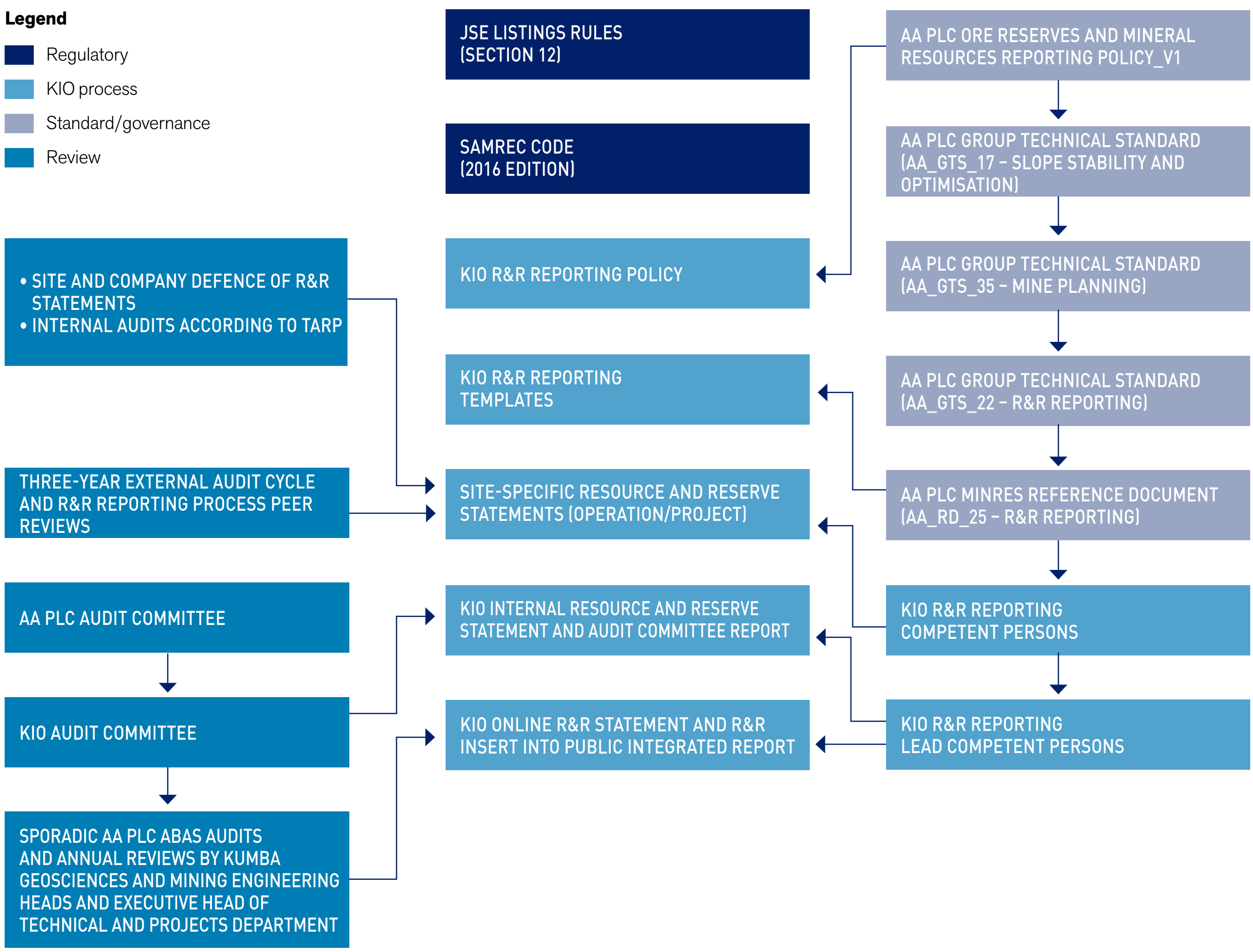



FIGURE 8: **KUMBA IRON ORE RESERVE AND RESOURCE REPORTING GOVERNANCE FRAMEWORK**

# ASSURANCE

Kumba follows a structured internal and external review programme to verify representative Ore Reserves (and Saleable Product) as well as Mineral Resources estimation.

The Anglo American and Kumba Iron Ore Audit Committees require all reporting entities (Operations, Projects and Exploration) to undergo a continuous and comprehensive programme of audits and reviews aimed at providing confidence and assurance in respect of all components contributing to the Ore Reserve and Mineral Resource estimation processes and the public reporting of those estimates.

As most of the Kumba Reserve and Resource estimation and reporting is conducted by Sishen Iron Ore Company Proprietary Limited employed technical specialists and Competent Persons, Kumba recognises the importance of independent external audits of its R&R estimation and reporting processes and associated output to provide assurance regarding its published R&R estimates. Since the inception of Kumba Iron Ore, its executive management has sustained a governance cost centre that sponsors or allows for the contracting of a reputable independent external mining consultancy firm, to be changed every four years.

Kumba prefers each operation/project for which Mineral Resources and Ore Reserves are declared to undergo an external independent due diligence audit once every three years. The scope of work required encompasses a due diligence (sign-off) audit of about two to four weeks and must include an additional one-week site visit by the auditors. The audit should not only produce ranked findings but also ranked opportunities. Ranking is conducted according to the Anglo American Risk Matrix (**Figure 9**), a standard adopted by all disciplines/functions within the Group as part of its risk management process, to allow for a uniform approach to the assessment and comparisons of risks across the value chain.

Currently, Golder Associates (Africa) is in its second year of contract, having conducted:

- A full due diligence audit in 2017 (including a one week site visit by a professionally registered mining engineer and geoscientist) of the 2016 Sishen Mineral Resources and associated estimation processes and the 2016 Sishen Ore Reserves and associated life-of-mine planning processes. ***No high/significant risks were identified.***

- A full due diligence audit in 2017 (including a one week site visit by a professionally registered mining engineer and geoscientist) of the 2016 Sishen low-grade project concept study Mineral Resource estimates and the processes informing the estimates, as well as the reporting of the 2016 Sishen low-grade project Mineral Resources. ***No high/significant risks were identified.***

  *"Golder is satisfied that the technical inputs to the Sishen low-grade project in the areas reviewed are supportable. Golder supports the general approach and processes for the Mineral Resource estimate. In Golder's opinion, the choice of the methodology and processes applied meet or exceed industry standard."*

# ASSURANCE CONTINUED

**CONSEQUENCE**
(Where an event has more than one "consequence type", choose the "consequence type" with the highest rating)

| PROBABILITY | | Insignificant | Minor | Moderate | High | Major |
|---|---|---|---|---|---|---|
| | | **RISK LEVEL** | | | | |
| Almost certain | 90% and higher probability of occurring | 11 | 16 | 20 | 23 | 25 |
| Likely | Between 60% and less than 90% of occurring | 7 | 12 | 17 | 21 | 24 |
| Possible | Between 30% and 60% probability of occurring | 4 | 8 | 13 | 18 | 22 |
| Unlikely | Between 1% and 30% probability of occurring | 2 | 5 | 9 | 14 | 19 |
| Rare | Less than 1% probability of occurring | 1 | 3 | 6 | 10 | 15 |

| Risk rating | Risk level | Guidelines for risk matrix |
|---|---|---|
| 21 to 25 | High | A high risk exists that management's objectives may not be achieved. Appropriate mitigation strategy to be devised immediately. |
| 13 to 20 | Significant | A significant risk exists that management's objectives may not be achieved. Appropriate mitigation strategy to be devised as soon as possible. |
| 6 to 12 | Medium | A moderate risk exists that management's objectives may not be achieved. Appropriate mitigation strategy to be devised as part of the normal management process. |
| 1 to 5 | Low | A low risk exists that management's objectives may not be achieved. Monitor risk, no further mitigation required. |

FIGURE 9: **ANGLO AMERICAN RISK MATRIX**

- A full review in 2018 (including a one week site visit by a professionally registered mining engineer and geoscientist) of the 2017 Kolomela mine Resource and Reserve estimates and the processes informing the estimates, as well as the reporting of the 2017 Kolomela Mineral Resources and Ore Reserves.

  ***Two significant risks were identified***
  - "*Pit optimisation: The selected pit shell maximises resource utilisation but does not consider discounted cash flow.*"
    Mitigation: Initiate comparison to assess potential discounted cash flow differential on per-pit basis and compare to the currently selected pit shells at Kolomela mine – to be completed before next round of Mineral Resource reporting.
  - *"Possible misalignment of cost input: Assessment of owner mining costs, capital forecast costs, and contract mining costs may be misaligned."*
    Mitigation: Review cost model that integrates with LoMP in order to reduce risk of "broken links" or errors in cost modelling assessment of LoMP.

Apart from the independent external due diligence audits, Kumba also conducts external independent appraisal audits as well as cross-business, internal independent reviews if and when required with the frequency and depth a function of:

- The risks and/or uncertainties associated with the Ore Reserve and Mineral Resource estimates of a particular operation or a project.
- The potential economic impact on the business.
- The time period that has elapsed since an external independent audit or review has been conducted.

An independent appraisal audit was conducted on the 2017 Zandrivierspoort project solids model (informing the 2018 geological grade model update) by TECT Geological Consulting, as a complete redo of the former explicit solids model was conducted, replacing it with an implicit solids model. The implicit solids model appraisal audit identified more than one significant finding, which prompted Kumba to have the solids model recompiled to address all the findings.

For 2019, an independent external due diligence audit is planned for the Sishen low-grade project feasibility study Ore Reserves, as well as the Ploegfontein (ore body at Kolomela mine not included in current LoMP) Mineral Resources front-end loading a concept study.

# ORE RESERVES (AND SALEABLE PRODUCT)

In Kumba's environment, this is what generates the cash, if accurately planned and subsequently extracted safely, responsibly, cost-effectively and most importantly, according to client needs.

Kumba applies a uniform Ore Reserve estimation process at all its sites as explained below:

## RESOURCE ESTIMATION

| | |
|---|---|
| **MINING BLOCK MODELLING** | • The *in situ* Mineral Resource tonnages and grades as estimated and classified within 3D geological block models are initially modified by converting the geological block models into mining block models, considering aspects such as smallest mining unit and open-pit bench definitions.<br>• In the mining block model, planned modifying factors such as dilution and mining losses are realised while other factors such as geological losses and mining recovery efficiencies, determined via value chain reconciliation of actual geological accuracies and extraction efficiencies, are applied to convert *in situ* ore to a run-of-mine ore equivalent. Software: *GEOVIA Surpac*™ |
| **PIT OPTIMISATION** | • The resultant mining block model is constrained via pit optimisation, using various fiscal parameters and geotechnical slope inputs, to spatially distinguish between ore which is currently (optimal pit shell) and eventually economically extractable (optimistic pit shell). The fiscal parameters used for pit optimisation is explained in a separate section. Software: *GEOVIA Whittle 4X*™ |
| **PIT DESIGN** | • The optimal pit shell is engineered or designed into a safe practical pit layout, considering geotechnical slope stability parameters, equipment aligned haul road and ramp as well as bench definitions. The pit layout envelopes the current economically extractable ore volume, and forms the basis for the life-of-mine scheduling and resultant Ore Reserve and Saleable Product estimates. Software: *Trimble Open Pit Design*™, *GEOVIA Surpac*™ *and Deswik*™ |
| **LIFE-OF-MINE SCHEDULING** | • The mining blocks as constrained by the pit layout are then scheduled using various equipment utilisation, mining activity effectiveness, cut-off grade and blending and stockpile philosophy inputs. The modified ore is scheduled to the various beneficiation plants and/or stockpile destinations, as well as from stockpiles to honour annual Saleable Product targets and client off-take specifications, while the waste is scheduled to the various waste destinations. This is an iterative process as sequencing of mining activities must be such that consistent output is achieved over time.<br>• Scenarios are generated considering strategic and tactical plans to be able to decide on a best fit life-of-mine plan for the business. Software: *RPM Open Pit Metals Solution*™ |
| **INFRASTRUCTURE MATCH** | • The infrastructure required to achieve the life-of-mine schedule is then compared with existing infrastructure and associated lifespans and if adjustments are required in terms of equipment purchases or stoppages or changes in terms of waste dumping, etc it is indicated as such to timeously plan the subsequent infrastructure to match the life-of-mine schedule.<br>• The placing of any additional permanent infrastructure is usually done outside the optimistic shell extents. |
| **VALUATION** | • The best fit plan is valuated through the assignment of value chain costs (including environmental, social and governmental costs) and long-term pricing and other fiscal parameters. This valuation is conducted including and excluding modified Inferred run-of-mine to indicate the risk associated with the modified Inferred run-of-mine included in the life-of-mine plan. |
| **REPORTING** | • The Proved and Probable Ore Reserves (as modified from the *in situ* Measured and Indicated Mineral Resources occurring inside the pit layout), excluding the modified Inferred run-of-mine, are then reported as Ore Reserves, and include all the planned Proved and Probable run-of-mine scheduled over the total life-of-mine period. The Proved and Probable product derived from applying relevant yield modifications to the Proved and Probable Ore Reserves, are quoted as the Saleable Product and include all the planned Proved and Probable Saleable Product derived over the total life-of-mine period. |

# ORE RESERVES (AND SALEABLE PRODUCT) CONTINUED

## COMMODITY PRICING PROCESS

Kumba prefers not to disclose its forward looking iron ore price and therefore provides a breakdown of how it is derived. The long-term price, as obtained from the Anglo American Commodities Research Department, is adjusted by Kumba to convert it from a market figure to a site-specific figure used to define current and eventual economic extractability:

- The first adjustment made to the price is the sea freight adjustment and is done to reflect the long-term price at Saldanha (Kumba's export harbour) in US$/tonne Free-On-Board (FOB) terms at a 62% Fe grade.
- Higher Fe-content, as well as Lump ore, gains a premium in the market. This is the second adjustment, considering site-specific planned Lump-Fine ratios and average Fe contents, ie prices are derived for the Lump and Fine products from each of the processing streams (for example the dense media separation and Jig processing streams at Sishen mine or direct shipping ore at Kolomela mine). Thereafter price averaging is applied based on a mass weighted average calculation.
- Once the average product prices are calculated in US$/tonne FOB terms, the long-term real exchange rate is applied to convert the price to a Rand/tonne FOB Saldanha base.
- To calculate the Rand/tonne Free-On-Rail (FOR) price for the products, the long-term rail cost is subtracted for each of the sites. The rail cost includes related logistics and marketing costs.
- As a final adjustment, contractual obligations are considered. This completes the long-term adjustment process.

Site-specific long-term pricing and a long-term exchange rate as well as current budget costs (representing the total mining value chain) escalated over time, are then used to derive an optimal pit shell (~1 revenue factor) and resource shell (1.6 revenue factor). The iron ore price required to obtain a 1.6 revenue factor has historically been achieved in the iron ore market and therefore supports reasonable prospects for eventual economic extraction as per Kumba's interpretation of iron ore price cycles.

## 2018 VS 2017 SALEABLE PRODUCT

Saleable Product has been derived through the application of:

- beneficiation (yield and associated product grade) algorithms derived from densimetric borehole data and adjusted or scaled up to represent plant beneficiation using measured plant beneficiation efficiencies at Sishen mine, and
- empirically estimated yield performances at Kolomela mine

to the scheduled LoMP run-of-mine (Ore Reserves).

Run-of-mine blending is one of the main levers used during scheduling to ensure that the resultant iron ore product is suitable for off-take in current market conditions.

The 2018 Kolomela and Sishen life-of-mine plans, considering current contract and client supply agreement conditions, deliver a total estimated Saleable Product of 594.8 Mt at an average 64.5% Fe over the reserve life years for the two mining operations (**Table 5**).

**Image:** (Left) Phetla Maefo, a professional in training (PIT) and Riaan Badenhorst, a process specialist at the Sishen mine Jig plant discussing safety procedures when taking belt cut samples. (Right) A loaded Komatsu truck at Kolomela mine.

# ORE RESERVES (AND SALEABLE PRODUCT) CONTINUED

## TABLE 5: KUMBA'S SALEABLE PRODUCT FOR 2018 (referenced against 2017)

| Operation/project | Operation status | Mining method | Ore type | % owned by KIO | Saleable Product category | 2018 Metallurgical yield (%) | 2017 Metallurgical yield (%) | 2018 Saleable Product Tonnage (Mt) | 2018 Saleable Product Grade (% Fe) Average | 2017 Tonnage (Mt) | 2017 Grade (% Fe) Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mining operations** | | | | | | | | | | | |
| Kolomela mine[1] | Steady-state | Open pit | Haematite | 76.3 | Proved | | | 114.8 | 64.6 | 88.3 | 64.3 |
| | | | | | Probable | | | 64.3 | 64.6 | 80.0 | 64.4 |
| | | | | | **Sub-total** | **95.2** | **95.8** | **179.1** | **64.6** | **168.3** | **64.3** |
| Sishen mine[2*] | Steady-state | Open pit | Haematite | 76.3 | Proved | | | 248.4 | 64.8 | 261.3 | 64.7 |
| | | | | | Probable | | | 167.2 | 63.9 | 109.1 | 64.4 |
| | | | | | **Sub-total** | **76.3** | **74.0** | **415.6** | **64.4** | **370.4** | **64.6** |
| **Company** | | | | | | | | | | | |
| Kumba Iron Ore – total Saleable Product | | | | | Proved | | | 363.3 | 64.7 | 349.6 | 64.6 |
| | | | | | Probable | | | 231.5 | 64.1 | 189.0 | 64.4 |
| | | | | | **Total** | **81.2** | **79.6** | **594.8** | **64.5** | **538.6** | **64.5** |

**Footnotes to Saleable Product (Table 5)**
- The tonnages are quoted in dry metric tonnes and million tonnes is abbreviated as Mt.
- Rounding of figures may cause computational discrepancies.
- Saleable Product figures are reported at 100% irrespective of percentage attributable ownership to Kumba Iron Ore.

**Footnotes to Saleable Product (Table 5) explaining year-on-year differences:**

1 **Kolomela mine's Saleable Product increased with 10.9 Mt (+6%) from 2017 to 2018**
Kolomela mine is primarily a direct shipping ore (DSO) operation where high-grade run-of-mine is crushed and screened to deliver Saleable Product at the required top sizes. The 2018 LoMP DSO product makes up 94% of the total Saleable Product portfolio remaining after 31 December 2018. The remainder of the portfolio is made up via the scheduled beneficiation of lower Fe (medium) grade run-of-mine through a small-scale modular dense media separation (DMS) plant.

A year-on-year change in the DSO to DMS ratio of 95 : 5 in 2017 to 94 : 6 in 2018 has resulted in a decrease in the average planned yield from 95.8% to 95.2%.

The 2018 Kolomela LoMP schedule delivers an average 60% Lump (64.8% Fe) and 40% Fines (63.2% Fe) Saleable Product

2 **Sishen mine's Saleable Product increased with 45.3 Mt (+12%) year-on-year**
Sishen mine beneficiates its high-grade run-of-mine by means of a dense media separation (DMS) plant and its medium grade run-of-mine by means of a Jig facility combined with a small-scale ultra-high dense media separation (UHDMS) plant treating a portion of the Jig plant discard, to produce its Saleable Product.

The DMS versus Jig and UHDMS Saleable Product ratio as per the 2018 life-of-mine plan is 66 : 34.

The overall average estimated yield at Sishen increased by 2.3% year-on-year because of improvements in the efficiencies in the beneficiation plants, the largest driver is the Jig (+modular UHDMS) plant with a yield increase from 64.7% in 2017 LoMP to 69.5% in the 2018 LoMP, and increased product from the UHDMS modular expansion project commissioned in 2018.

The 2018 Sishen LoMP schedule delivers an average 71.8% Lump and 28.2% Fines Saleable Product. Three different Lump (different top-size and Fe) and four different Fines (different Fe) products are produced on site.

The Sishen products are co-stockpiled with the Kolomela products at the Saldanha export harbour to deliver the following final products:
- Premium Lump @ 65.5% Fe
- Premium 20mm Lump @ 65.2% Fe
- Standard Fines @ 63.5% Fe

# ORE RESERVES (AND SALEABLE PRODUCT) CONTINUED

## 2018 VS 2017 ORE RESERVES

The 2018 Kolomela and Sishen life-of-mine plans, considering the latest technical and business inputs, estimates the Ore Reserves (Proved and Probable portion of scheduled run-of-mine) at 732.9 Mt at an average 59.1% Fe over the reserve life years for the two mining operations (**Table 6**).

### TABLE 6: **KUMBA'S ORE RESERVES FOR 2018** (referenced against 2017)

| | | | | | | 2018 Ore Reserves | | | | 2017 Ore Reserves | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Operation/project | Operation status | Mining method | Ore type | % owned by KIO | Reserve category | **Tonnage (Mt)** | **Grade (% Fe) Average** | **Grade (% Fe) Cut-off*** | **Reserve Life** Years** | Tonnage (Mt) | Grade (% Fe) Average | Grade (% Fe) Cut-off | Reserve Life** Years |
| **Mining operations** | | | | | | | | | | | | | |
| Kolomela mine[1] (including run-of-mine) | Steady-state | Open pit | Haematite | 76.3 | Proved | 117.9 | 64.3 | 50.0 | 14 | 92.2 | 64.3 | 50.0 | 14 |
| | | | | | Probable | 70.4 | 63.2 | | | 83.4 | 64.4 | | |
| | | | | | **Sub-total** | **188.2** | **63.9** | | | **175.6** | **64.4** | | |
| Sishen mine[2] (including run-of-mine) | Steady-state | Open pit | Haematite | 76.3 | Proved | 323.0 | 58.7 | 40.0 | 14 | 352.1 | 58.3 | 40.0 | 13 |
| | | | | | Probable | 221.6 | 55.6 | | | 148.7 | 57.1 | | |
| | | | | | **Sub-total** | **544.6** | **57.5** | | | **500.8** | **58.0** | | |
| **Company** | | | | | | | | | | | | | |
| Kumba Iron Ore | | | | | Proved | 440.9 | 60.2 | | | 444.3 | 59.6 | | |
| – total Ore Reserves | | | | | Probable | 291.9 | 57.5 | | | 232.1 | 59.8 | | |
| | | | | | **Total** | **732.9** | **59.1** | | | **676.4** | **59.6** | | |

**Footnotes to the Ore Reserves (Table 6)**

- The tonnages are quoted in dry metric tonnes and million tonnes is abbreviated as Mt.
- Rounding of figures may cause computational discrepancies.
- Ore Reserve figures are reported at 100% irrespective of percentage attributable ownership to Kumba Iron Ore.
- Ore Reserves include run-of-mine as scheduled from run-of-mine stockpiles.

* The cut-off grade assigned to Ore Reserves is variable and is dependent on the beneficiability and/or blending capacity of the modified ore scheduled as run-of-mine, which is iteratively determined during life-of-mine plan scheduling to achieve a scheduling grade target that is set to meet the client product specifications. The % Fe cut-off illustrated is therefore the lowest of a range of variable cut-offs for the various mining areas. It includes dilution material and can therefore, in certain cases, be less than the Mineral Resource cut-off grade.

** Reserve Life represents the period in years in the approved life-of-mine plan for scheduled extraction of Proved and Probable Reserves. The Reserve Life is limited to the period during which the Ore Reserves can be economically exploited. Where the scheduled Ore Reserves falls below 25% of the average annual production rate, the period beyond this is excluded from the Reserve Life, implying for example that the period beyond and including a year where the run-of-mine of an operation is made up of 24% Proved and Probable Ore Reserves and 76% Inferred Mineral Resources does not count towards Reserve Life.

**Footnotes to the Ore Reserves (Table 6) – summarising reserve life**

1 **For Kolomela mine a 14-year remaining reserve life, at an average 13.6 Mtpa Saleable Product output for 13 of the 14 years of reserve life (ramp-down in last year) has been quoted in 2018.**

The run-of-mine is scheduled at an average 14.3 Mtpa plant feed rate, which includes 2% modified Inferred run-of-mine ore. The 2017 LoMP quoted the same average annual Saleable Product output but derived from a plant feed including 8% modified Inferred run-of-mine ore. The year-on-year decrease in the modified Inferred considered in the LoMP is the result of a continued on-mine exploration focus to minimise the Inferred ore to derisk the Kolomela LoMP. The reserve life increased with one year from 2017, primarily because of the on-mine exploration programme making available additional Measured and Indicated Mineral Resources for conversion to Ore Reserves.

2 **For Sishen mine, a 14-year reserve life, at an average 31.6 Mtpa Saleable Product output for 13 of the 14 years of reserve life (ramp-down in last year) has been quoted in 2018.**

The run-of-mine is scheduled at an average 41.6 Mtpa plant feed rate, which includes 2% modified Inferred run-of-mine ore. The 2017 LoMP quoted 0.9 Mtpa more Saleable Product, derived from a plant feed including 5% modified Inferred run-of-mine in total. The two-year increase in reserve life can mainly be attributed to a decrease in the annual Saleable Product output, but also a steepening of the slopes of the pit design based on a refinement of the geotechnical spatial modelling and subsequent pit-slope stability assessment methods, as well as an improvement in the planned resource-to-reserve conversion based on improved operational efficiencies, resulting in more Ore Reserves year-on-year.

*Footnotes continue on following page.*

# ORE RESERVES (AND SALEABLE PRODUCT) CONTINUED

**Footnotes to Ore Reserves (Table 6) – explaining annual Ore Reserve differences**

1 **Kolomela mine's Ore Reserves increased with 12.6 Mt (+7%) from 2017 to 2018.**

The primary aspect that resulted in a year-on-year increase of the Kolomela Ore Reserves is the continued focus on on-mine exploration, which made available additional Measured and Indicated Mineral Resources for conversion to Ore Reserves, resulting in 25.9 Mt more Ore Reserves.

The increase as explained above was offset by a 13.8 Mt Ore Reserve (excluding modified Inferred) ex-pit production figure.

Other minor movements accounted for a 0.5 Mt increase in Ore Reserves.

The Probable Ore Reserve figure includes 12.3 Mt at 57.2% Fe run-of-mine stockpile ore.

In the case of the Kolomela mining operation, the Ore Reserve reference point is the primary crusher feeders where the planned run-of-mine is to be delivered to either the crushing and screening plant (where direct shipping ore is produced), or the small-scale dense media separation plant.

2 **Sishen mine's Ore Reserves increased by 43.8 Mt (+9%) year-on-year.**

Most of the annual increase can be attributed to an optimisation of the pit slopes of the Sishen pit design resulting in a 50.8 Mt increase in Ore Reserves, based on advances made in the spatial geotechnical modelling field enabling a better spatial understanding of pit slope failure mechanisms, allowing for optimisation of pit slope designs.

Furthermore, an improved resource-to-reserve conversion rate (application of a higher mining recovery efficiency modifying factor) based on improved actual operational efficiencies achieved for a prolonged period at Sishen mine resulted in a 21.7 Mt increase in Ore Reserves.

A change in the geological confidence classification method, whereby borehole sample representivity as measured against QA/QC metadata, was introduced in the Mineral Resource classification approach, resulting in an overall 11.6 Mt increase in Ore Reserves.

The increase in the Sishen Ore Reserves as explained above was offset by an annual Ore Reserve ex-pit production of 38.2 Mt (excluding modified Inferred ore).

Other minor year-on-year movements accounted for a 2.1 Mt decrease in Ore Reserves.

The Probable Ore Reserve figure includes 9.8 Mt at 56.7% Fe run-of-mine stockpile ore.

In the case of the Sishen mining operation, the Ore Reserve reference point is the primary crusher feeders where the planned run-of-mine is to be delivered to either the dense media separation (DMS) plant or the Jig (+ small-scale ultra-high media separation – UHDMS) plant.

**Image:** (Left) Remote operated drill rigs at Kolomela mine. (Right) Keotshepile Babusi, a mining operator and Steven Farao, a mine dispatcher working at the Kolomela mine control room.

# EXCLUSIVE MINERAL RESOURCES

This is the ore in addition to the Ore Reserves, which is receiving Kumba's undivided attention as part of "Horizon 1" (improved resource utilisation) and "Horizon 2" (continued exploration, project studies, technology development and possible partnerships) of its strategy, in an attempt to convert it to Ore Reserves (Horizon 1) and increase the resource base (Horizon 2). It must be noted that only a portion of the current Mineral Resource portfolio can be converted to Ore Reserves by achieving improved resource utilisation targets; conversion of the rest is dependent on an increase in Kumba's long-term iron ore price outlook – market related.

## EXPLORATION

Kumba Iron Ore prefers not to declare exploration results. Kumba does, however, as a rule provide a general summary of its annual exploration activities.

A continued focus on exploration on and near mine resulted in the following outcomes in 2018:

- The Kolomela mine Inferred Mineral Resources considered in the LoMP was reduced from 8% in 2017 to 2% in 2018.
- The Sishen mine Inferred Mineral Resources considered in the LoMP was reduced from 5% in 2017 to 2% in 2017, despite an unforeseen increase in the size of the pit layout year-on-year.
- The near mine exploration results are not discussed but is incorporated in the exploration expenditure as detailed in **Table 7**.

## COST

Kumba conducted on and near mine exploration in 2018 to refine existing and target possible new future Mineral Resources. Drilling activities decreased 7% (~6,387m) year-on-year. However, the total exploration spent increased by 14% (R58.6 million) from 2017 to 2018, the latter a result of geometallurgical sampling and testing costs erroneously not incorporated into the total 2017 exploration cost calculation.

The increase in the unit cost for drilling in the prospecting right areas can be attributed to a significant amount of specialised inclined and geotechnical drilling conducted in 2018 compared to 2017.

The all-inclusive cost associated with exploration in 2018 is summarised in **Table 7**. The 2018 (10 actual +2 forecast) exploration expenditure comprises 1.0% of Kumba Iron Ore's 2018 (10 actual +2 forecast) revenue.

TABLE 7: **SUMMARY OF 2018 VS 2017 KUMBA EXPLORATION EXPENDITURE** (10+2 forecast)

| | Total exploration spend (10+2) x million | | Drilling spend (10+2) x million | | Number of holes drilled (10+2) | | Metres drilled (10+2) | | Average cost per metre | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **2018** | 2017 | **2018** | 2017 | **2018** | 2017 | **2018** | 2017 | **2018** | 2017 |
| Mining right areas | R321.15 | R233.81 | R223.42 | R216.82 | 419 | 385 | 69 308 | 58 747 | R3 223.55 | R3 690.72 |
| Prospecting right areas | R142.05 | R170.82 | R65.97 | R110.65 | 80 | 127 | 19 580 | 36 528 | R3 369.13 | R3 029.11 |
| **Total** | **R463.20** | **R404.63** | **R289.39** | **R327.47** | **499** | **512** | **88 888** | **95 275** | **R3 296.34** | **R3 359.91** |

The exploration costs as set out in the table above is the combined costs of various types of core, reverse circulation and percussion drilling, of which the ratio of various drill types differ between the different Kumba sites where exploration is conducted.

# EXCLUSIVE MINERAL RESOURCES CONTINUED

## SAMPLING AND ASSAYING

All primary geological samples taken from drilled core (and in some instances RC chips) via normal exploration drilling at all the relevant Kumba sites in 2018, to be used for future Mineral Resource estimation, were prepared and assayed by the Chemistry Laboratory (co reg no: 1921/0067130/06) of the Technical Solutions (TS) Division of Anglo American plc.

All samples taken from drilled core of dedicated geometallurgical boreholes were prepared and tested for an array of metallurgical and other physical property measurements by the Metallurgical Laboratory of the Anglo Technical Solutions (TS) Division of Anglo American plc, with subsequent assaying of these samples, where required, conducted by the AA plc Chemistry Laboratory.

The TS Chemistry Laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025:2005 by the South African National Accreditation System (SANAS) under the Facility Accreditation Number T0051 (valid from 22 July 2016 to 30 April 2021) for the preparation and assaying of iron ore samples, applying methods that comply with the requirements of Kumba Iron Ore.

As per the 10+2 forecast, Kumba Geosciences submitted 31,696 primary exploration (and some production) borehole samples in 2018 directly to the TS Chemistry Laboratory to be prepared and analysed, and 338 composite samples (derived from 3,633 primary borehole samples) directly to the TS Metallurgical Laboratory to be prepared and tested. A total of 38,017 primary samples were submitted. Of the samples submitted, the TS Chemistry Laboratory prepared 29,235 samples (including samples from the TS Metallurgical Laboratory) and assayed 34,807 samples for the year (including samples from the TS Metallurgical Laboratory).

Differences between submitted, prepared and assayed sample numbers are influenced by laboratory turnaround times, a backlog of samples carried over from 2017 as well as additionally created QC samples (5% coarse and 5% pulp duplicates with 5% blind matrix matched certified reference materials counting as a primary sample) as required by the Kumba Geosciences QA/QC protocol.

The TS Metallurgical Laboratory prepared 3,693 samples (including backlog of 60 samples from 2017) in 2018. Some of these samples have been composited into 338 geometallurgical samples (compositing required to obtain minimum masses as required by certain geometallurgical tests) for subsequent geometallurgical test-work. In total, 338 composited geometallurgical samples underwent various densimetric, geotechnical and refinement test-work in 2018.

All of the primary exploration samples were prepared, assayed and tested in the Republic of South Africa. A total of 5% pulp replicate QC samples generated by the TS Chemistry Laboratory were analysed by the Bureau Veritas Laboratory in Perth, Australia, which is ISO and National (Australian) Association of Testing Authorities (NATA) accredited for iron ores and a member of the ISO MN-002-02 Chemical Analysis Committee, as part of the Kumba Geosciences Department's required external independent QA/QC validation.

The 2018 (10+2 forecast) spend on sample preparation and assaying at the AA plc TS Chemistry Laboratory amounted to R31.4 million (7% of total exploration expenditure). The 2018 (10+2 forecast) spend on sample preparation and metallurgical testing at the AA plc TS Metallurgical Laboratory amounted to R26.0 million (6% of total exploration budget).

Kumba ensures sample representivity by means of applying a stringent QA/QC protocol (KIO QC protocol for exploration drilling, sampling and sub-sampling – Version 8) that governs all stages of sampling, sub-sampling and assaying, including blind validation of the sample preparation and assaying of laboratories.

Kumba applies a uniform Mineral Resource estimation process

# EXCLUSIVE MINERAL RESOURCES CONTINUED

at all its sites as explained below.

## RESOURCE ESTIMATION

| | |
|---|---|
| **DATA ASSEMBLY AND QUALITY** | • The data generated by exploration, primarily drilling must be representative of the volume of material being sampled. Samples are generated through quasi regular sampling (drilling) grids and are validated by means of a stringent quality control programme which blindly monitors sample location, primary sampling, sample preparation and sample assaying. Because some of the historically drilled samples used for estimation does not have QA/QC metadata, Kumba introduced a sample representivity indexing method, which is considered during spatial geological confidence classification. Software: *acQuire™* |
| **SOLIDS MODELLING** | • Validated exploration data is used to compile spatially referenced 3D tectono-stratigraphic models based on the geologists' understanding and interpretation of the regional and local geology and ore genesis.<br>• The solids model geometrically domains the various iron ore types in relation to the waste lithologies, within primary structural domains. Because of the pervasive nature of the iron ore mineralisation in the Northern Cape province of RSA, Kumba has to compile full 3D solids models and ferruginisation is often of such a nature that lower grade ore domains are distinguished from waste and higher grade ore applying soft boundaries or Fe cut-off grades.<br>• Each domain's bounding surface in effect provides an efficient volume description of the tectonostratigraphical unit. Software: *Seequent Leapfrog Geo™* and *Geovia Surpac™* |
| **EXPLORATORY DATA ANALYSES** | • The validated borehole grade data intersecting the various solids model domains is statistically analysed through univariate and multivariate statistical methods to understand its distributions and relations and to identify outliers.<br>• Thereafter the data is composited to achieve constant sample support and again statistically analysed per domain and sub-domaining based on grade is conducted if different populations within a single solids domain can be spatially distinguished. Software: *JMP™* |
| **VARIOGRAPHIC ANALYSIS** | • Iron ore is a typical multivariate grade commodity and Kumba geostatistically models sample density and the following sample grade parameters of the ore domains as a minimum, ie Fe, $SiO_2$, $Al_2O_3$, $K_2O$ and P to establish its spatial variability.<br>• Experimental variograms for each variable is obtained and modelled and used as input to derive search parameters for subsequent estimation runs. Software: *Isatis™* |
| **GEOLOGICAL BLOCK MODELLING** | • To enable subsequent mine planning, the solids model must be converted into a block model, to allow for the scheduling of mineable units of ore and waste. At Kumba, parent block sizes are determined through a method called Quantitative Kriging Neighbourhood Analyses to cater for volume-variance, and are then sub-blocked into smaller blocks to better honour solid domain boundaries and provide an accurate estimate of *in situ* ore volumes.<br>• The block models are subsequently populated by various estimation methods, ie Ordinary Kriging or Co-Kriging runs where sufficient data is available or by Simple Kriging or default value assignment where sample data becomes progressively more scattered or very scarce. Software: *Isatis™, Geovia Surpac™, DataMine Studio™* |
| **CONFIDENCE CLASSIFICATION** | • Kumba applies a scorecard approach whereby certain key site-specific parameters as identified by the Competent Person (CP), are indexed and used to measure geometry and grade continuity. Each block within the geological block model is populated with these indices. The individual grade indices and geometry indices are then weighted as per the CP's understanding of its impact. The weights are applied to derive a combined grade index as well as a combined geometry index, which in turn is weighted, as per the CP's understanding of the deposit to derive a final single geological confidence index. The final confidence index is then classed against index boundaries as derived by the CP to distinguish between Measured, Indicated and Inferred Mineral Resources. The CP also has the authority to override areas of indexed classification and downgrade it. Software: *Isatis™, Geovia Surpac™, DataMine Studio™* |
| **RESOURCE REPORTING** | • Resources are reported as that portion of the ore in the 3D geological block model that has *in situ* grades above the Fe cut-off grade (derived from beneficiation potential), that are located within the 1.6 Revenue Factor resource shell (as derived through pit optimisation). |

# EXCLUSIVE MINERAL RESOURCES CONTINUED

## 2018 VS 2017 EXCLUSIVE MINERAL RESOURCES

The Kumba Mineral Resources (in addition to Ore Reserves) for 2018 are detailed in **Table 8**.

**TABLE 8: KUMBA'S EXCLUSIVE MINERAL RESOURCES FOR 2018** (referenced against 2017)

| | | | | **2018** | | | | 2017 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Operation/project | Ore type | % owned by KIO | Resource category | **Tonnage (Mt)** | **Average % Fe** | **Average % $Fe_3O_4$*** | **% Fe Cut-off**** | Tonnage (Mt) | Average % Fe | Average % $Fe_3O_4$* | % Fe Cut-off** |
| **Mining operations** | | | | | | | | | | | |
| **Kolomela mine**[1] ■ mineral resources in addition to ore reserves (including long-term stockpiled ore) | Haematite | 76.3 | Measured (outside LoMP) | 36.4 | 63.2 | Not applicable | 50.0 | 36.2 | 63.1 | Not applicable | 50.0 |
| | | | Indicated (outside LoMP) | 96.1 | 61.8 | | | 57.5 | 62.8 | | |
| | | | **Measured & Indicated (outside LoMP)** | **132.5** | **62.1** | | | **93.8** | **62.9** | | |
| | | | Inferred (considered in LoMP) | 5.3 | 64.7 | | | 19.4 | 60.9 | | |
| | | | Inferred (outside LoMP) | 33.8 | 62.5 | | | 60.2 | 63.3 | | |
| | | | Total Inferred | 39.1 | 62.8 | | | 79.6 | 62.7 | | |
| | | | **Sub-total** | **171.6** | **62.3** | | | **173.4** | **62.8** | | |
| **Sishen mine**[2] ■ mineral resources in addition to ore reserves (including long-term stockpiled ore) | Haematite | 76.3 | Measured (outside LoMP) | 113.7 | 56.3 | | 40.0 | 216.8 | 55.7 | | 40.0 |
| | | | Indicated (outside LoMP) | 325.2 | 53.4 | | | 228.4 | 49.0 | | |
| | | | **Measured & Indicated (outside LoMP)** | **438.9** | **54.2** | | | **445.1** | **52.3** | | |
| | | | Inferred (considered in LoMP) | 11.8 | 57.2 | | | 25.5 | 57.5 | | |
| | | | Inferred (outside LoMP) | 19.6 | 47.9 | | | 89.0 | 49.0 | | |
| | | | Total Inferred | 31.4 | 51.4 | | | 114.5 | 50.9 | | |
| | | | **Sub-total** | **470.3** | **54.0** | | | **559.6** | **52.0** | | |
| **Kumba Iron ore – mining operations** ■ mineral resources in addition to ore reserves | | | Measured (outside LoMP) | 150.1 | 58.0 | | | 253.0 | 56.8 | | |
| | | | Indicated (outside LoMP) | 421.3 | 55.3 | | | 285.9 | 51.8 | | |
| | | | **Measured & Indicated (outside LoMP)** | **571.4** | **56.0** | | | **538.9** | **54.2** | | |
| | | | Inferred (considered in LoMP) | 17.2 | 59.5 | | | 44.9 | 59.0 | | |
| | | | Inferred (outside LoMP) | 53.3 | 57.2 | | | 149.2 | 54.8 | | |
| | | | Total Inferred | 70.5 | 57.7 | | | 194.1 | 55.8 | | |
| | | | **Total** | **641.9** | **56.2** | | | **733.0** | **54.6** | | |
| **Projects** | | | | | | | | | | | |
| **Zandrivierspoort**[3] ■ mineral resources in addition to ore reserves | Magnetite and haematite | 38.2 | Measured (outside LoMP) | 95.1 | 35.5 | 41.4 | 20.2 | 107.0 | 34.7 | 41.5 | 21.7 |
| | | | Indicated (outside LoMP) | 178.8 | 35.5 | 39.9 | | 206.4 | 34.4 | 42.5 | |
| | | | **Measured & Indicated (outside LoMP)** | **273.9** | **35.5** | **40.5** | | **313.4** | **34.5** | **42.2** | |
| | | | Inferred (considered in LoMP) | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | |
| | | | Inferred (outside LoMP) | 145.2 | 35.2 | 37.6 | | 162.7 | 34.5 | 38.1 | |
| | | | Total Inferred | 145.2 | 35.2 | 37.6 | | 162.7 | 34.5 | 38.1 | |
| | | | **Sub-total** | **419.1** | **35.4** | **39.5** | | **476.1** | **34.5** | **40.8** | |
| **Kumba Iron Ore – projects** ■ mineral resources in addition to ore reserves | | | Measured (outside LoMP) | 95.1 | 35.5 | 41.4 | | 107.0 | 34.7 | 41.5 | |
| | | | Indicated (outside LoMP) | 178.8 | 35.5 | 39.9 | | 206.4 | 34.4 | 42.5 | |
| | | | **Measured & Indicated (outside LoMP)** | **273.9** | **35.5** | **40.5** | | **313.4** | **34.5** | **42.2** | |
| | | | Inferred (considered in LoMP) | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | |
| | | | Inferred (outside LoMP) | 145.2 | 35.2 | 37.6 | | 162.7 | 34.5 | 38.1 | |
| | | | Total Inferred | 145.2 | 35.2 | 37.6 | | 162.7 | 34.5 | 38.1 | |
| | | | **Total** | **419.1** | **35.4** | **39.5** | | **476.1** | **34.5** | **40.8** | |

# EXCLUSIVE MINERAL RESOURCES CONTINUED

## TABLE 8: KUMBA'S EXCLUSIVE MINERAL RESOURCES FOR 2018 (referenced against 2017) continued

| | | | | 2018 | | | | 2017 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Operation/project | Ore type | % owned by KIO | Resource category | Tonnage (Mt) | Average % Fe | Average % $Fe_3O_4$* | % Fe Cut-off** | Tonnage (Mt) | Average % Fe | Average % $Fe_3O_4$* | % Fe Cut-off** |
| **Company** | | | | | | | | | | | |
| **Kumba Iron Ore** | | | Measured (outside LoMP) | 245.2 | 49.2 | | | 360.0 | 50.2 | | |
| ■ mineral resources in addition to ore reserves | | | Indicated (outside LoMP) | 600.1 | 49.4 | | | 492.3 | 44.5 | | |
| | | | **Measured & Indicated (outside LoMP)** | **845.3** | **49.4** | | | **852.4** | **46.9** | | |
| | | | Inferred (considered in LoMP) | 17.2 | 59.5 | | | 44.9 | 59.0 | | |
| | | | Inferred (outside LoMP) | 198.5 | 41.1 | | | 311.9 | 44.2 | | |
| | | | Total Inferred | 215.7 | 42.5 | | | 356.8 | 46.1 | | |
| | | | **Grand total** | **1,061.0** | **48.0** | | | **1,209.2** | **46.7** | | |

**Footnotes to the exclusive Mineral Resources (Table 8)**

- The tonnages are quoted in dry metric tonnes and million tonnes is abbreviated as Mt.
- Rounding of figures may cause computational discrepancies.
- Mineral Resource figures are reported at 100% irrespective of percentage attributable Kumba Iron Ore ownership.
- The term Inferred Mineral Resource (outside LoMP) refers to that portion of the Mineral Resources not utilised in the LoMP of the specific mining operation or project.
- The term Inferred Mineral Resource (considered for LoMP) refers to that portion of the Mineral Resources utilised in the LoMP of the specific mining operation; reported without having any modifying factors applied – therefore the term "considered for LoMP" instead of "inside LoMP".
- Due to the uncertainty that may be attached to some Inferred Mineral Resources, it cannot be assumed that all or part of an Inferred Mineral Resource will necessarily be upgraded to an Indicated or Measured Resource after continued exploration.

* $Fe_3O_4$ – Magnetite

** The cut-off grade quoted for all the Kumba sites except the Zandrivierspoort project, is a fixed grade cut-off grade. In the case of Zandrivierspoort, the 20.2% Fe cut-off grade is a minimum value, with the cut-off grade being spatially dynamic. A minimum yield of 35.6% is required to define eventual economic extractability. This yield is determined from beneficiation algorithms based on metallurgical test-work conducted on borehole samples and is spatially estimated considering the total *in situ* % Fe as well as the *in situ* magnetite : haematite ratio, with the cut-off determined to achieve break-even cost.

**Footnotes to Mineral Resources (Table 8) explaining year-on-year exclusive Mineral Resource differences:**

1 **Kolomela mine quotes a 1.9 Mt (–1%) decrease in exclusive Mineral Resources from 2017 to 2018.**

The overall decrease is primarily the result of:

- Geological model updates based on new borehole information and the subsequent upgrade of Inferred and Indicated Mineral Resources to Measured Mineral Resources, the latter in turn being converted to Ore Reserves (–10.3 Mt).
- Reconciliation to correct for a 5.6 Mt error made in the reporting of the 2017 Mineral Resources associated with one of the ore bodies (not included in the Kolomela LoMP) as well as actual depletion of Inferred Mineral Resources considered for the LoMP exceeding the depletion of Q4 of 2017 as forecast at the time of reporting by 0.7 Mt.
- Other minor movements (annual depletion of Inferred Mineral Resources) accounts for a further 1.3 Mt decrease in Mineral Resources.

The decrease as explained above was offset by a 12.9 Mt (–3.3 Mt Measured, +13.4 Mt Indicated and +2.8 Mt Inferred) increase based on geological model refinements as well as a 3.2 Mt annual increase in the level of long-term medium-grade stockpiles Indicated Mineral Resources.

Of the 33.8 Mt Inferred Mineral Resources (outside the LoM plan), 21.3 Mt is extrapolated.

Of the total 168.4 Mt exclusive Mineral Resource, 3.2 Mt (@ 55.0% Fe) Indicated Mineral Resources are located on long-term stockpiles and are not *in situ*.

2 **The Sishen mine exclusive Mineral Resources showed a material 16% decrease of 89.3 Mt year-on-year.**

The material year-on-year decrease is primarily the result of the removal of a 79.4 Mt portion from low-grade Mineral Resource portfolio. Geometallurgical test-work conducted as part of the Sishen low-grade project pre-feasibility study has shown the Flagstone lithology portion of the low-grade Mineral Resources to demonstrate poor beneficiation characteristics, rendering the material to have a high risk in terms of achieving reasonable prospects for eventual economic extraction, as a high ratio of high-grade run-of-mine is required for blending with this material to achieve Saleable Product grade specifications. This also resulted in an overall increase in the average Fe of the exclusive Mineral Resources of 2%.

The other major contributing factor is based on a change in the Mineral Resource classification methodology, whereby a sample representivity indexing system was introduced as a parameter to spatially measure the confidence in *in situ* grade continuity. It is based on the QA/QC metadata associated with borehole samples and resulted in a 17.5 Mt decrease in Mineral Resources.

Other minor positive and negative movements adding up to a net +7.6 Mt make up the overall -89.3 Mt year-on-year movement.

Of the 19.6 Mt Inferred Mineral Resources (outside the LoMP, 1.0 Mt is extrapolated.

Of the total 470.3 Mt exclusive Mineral Resource, 17.9 Mt (@ 43.4% Fe) Indicated Mineral Resources are located on long-term stockpiles and are not *in situ*.

3 **The Zandrivierspoort project exclusive Mineral Resources decreased by a material 57.0 Mt (-12%) from 2017 to 2018.**

The material year-on-year decrease can be attributed to:

- A change in the economic assumptions resulting in a smaller resource shell size because of smaller price to cost margins based on a revised business case where pig-iron is produced instead of a magnetite concentrate, resulting in a 40.0 Mt decrease in the Mineral Resource.
- A complete redo of the geological solids model (replacing the 2013 explicit solids model with an implicit solids model), as well as an update of the magnetite grade estimates. In terms of the latter, borehole sample magnetite values, that were previously derived from assay information using a general assumption in terms of the Banded Iron Formation mineralogy, were replaced with values derived from a correlation between assay derived magnetite values and direct Satmagan laboratory test result magnetite values. These combined model refinements resulted in a 17.0 Mt decrease in Mineral Resources.

# RISK

## What are the most prominent risks that can result in the Ore Reserves and Mineral Resources not materialising as estimated?

Apart from the Mineral Resource and Ore Reserve estimation confidence classifications, Kumba, on an annual basis, asks its Competent Persons to highlight prominent (high and significant ranked as per the standard Anglo American risk matrix) Reserve and Resource risks relevant to their specific sites. These risks are then re-evaluated and rated by the lead Competent Persons to consider its potential impact on the total Kumba business.

## ORE RESERVE RISKS

The 2018 Ore Reserve estimates are subject to the following significant risks:

- Legal:
  - If Kumba does not resolve the matter of relocation of final households of the Dingleton community (located south-west of Sishen mine), the mining of ~61 Mt of associated Ore Reserves (dependent on waste stripping in the Dingleton area) at a stripping ratio of 1 : 4.03, as per the 2018 Sishen life-of-mine plan will result in a loss or deferral of between 5 Mtpa to 18 Mtpa Saleable Product from 2020 to 2025.

    *Mitigation: Subsequent Sishen LoM plans will have to consider the scheduling of alternative mining areas (albeit at a higher stripping ratio and increased mining cost), to sustain annual Saleable Product output to planned levels.*

- Technical:
  - None.
- Market:
  - Kumba Iron Ore is a relatively small player in the global iron ore market and its Ore Reserves are very sensitive to price changes. Should the iron ore price deteriorate over time, Kumba will have to accommodate for this by reducing the size of its pit layouts to manage costs in order to protect its income margin.

    *Mitigation: The pit designs conducted by Kumba are in the form of pushbacks, with different pushbacks having different stripping ratios. Pushbacks can be activated or deactivated to consider significant changes in the long-term iron ore price.*

### Mineral Resource risks

The 2018 Mineral Resource estimates are subject to the following significant risks:

- Technical:
  - The Zandrivierspoort project's business case supporting reasonable prospects for eventual economic extraction has changed and has become capital intensive involving additional downstream beneficiation including the production of pig-iron. Should the Polokwane Iron Ore Company, of which Sishen Iron Ore Company is a 50% partner, consider not to commit to the business case before the prospecting right expires in 2020, the argument in terms of reasonable prospect for eventual economic extraction will no longer hold and the Mineral Resources will be redeclared as exploration results, resulting in a decrease of the Kumba exclusive Mineral Resource portfolio of 40%.

    *Mitigation: Dependent on Polokwane Iron Ore Company (SIOC and ArcelorMittal South Africa JV) business decision.*

**Image:** (Left) A fleet of trucks at the Leeuwfontein pit operation at Kolomela mine. (Right) Zuko Mankayi, an employee monitoring the pressure gauge at the main outflow pipe at the Sishen export transfer station.

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT

All the production-related figures quoted in this section are forecast (9 + 3) as the compilation of the site Resource and Reserve Statements, from which this condensed public **R&R** Statement was derived for Kumba, commenced on 1 October 2018.

## KOLOMELA MINE

### GEOLOGICAL OUTLINE

**Regional geology**

Kolomela mine is located towards the southern end of the "Iron Ore Belt" in the Northern Cape province of South Africa (**Figure 10**).

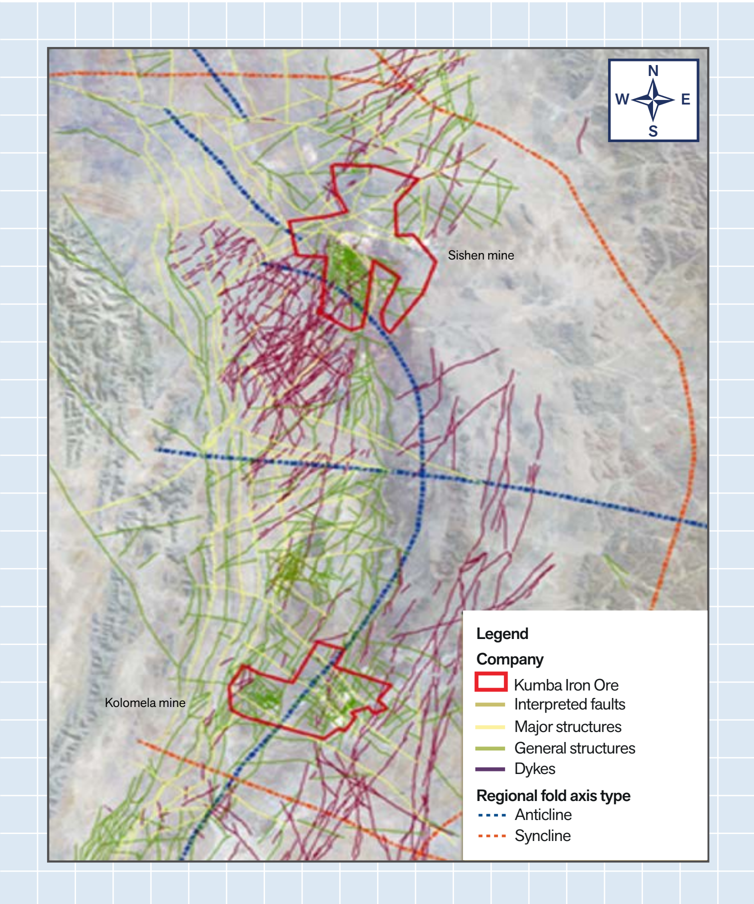



FIGURE 10: **KOLOMELA MINE'S LOCATION IN THE NORTHERN CAPE PROVINCE "IRON ORE BELT" OF RSA**

The Transvaal Supergroup (Eriksson et al, 1993; 1995), or Griqualand West Supergroup as it is referred to where it occurs in the Northern Cape, is host to all of the iron ore occurrences in the region. The Supergroup was deposited in fault-controlled basins on a basement of Archaean granite gneisses and greenstones and/or lavas of the Ventersdorp Supergroup (Beukes, 1983). In the Kathu-Postmasburg region, the oldest rocks of the approximately 8km thick Griqualand West Supergroup (Beukes, 1980) are the ~1.6km thick carbonate platform sediments (dolomites with minor limestone, chert and shale) of the Campbell Rand Subgroup of the Ghaap Group (Beukes, 1983; Altermann and Wotherspoon, 1995; Beukes, 1986).

Conformably overlying the carbonates is the banded iron formation unit, the Asbestos Hills Subgroup (Beukes, 1980), which is considered to be a Superior-type banded iron formation, that can be up to 500m thick. Locally the upper portion of the banded iron formation (Kuruman Iron Formation) has been enriched to ore grade, ie Fe>60%, and the ores found within this unit comprise the bulk of the high-grade iron ores in the region. The Kuruman Iron Formation is conformably overlain by the Griquatown Iron Formation. The two iron formations differ in that the Griquatown Iron Formation, comprising mainly allochemical sediments, was deposited in a shallow-water, storm-dominated epeiric sea (Beukes, 1984), whereas the Kuruman Iron Formation, comprising orthochemical iron formations, was developed in the basin (Beukes, 1980). However, in the Maremane dome area, the Griquatown Iron Formation has been almost entirely removed by erosion along an unconformity separating the banded iron formations from the overlying clastic sediments of the Gamagara Formation.

During uplift and erosion solution and karstification of the upper dolomitic units of the lower Ghaap Group occurred and a 10-20m thick, residual solution breccia, referred to as the "Manganese Marker", "Wolhaarkop Breccia" (van Wyk, 1980; van Schalkwyk and Beukes, 1986) or Wolhaarkop Formation, developed between the basal dolomites and overlying banded iron formation. Locally, deep sinkholes developed in the dolomites, into which the overlying iron formation collapsed (Beukes, 1983).

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

A thick sequence of younger clastic sediments (shales, quartzites and conglomerates) of the Gamagara Formation unconformably overly the Ghaap Group rocks and some of the conglomerates, comprised almost entirely of haematite, constitute lower-grade iron ore. The Gamagara Formation, interpreted as the base of the Palaeoproterozoic (~2.1-1.83 Ga) Olifantshoek Supergroup is overlain by the Palaeoproterozoic (~2.35-2.1 Ga) Postmasburg Group along an interpreted thrust contact in the study area (van Schalkwyk and Beukes, 1986; Friese and Alchin, 2007). The thrust fault has been folded during subsequent deformation.

An altered gabbroic sill in the Kolomela area typically separates the iron ore from the underlying host banded iron formation, or is intrusive in the banded iron formation at Kolomela (Carney and Mienie, 2002). It is interpreted to have intruded into the Griqualand West Supergroup in late Proterozoic times (Friese and Alchin, 2007). The localised unit is prominent in the Leeuwfontein and Klipbankfontein ore bodies but absent in other areas.

Diamictite of the Makganyene Formation (de Villiers and Visser, 1977) and lava of the Ongeluk Formation (Postmasburg Group) have been thrust over the Gamagara Formation sediments in the vicinity of Postmasburg, which are now preserved only within the larger synclinal basins (Schütte, 1992).

The Makganyene diamictites comprise massive to poorly-bedded diamictite, pebbly sandstone and siltstone, shale and mudstone up 100m thick, which are interpreted as piedmont glacial and glaciofluvial assemblages (Beukes, 1983; Visser 1971). A second facies within the Makganyene contains mainly stacked cycles of graded bedded diamictite-greywacke-siderite bandlutite, which have been interpreted as glaciomarine deposits (Beukes, 1983). The Ongeluk lavas (600m thick; Schütte, 1992) were extruded under water in a marginal basin within the continental setting of the Kaapvaal craton (Schütte, 1992), and comprise essentially tholeiitic basaltic andesites.

The lavas have been dated at 2,240 ± 57 Ma (Walraven et al, 1982), 2,239 ±90 Ma (Armstrong, 1987) and 2,222 ± 13 Ma (Cornell et al, 1996).

A considerable portion of the upper parts of the stratigraphy was eroded during Dwyka glaciation and re-deposited as tillite (Visser, 1971) during the Cretaceous era. The entire, folded sequence was later truncated by Tertiary erosion and a thick blanket of calcrete, dolocrete, clays and pebble layers of the Kalahari Group were deposited unconformably over older lithologies.

### Stratigraphy

Iron ore at Kolomela mine is associated with the chemical and clastic sediments of the Proterozoic Transvaal Supergroup. These sediments define the western margin of the Kaapvaal Craton in the Northern Cape province. The stratigraphy has been deformed by thrusting from the west and has undergone extensive karstification. The thrusting has produced a series of open, north-south plunging anticlines, synclines and grabens and karstification has been responsible for the development of deep sinkholes. The iron ore at Kolomela has been preserved from erosion within these geological structures. These structures are therefore important exploration targets. The Kolomela local stratigraphy is illustrated in **Figure 11**.

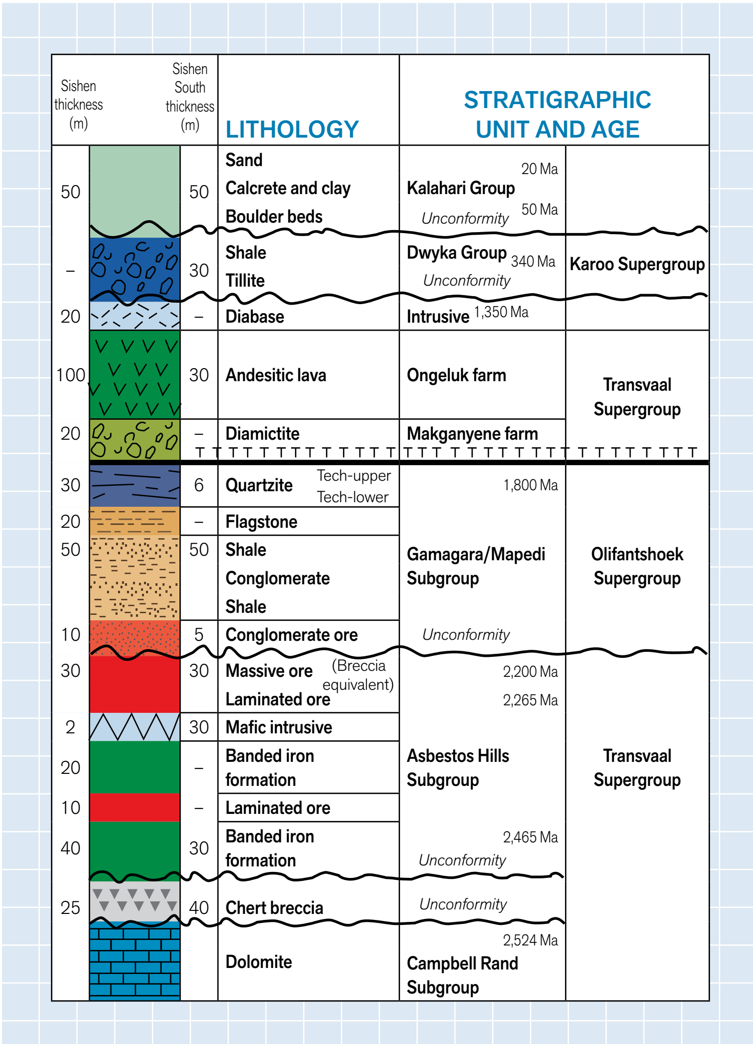



FIGURE 11: **SIMPLIFIED STRATIGRAPHIC COLUMN DEPICTING THE KOLOMELA LOCAL GEOLOGY**

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

The Transvaal Supergroup lithologies were deposited on a basement of Archaean granite gneisses and greenstones, and/or lavas of the Ventersdorp Supergroup. In the Sishen – Postmasburg region, the oldest rocks of the Transvaal Supergroup form a carbonate platform sequence (dolomites with minor limestone, chert and shale) known as the Campbell Rand Subgroup. The upper part of the Transvaal Supergroup comprises a banded iron formation unit, the Asbestos Hills Subgroup, which has been conformably deposited on the carbonates. In places, the upper portion of the banded iron formation has been supergene-enriched to Fe ≥ 60%. The iron ore/banded iron formation zone is referred to as the Kuruman Formation. The ores found within this formation comprise the bulk of the higher-grade iron ores in the region.

Iron ore at Kolomela mine is associated with the chemical and clastic sediments of the Proterozoic Griqualand West Supergroup. These sediments define the western margin of the Kaapvaal Craton in the Northern Cape province.

The stratigraphy has been deformed by thrusting from the west and has undergone extensive karstification. The thrusting has produced a series of open, north-south plunging anticlines, synclines and grabens and karstification has been responsible for the development of deep sinkholes. The iron ore at Kolomela has been preserved from erosion within these geological structures. These structures are therefore important exploration targets.

The Griqualand West Supergroup lithologies were deposited on a basement of Archaean granite gneisses and greenstones, and/or lavas of the Ventersdorp Supergroup. In the Sishen – Postmasburg region, the oldest rocks of the Griqualand West Supergroup form a carbonate platform sequence (dolomites with minor limestone, chert and shale) known as the Campbell Rand Subgroup.

The upper part of the Griqualand West Supergroup comprises a banded iron formation unit, the Asbestos Hills Subgroup, which has been conformably deposited on the carbonates. In places, the upper portion of the banded iron formation has been supergene-enriched to Fe ≥ 60%. The iron ore/banded iron formation zone is referred to as the Kuruman Formation. The ores found within this formation comprise the bulk of the higher-grade iron ores in the region.

An altered mafic intrusive sill (originally of gabbroic composition) usually separates the iron ore deposits from the underlying host iron formation. It is believed to have intruded the Griqualand West Supergroup in late Proterozoic times.

A thick sequence of younger clastic sediments (shales, quartzites and conglomerates) belonging to the Gamagara Subgroup unconformably overlies the banded iron formations. Some of the conglomerates comprise predominantly of haematite and are of lower-grade ore quality. The unconformity separating the iron formations from the overlying clastic sediments represent a period of folding, uplift and erosion.

During this time, dissolution and karstification took place in the upper dolomitic units. This resulted in the formation of residual solution breccias, referred to as the “Manganese Marker” or “Wolhaarkop Breccia”, between the dolomites and overlying banded iron formations. In places, deep sinkholes developed in the dolomites, into which the overlying iron formation and iron ore deposits collapsed.

Diamictite of the Makganyene Formation and lava of the Ongeluk Formation have been thrusted over the Gamagara sediments in the Kolomela region. These are preserved only within larger synclinal structures.

A considerable portion of the upper parts of the stratigraphy were eroded and re-deposited as tillite during Dwyka glaciation. The entire folded sequence was then eroded during Tertiary times. A thick blanket of calcrete, dolocrete, clays and pebble layers (Kalahari Group) was deposited unconformably over the older lithologies.

Evidence of karst formation after the development of the calcretes of the Edin and Boudin Formation can be seen in the current Leeuwfontein pit.

**Tectonic setting**

Structurally, Kolomela mine lies on the western margin of the Kaapvaal Craton, and has been affected by Kheis Orogeny. The deformation intensity increases from east to west and the area is dominated by a regional-scale synforms and antiforms – the so-called Welgevonden Basin and Wolhaarkop antiform.

The area west of the Wolhaarkop antiform (including the western limb of the antiform), is characterised by tight overturned fold structures that verge towards the east. The overturned limbs of the fold structures are locally disrupted, which have produced thrusts with limited displacement. East of the antiform (Kolomela area), the folds are upright, tight to open structures that have variable inter-limb angles. All of the fold structures west of the antiform are the product of east-west crustal contraction during the Kheis Orogeny, which produced eastward-directed thrusting.

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

Thrust faults that were intersected in drill core in the Welgevonden north area caused duplication of the stratigraphy. The high degree of associated deformation is clearly illustrated in drill core from the Welgevonden area and duplication or elimination of iron ore may occur.

The Wolhaarkop area is structurally more intensely deformed than the Kapstevel and the Welgevonden areas. The folds are tight to isoclinal, over-folded with an eastwards vergence. With subsequent deformation the fold structures became disrupted, resulting in thrust structures with eastwards directed movement.

The high-strain zones (thrusts) are locally characterised by a high degree of ferruginisation of extensively brecciated BIF. In some places, the ore is preserved as narrow, tightly folded lenses within the high-strain zones.

### Local geology

Four distinct high-grade iron ore types have been described at Kolomela mine in the various separate iron ore deposits:

- High-grade (Fe-rich) Laminated ore, which constitutes the main ore-type and comprises alternating micro bands of high-lustre haematite with equally thin, porous bands of lower-lustre haematite and specularite. The primary lamination of the precursor banded iron formation is still preserved, suggesting supergene enrichment (*in situ* replacement) of silica by iron.
- High-grade (Fe-rich) Clastic textured ore, comprising alternating haematite and specularite layers, thicker than those of the laminated ore and characterised by distorted, wavy bedding and occurs as lenses and massive units.
- High-grade (Fe-rich) Collapse breccia-type ore, comprising angular fragments of laminated and clastic-textured ore in chaotic arrangement. The fragments are cemented by fine-grained specularite and haematite. The brecciation is probably as a result of karstification of the underlying dolomites, ie the collapse breccia ore is the product of sudden, brittle collapse of laminated and clastic-textured ores into underlying solution cavities and is preserved in deep sinkhole structures.
- High-grade (Fe-rich) Conglomeratic ore, comprising poorly sorted, rounded to sub-rounded haematite pebbles and clasts in a ferruginised matrix representing, which usually occurs very localised and is considered to represent ferruginised Gamagara conglomerates.

In addition, material defined in the geological models with an *in situ* 50% ≤ Fe < 61%, comprising ferruginised banded iron formation, conglomerates and collapse breccia material, is termed medium-grade ore.

The various iron ore deposits located within the Kolomela mining right area contains a unique combination of ore types as described above as well as associated waste lithologies. The proportion of high-grade ore to medium-grade ore for the inclusive Mineral Resources as stated in 2018 is 86 to 14.

Geological interpretations have been derived from a borehole database comprising 7,838 boreholes. Additional boreholes informing the 2018 geological model update, compared to the 2017 geological models, are depicted as red dots in **Figure 12**.

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

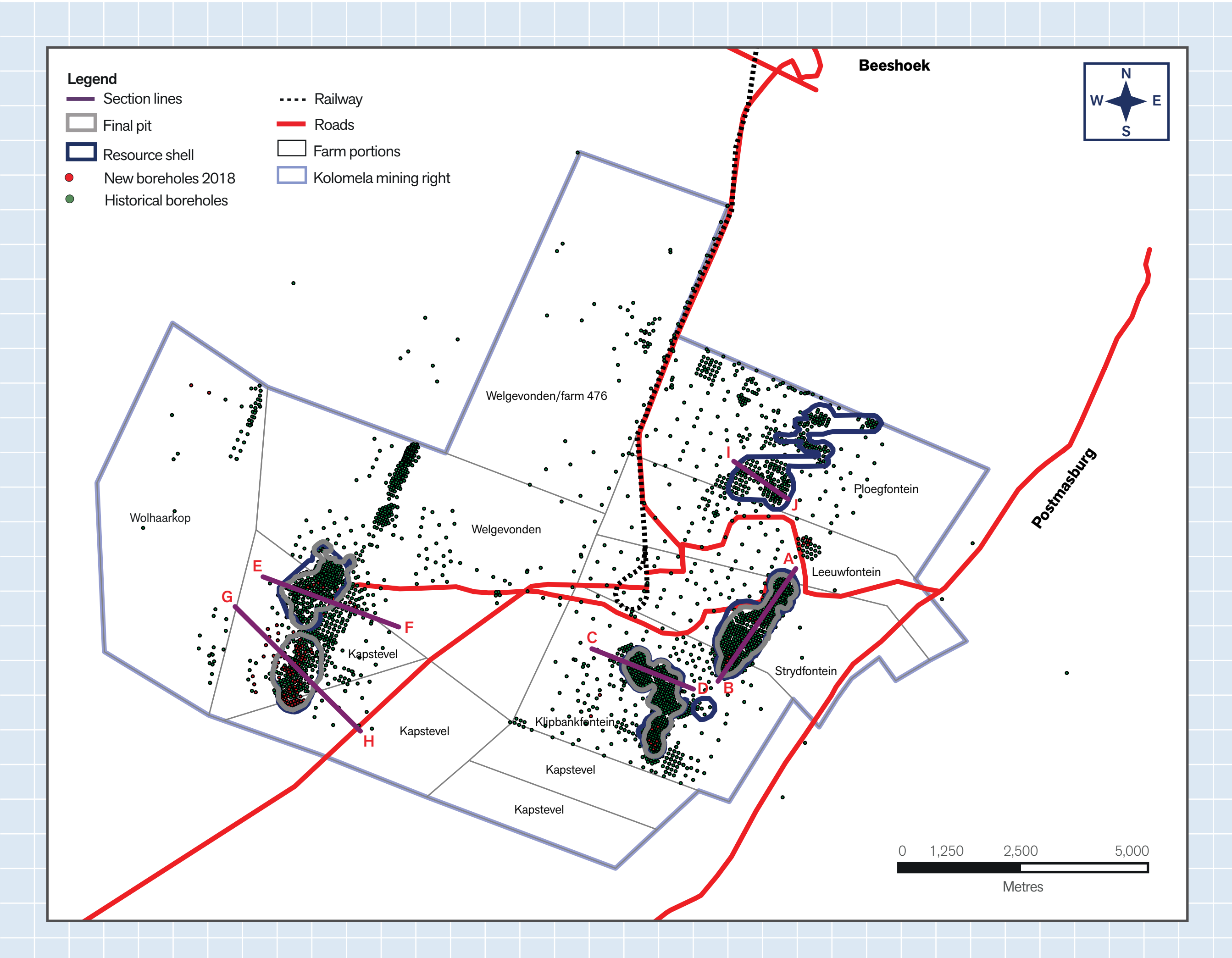



FIGURE 12: **KOLOMELA MINING RIGHT AREA WITH EXPLORATION (BOREHOLES SUNK IN 2018 AS PART OF THE MINE'S ONGOING EXPLORATION PROGRAMME INDICATED WITH RED DOTS)**

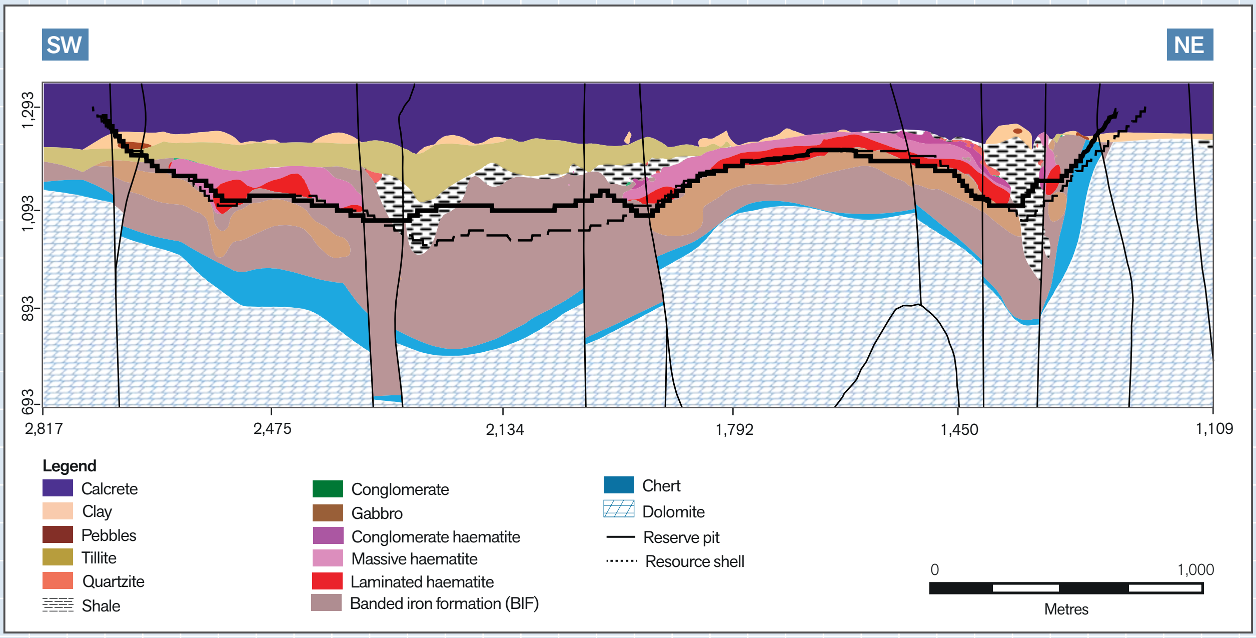
The geometry of the different ore bodies is depicted via cross-sections taken through the three-dimensional solids models of the various ore bodies:

- Cross-section AB (**Figure 13**) as referenced in plan (**Figure 12**) – North-east to south-west cross-section through the Leeuwfontein ore body.
- Cross-section CD (**Figure 14**) as referenced in plan (**Figure 12**) – West-north-west to east-south-east cross-section through the Klipbankfontein ore body.
- Cross-section EF (**Figure 15**) as referenced in plan (**Figure 12**) – West-north-west to east-south-east cross-section through the Kapstevel North ore body.
- Cross-section GH (**Figure 16**) as referenced in plan (**Figure 12**) – North-west to south-east cross-section through the Kapstevel South ore body.
- Cross-section IJ (**Figure 17**) as referenced in plan (**Figure 12**) – West-north-west to east-south-east cross-section through the Ploegfontein ore body.

It can be noticed in some of these figures that the pit layout boundaries in some instances exceeds the resource shell in size. This is possible where during pit optimisation ore geology is the limiting factor and not economic viability, and when the pit shell is engineered into a safe pit layout or design, the layout boundaries in some areas exceed the resource shell.

Also, the vertical scale has been exaggerated in all the cross-sections, for better illustrative purposes, resulting in ore body dip angles appearing steeper than actual.

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED



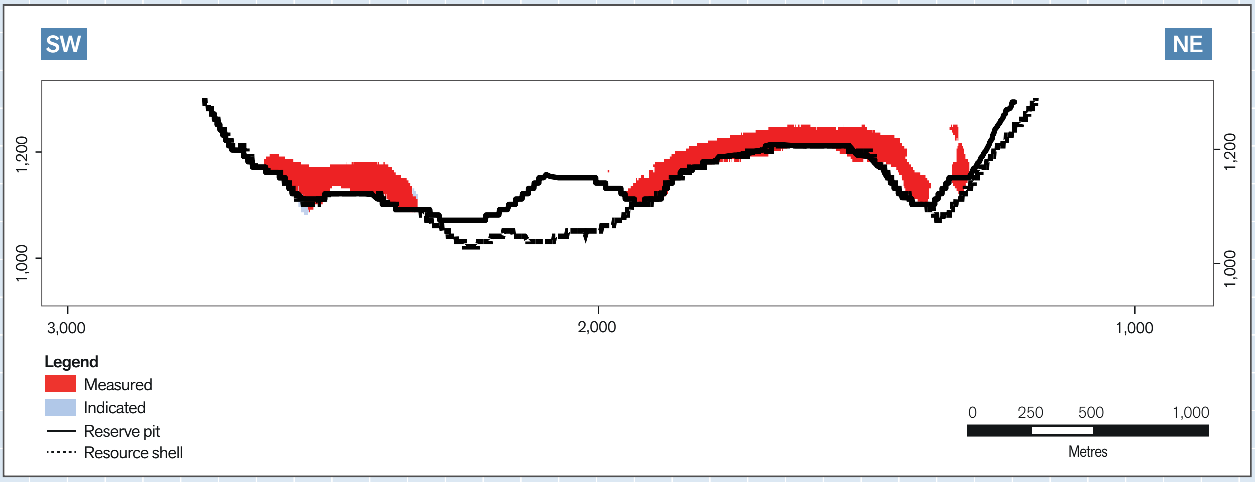
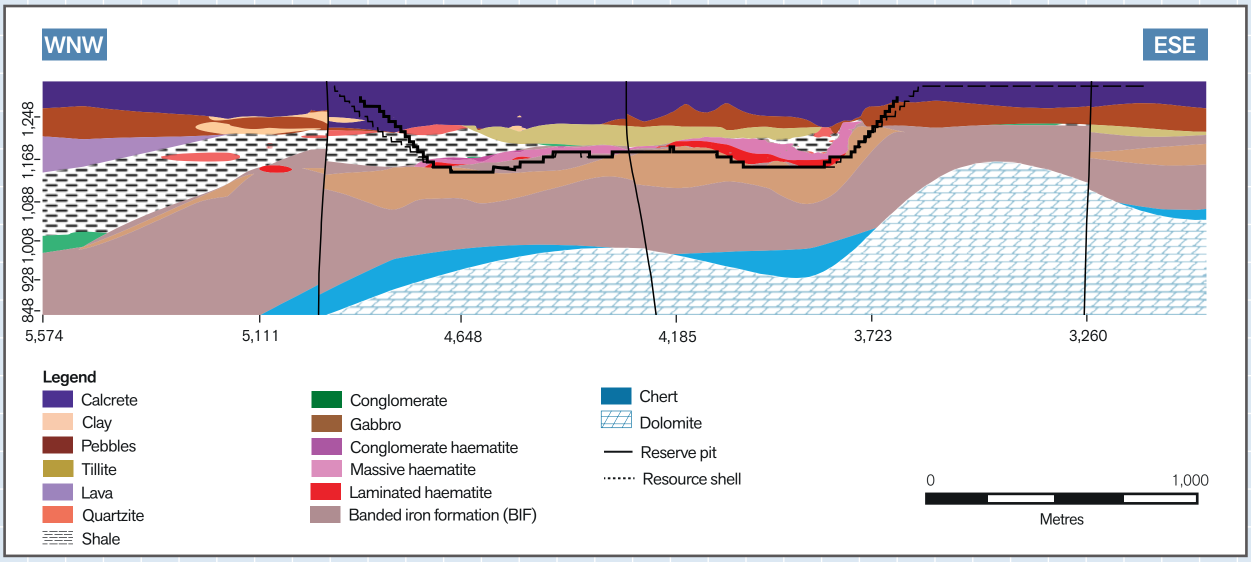




FIGURE 13: **SW-NE CROSS-SECTION THROUGH THE LEEUWFONTEIN ORE BODY (TOP) WITH ASSOCIATED GEOLOGICAL CONFIDENCE CLASSIFICATION (BOTTOM)**

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED



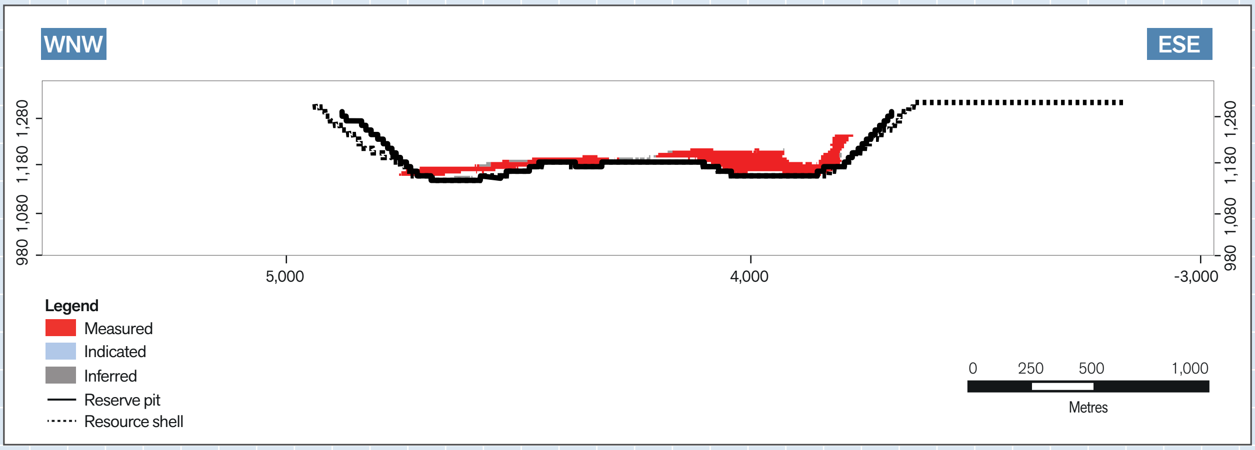
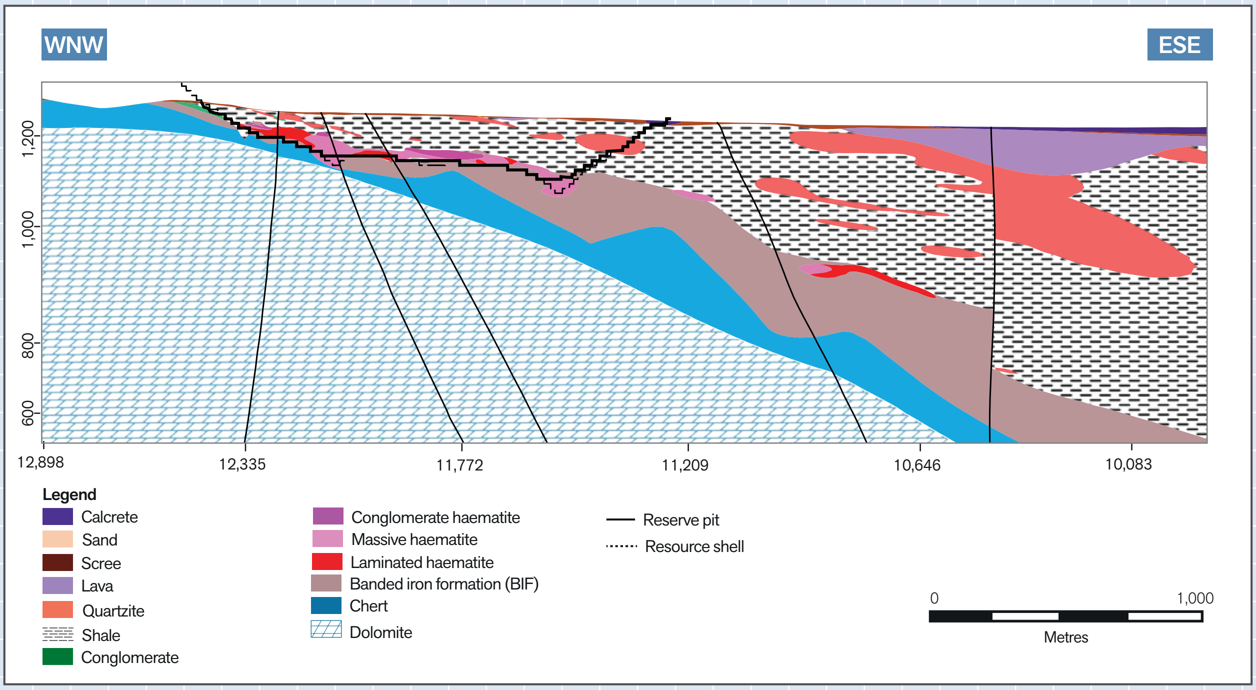




FIGURE 14: **WNW-ESE CROSS-SECTION THROUGH THE KLIPBANKFONTEIN ORE BODY (TOP) WITH ASSOCIATED GEOLOGICAL CONFIDENCE CLASSIFICATION (BOTTOM)**

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED



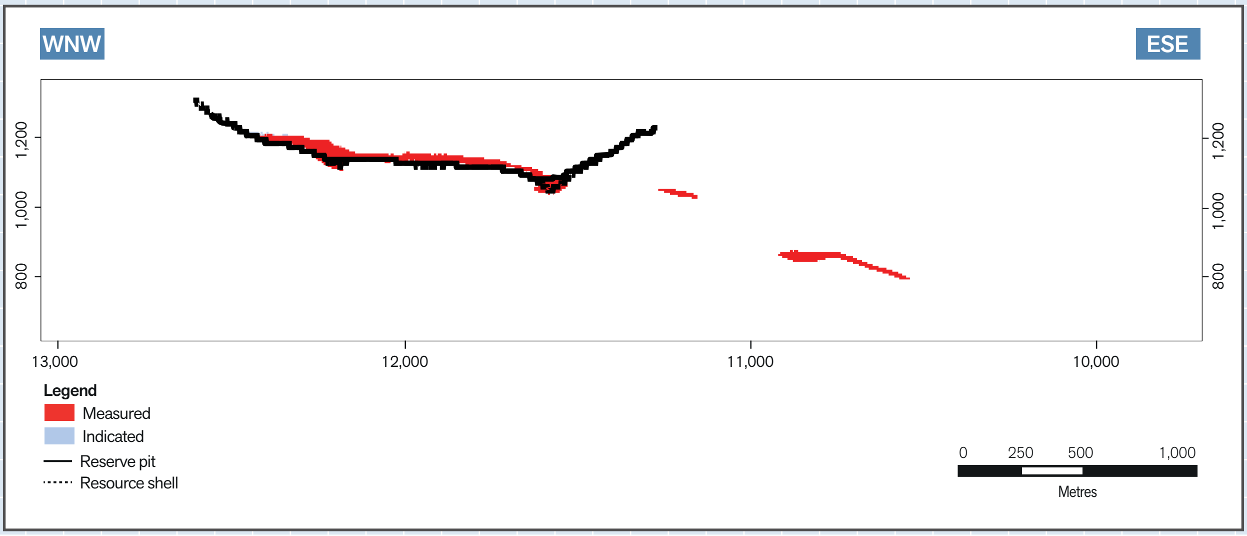
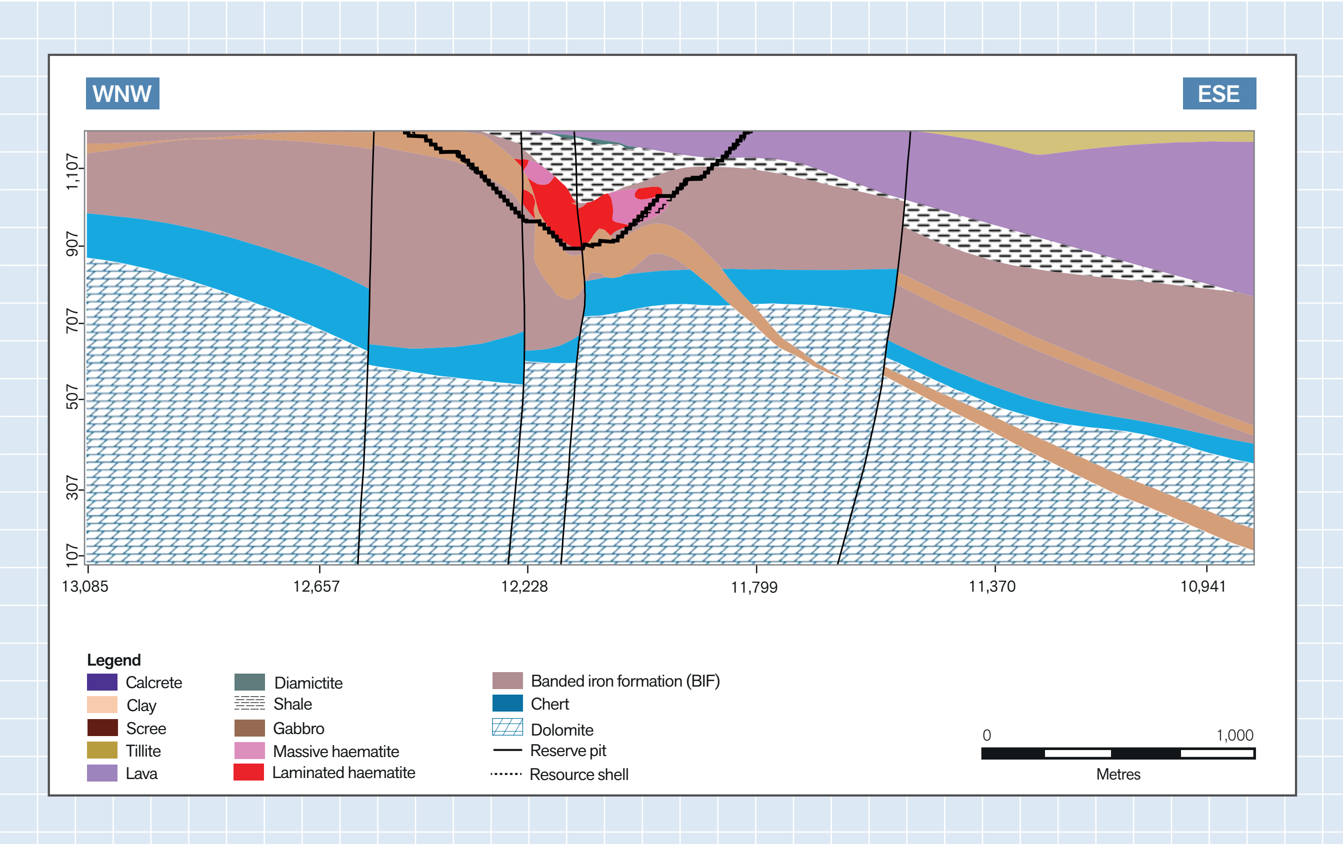




FIGURE 15: **WNW-ESE CROSS-SECTION THROUGH THE KAPSTEVEL NORTH ORE BODY (TOP) WITH ASSOCIATED GEOLOGICAL CONFIDENCE CLASSIFICATION (BOTTOM)**

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED



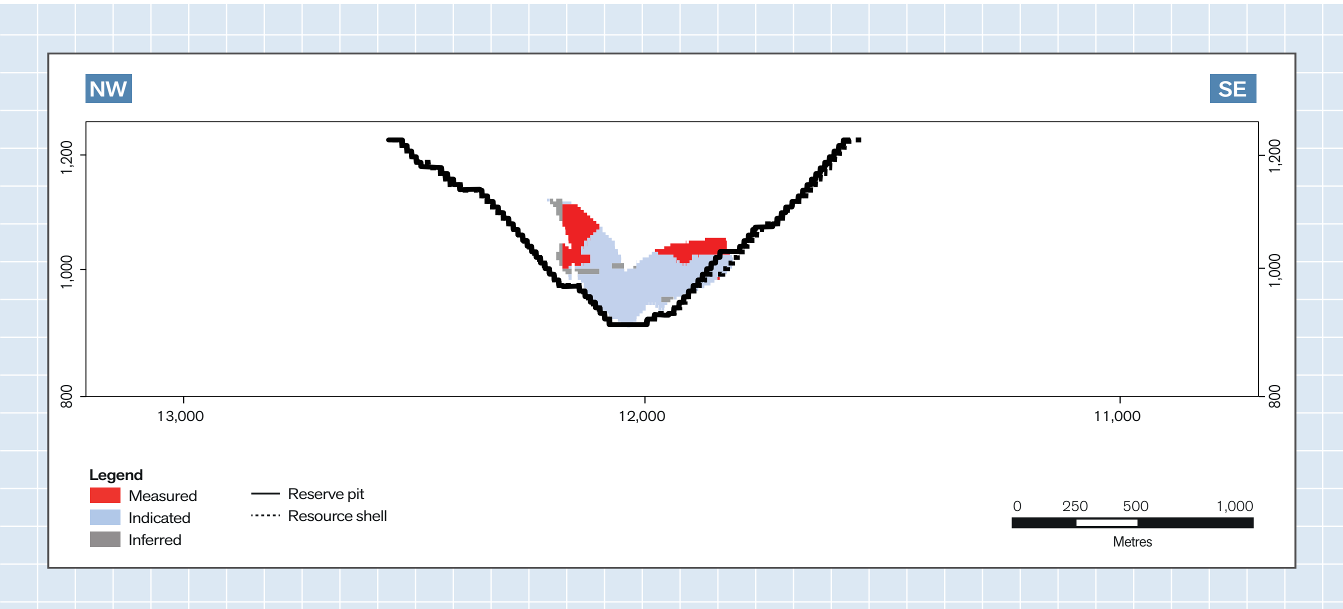
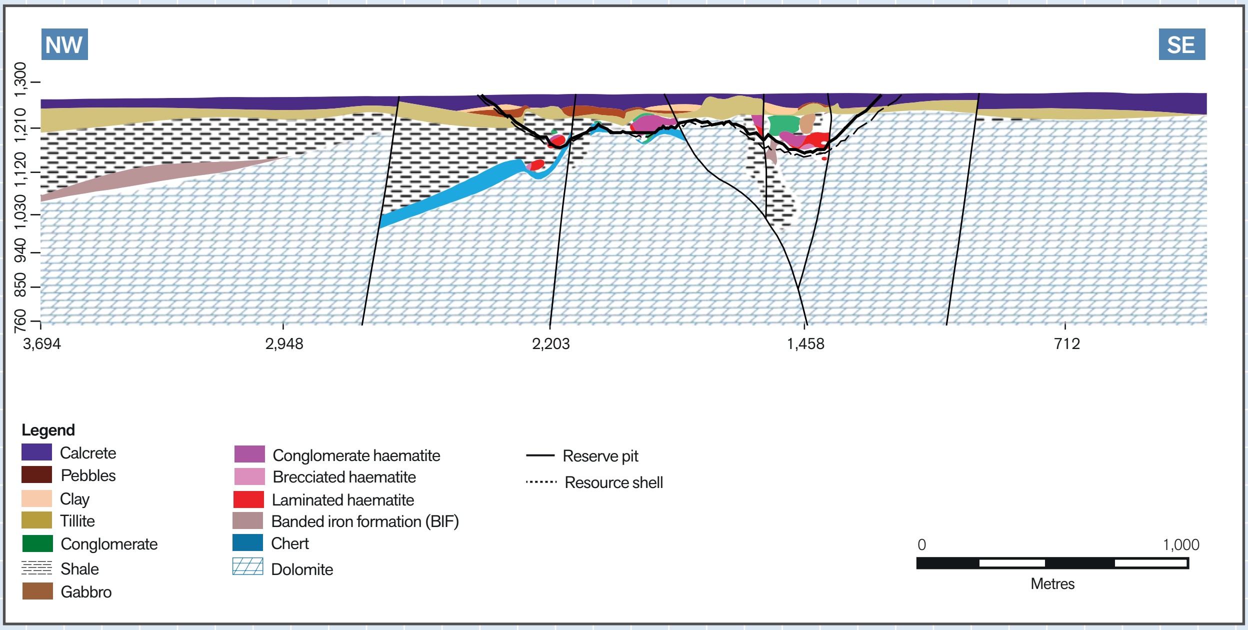




FIGURE 16: **WNW-ESE CROSS-SECTION THROUGH THE KAPSTEVEL SOUTH ORE BODY (TOP) WITH ASSOCIATED GEOLOGICAL CONFIDENCE CLASSIFICATION (BOTTOM)**

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED



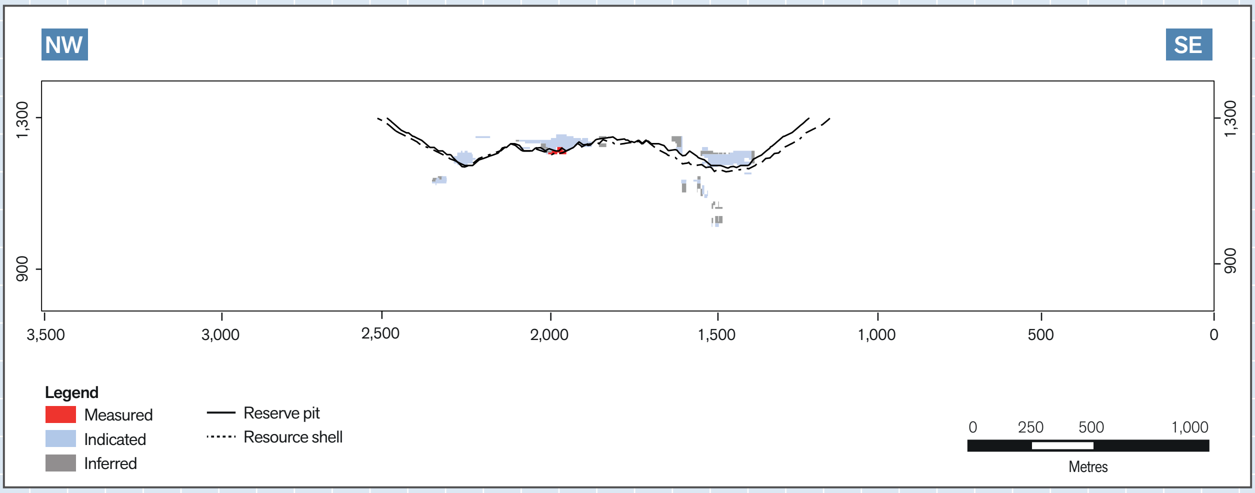




FIGURE 17: **NW-SE CROSS-SECTION THROUGH THE PLOEGFONTEIN ORE BODY (TOP) WITH ASSOCIATED GEOLOGICAL CONFIDENCE CLASSIFICATION (BOTTOM)**

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

**Operational outline**

Kolomela mine has been designed as a direct shipping ore operation, where conventional open-pit drilling-and-blasting, truck-and-shovel loading and hauling mining processes are applied to generate plant feed. Currently the Leeuwfontein, Klipbankfontein and Kapstevel North ore bodies are mined, but the 2018 LoMP also includes future mining of the Kapstevel South ore body.

The iron ore is loaded according to blend (grade) requirements and transported to designated run-of-mine finger stockpiles dependent on the Fe grade and contaminant grade of the load. The primary crushing and screening direct shipping ore (DSO) plant is fed from the finger stockpiles in blend ratios ensuring that the Lump and Fine product is suitable for client uptake (considering subsequent blending with Sishen mine product at the Saldanha harbour stock yard). A modular small-scale dense media separation (DMS) plant was commissioned in 2016 and contributes an average 6% to the Saleable Product output of Kolomela mine, through the treatment of medium-grade ore material.

The iron ore product (on average 60% Lump to 40% Fine) is railed to the Saldanha export harbour via the OREX iron ore export line. The product is marketed to SIOC's current overseas customer base as part of the SIOC marketing strategy and are blended with Sishen mine's product. Kolomela mine produces Lump and Fine ore, with the grade and physical properties of the Lump ore of such a high standard that it meets niche demand.

Kolomela mine's key operational parameters are summarised in **Table 9**.

TABLE 9: **KOLOMELA MINE OPERATIONAL OUTLINE SUMMARY**

| Key details | |
|---|---|
| Ownership (AA plc) | 53.2% |
| Ownership (KIO) | 76.3% |
| Commodity | Iron Ore |
| Country | Republic of South Africa |
| Mining method | Open pit – conventional |
| Reserve life* | 14.0 years |
| Estimated Saleable Product Lump : Fine ratio | 60 : 40 |
| Saleable Product design capacity | 15.0 (Mtpa) |
| Estimated 2018 run-of-mine production | 15.0 (Mt) |
| Estimated 2018 Saleable Product | 14.2 (Mt) |
| Estimated 2018 waste production | 56.5 (Mt) |
| Overall planned stripping ratio (2018 LoMP) | 4.1 : 1 |
| Estimated product sold in 2018 | 13.7 (Mt) |
| Product types | Lump and Fine |
| Mining right expiry date | 17 September 2038 |

* Reserve life includes all consecutive years in the life-of-mine plan where the Proved and Probable Ore Reserves make up >25% of the year's run-of-mine.

The total tonnes extracted from three pits (Leeuwfontein, Klipbankfontein and Kapstevel North) at Kolomela mine increased by 2% from 71.8 Mt (in 2017) to an estimated 73.3 Mt in 2018. The 2018 mining performance (as estimated at the time of reporting) comprises 56.5 Mt of ex-pit waste and 16.8 Mt (15.6 Mt Ore Reserves and 1.2 Mt modified Inferred Mineral Resources) of ex-pit ore, of which 15.0 Mt was delivered to the DSO and DMS plants as run-of-mine with a year-on-year run-of-mine stockpile growth of 1.8 Mt.

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

In total, 14.2 Mt of Saleable Product is expected to be produced on site from the run-of-mine delivered to the crushing and screening and DMS plants in 2018, compared to 13.9 Mt in 2017. In total, 13.7 Mt is expected to be railed to the Saldanha Port for export in 2018.

### Production history

Kolomela mine's production history of Saleable Product is summarised in **Figure 18**.

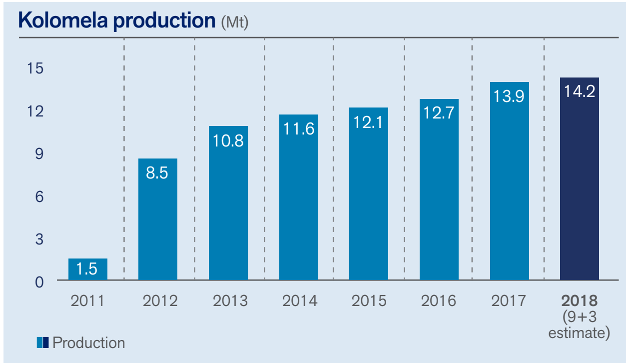



FIGURE 18: **KOLOMELA MINE PRODUCTION HISTORY**

### Latest life-of-mine plan Saleable Product profile

The 2018 LoMP Saleable Product profile is depicted in **Figure 19**.

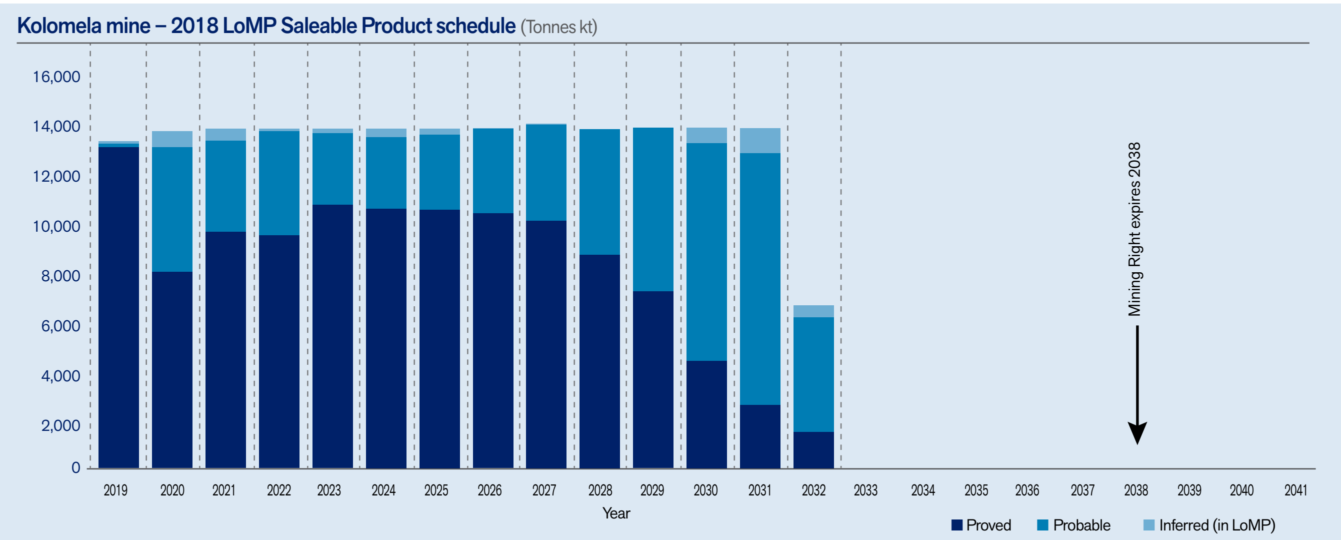



FIGURE 19: **KOLOMELA MINE'S 2018 LIFE-OF-MINE PLAN ANNUAL SALEABLE PRODUCT PROFILE** (including modified beneficiated Inferred Mineral Resources)

### Ore Reserve ancillary information

The Kolomela mine Ore Reserve ancillary information is summarised in **Table 10a** (background information) and **Table 10b** (Leeuwfontein Ore Reserve estimation parameters – as an example).

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

## TABLE 10A: KOLOMELA MINE'S 2018 VS 2017 ORE RESERVE BACKGROUND INFORMATION

| KOLOMELA MINE | 2018 | 2017 |
|---|---|---|
| **LOCATION** | | |
| Country | Republic of South Africa | Republic of South Africa |
| Province | Northern Cape | Northern Cape |
| **OWNERSHIP** | | |
| Sishen Iron Ore Company Proprietary Limited | 100% | 100% |
| Kumba Iron Ore Limited | 76.3% | 76.3% |
| AA plc | 53.2% | 53.2% |
| **OPERATIONAL STATUS** | | |
| Operation status | Steady-state | Steady-state |
| Mining method | Opencast (conventional drilling and blasting and truck and shovel operation) | Opencast (conventional drilling and blasting and truck and shovel operation) |
| Beneficiation method | Direct shipping ore (only crushing and screening of high-grade RoM) as well as dense media separation plant for B-grade material | Direct shipping ore (only crushing and screening of high-grade RoM) as well as dense media separation plant for B-grade material |
| Annual Saleable Product (Mtpa) | 13.6 | 13.6 |
| Annual supply to domestic market (Mtpa) | 0.0 | 0.0 |
| Annual supply to export market (Mtpa) | 13.6 | 13.6 |
| Number of products | 2 product types (Lump and Fine) | 2 product types (Lump and Fine) |
| **GOVERNANCE** | | |
| Code | THE SAMREC CODE – 2016 EDITION | THE SAMREC CODE – 2016 EDITION |
| AA plc group technical standard | AA_GTS_22 (Reporting of Exploration Results, Mineral Resources and Ore Reserves in Anglo American) | |
| KIO reporting policy | http://www.angloamericankumba.com/sd_policies.php | http://www.angloamericankumba.com/sd_policies.php |
| KIO reporting protocols | KIOReportingProcedure(2015) | KIOReportingProcedure(2015) |
| | KIO Reserve Classification Guideline (version 1) | KIO Reserve Classification Guideline (version 1) |
| KIO reporting template | Ore Reserve (and Saleable Product) Reporting Template (2017) | Ore Reserve (and Saleable Product) Reporting Template (2017) |
| **REPORTING METHOD** | | |
| Approach | Ore Reserves are those derived from Measured and Indicated Mineral Resources only (through application of modifying factors) and do not include Inferred Mineral Resources. In the case of Kumba Iron Ore all Ore Reserves are constrained by practical pit layouts, mining engineered from pit shells that define "current economically mineable".<br><br>The geological block model(s) is converted into a mining block model considering a site-specific practical mineable smallest mining unit. Furthermore, protocols ensure that Kumba Iron Ore's operations/projects consider expected long-term revenues versus the operating and production costs associated with mining and beneficiation as well as legislative, environmental and social costs, in determining whether or not a Mineral Resource could be economically extracted and converted to an Ore Reserve. This is performed by applying a Lerchs-Grosmann algorithm to the mining model to derive an optimised pit shell. This optimised pit shell is then iteratively converted to a practical layout by applying geotechnical slope stability parameters and haul road and ramp designs, legal restrictions, etc with safety being one of the most considered parameters. Once a practical pit layout has been established the material within the pit is scheduled over time to achieve client specifications and thus a LoM schedule is produced.<br><br>The average % Fe grade and metric tonnage estimates of "Saleable Product" are also reported to demonstrate that beneficiation losses have been taken into account. | |

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

## TABLE 10A: KOLOMELA MINE'S 2018 VS 2017 ORE RESERVE BACKGROUND INFORMATION continued

| KOLOMELA MINE | 2018 | 2017 |
|---|---|---|
| **REPORTING METHOD** continued | | |
| Scheduled run-of-mine metric tonnes (dry/wet) | Dry | Dry |
| Tonnage calculation | Tonnages are calculated from the life-of-mine schedule, originating from the mining block models, and are modified tonnages considering geological losses, the effect of dilution, mining losses, mining recovery efficiencies and design recovery efficiencies to derive the run-of-mine tonnages delivered to the crushing and screening plant. | Tonnages are calculated from the life-of-mine schedule, originating from the mining block models, and are modified tonnages considering geological losses. The effect of dilution, mining losses, mining recovery efficiencies and design recovery efficiencies to derive the run-of-mine tonnages delivered to the crushing and screening plant. |
| Fe grade | Ore Reserve % Fe grades reported, represent the weighted average grade of the "plant feed" or "run-of-mine" (RoM) material and take into account all applicable modifying factors. | Ore Reserve % Fe grades reported, represent the weighted average grade of the "plant feed" or "run-of-mine" (RoM) material and take into account all applicable modifying factors. |
| Cut-off grade (Fe) | 50% Fe (includes diluting material) | 50% Fe (includes diluting material) |
| Ore type | Haematite Ore | Haematite Ore |
| Saleable Product selling unit | Iron Ore – Fe (US$/tonne) | Iron Ore – Fe (US$/tonne) |
| **Life-of-mine scheduling** | | |
| Software | OPMS | OPMS |
| Method | Product tonnage and grade target driven to achieve required client product specifications | Product tonnage and grade target driven to achieve required client product specifications |
| Stripping strategy | Deferred waste stripping strategy | Deferred waste stripping strategy |
| Reserve life years | 14 | 14 |
| LoMP run-of-mine tonnes (including modified Inferred) (expressed in million tonnes) | 192.5 | 190.9 |
| Overall average stripping ratio (including Inferred Mineral Resources) | 1.0 : 4.1 | 1.0 : 4.5 |
| Production data cut-off date (date whereafter short-term plan instead of actual figures is used to estimate the annual run-of-mine and Saleable Product production for the mine until 31 December of year of reporting) | 30 September 2018 | 31 July 2017 |
| Topography and pit progression assigned | 31 December 2018 | 31 December 2017 |
| Reserve Schedule ID (Schedule file name + extension) | 2018 LoM Base Case Optimised Report.xlsx | 2017 LoM Base Case Optimised Report.xlsx |
| Reserve schedule completion date | 15 October 2018 | 30 September 2017 |

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

TABLE 10B: **KOLOMELA MINE'S 2018 VS 2017 LEEUWFONTEIN ORE RESERVE ESTIMATION PARAMETERS** (similar tables exist for the Klipbankfontein, Kapstevel North and Kapstevel South mining areas)

| | **2018** | 2017 |
|---|---|---|
| **ESTIMATION** | | |
| **Leeuwfontein** | | |
| Mining block model name | lft_smultmod0318v3.1.dm | lf_10_10_10_smu_rotated.mdl |
| Smallest mining unit | 10m(X) x 10m(Y) x 10m(Z) | 10m(X) x 10m(Y) x 10m(Z) |
| **Practical mining parameters** | | |
| Bench height | 10m | 10m |
| Ramp gradient | 8% to 10.0% (1 in 8 to 1 in 10) | 8% to 10.0% (1 in 8 to 1 in 10) |
| Road width | 35m | 35m |
| Minimum mining width | 80m (hydraulic truck-and-shovel mining) | 80m (hydraulic truck-and-shovel mining) |
| Geohydrology | Groundwater level maintained 20m below pit floor | Groundwater level maintained 20m below pit floor |
| Pit slopes | Designed according to a defendable risk matrix, guided by an appropriate factor of safety of 1.3 and a probability of failure of 10% | Designed according to a defendable risk matrix, guided by an appropriate factor of safety of 1.3 and a probability of failure of 10% |
| **Pit optimisation** | | |
| Software | Whittle 4X | Whittle 4X |
| Method | Lerchs-Grosmann (marginal cost cut-off analysis) | Lerchs-Grosmann (marginal cost cut-off analysis) |
| **Modification** | | |
| **Modifying factors** | | |
| • Geological loss (%) | 0.0 | 0.0 |
| • Dilution (%) | 4.4 | 0.1 |
| • Mining loss (%) | −6.9 | −3.3 |
| • Mining recovery efficiency (%) | 93.6 | 93.3 |
| • Design recovery efficiency (%) | 100.0 | 99.7 |
| • Ore Reserves reallocated to Mineral Resources (%) | −3.3 | −6.2 |
| • Metallurgical yield (%) to convert to Saleable Product | 98.8 | 95.8 |
| **Estimator** | | |
| Reserve estimator | Grant Crawley | Grant Crawley |
| Reserve estimator status | External Competent Person | External Competent Person |
| Estimator employer | RPMGlobal | RPMGlobal |

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

**Mineral Resource ancillary information**

The Kolomela mine Mineral Resource ancillary information is summarised in **Table 11a** (background information) and **Table 11b** (Leeuwfontein Mineral Resource estimation parameters – as an example).

TABLE 11A: **KOLOMELA MINE'S 2018 VS 2017 MINERAL RESOURCE BACKGROUND INFORMATION**

| KOLOMELA MINE | 2018 | 2017 |
|---|---|---|
| **LOCATION** | | |
| Country | Republic of South Africa | Republic of South Africa |
| Province | Northern Cape | Northern Cape |
| **OWNERSHIP** | | |
| Sishen Iron Ore Company Proprietary Limited | 100 | 100 |
| Kumba Iron Ore Limited | 76.3 | 76.3 |
| Anglo American plc | 53.2 | 53.2 |
| **SECURITY OF TENURE** | | |
| Number of applicable mining rights | 1 | 1 |
| Mining right status | Registered | Registered |
| Mining right expiry date(s) | 17 September 2038 | 17 September 2038 |
| **EXPLORATION STATUS** | | |
| Exploration type | Geological confidence (in mine) | Geological confidence (in mine) |
| Exploration phase | In execution | In execution |
| **GOVERNANCE** | | |
| Code | THE SAMREC CODE – 2016 EDITION | THE SAMREC CODE – 2016 EDITION |
| AA plc group technical standard | AA_GTS_22 (Reporting of Exploration Results, Mineral Resources and Ore Reserves in Anglo American) | |
| KIO reporting policy | http://www.angloamericankumba.com/sd_policies.php | http://www.angloamericankumba.com/sd_policies.php |
| KIO reporting protocols | KIOReportingProcedure(2015) | KIOReportingProcedure(2015) |
| | KIO Resource Classification Guideline (version 2) | KIO Resource Classification Guideline (version 2) |
| KIO reporting template | Mineral Resource (and Mineral Inventory) Reporting Template (2017) | Mineral Resource (and Mineral Inventory) Reporting Template (2017) |
| **REPORTING METHOD** | | |
| Approach | Mineral Resources are reported exclusive of Ore Reserves and not factoring in attributable ownership and only if: (1) spatially modelled; (2) spatially classified; (3) spatially constrained in terms of reasonable and realistic prospects for eventual economic extraction (occurring within an RRPEEE defined envelope, in other words not all mineral occurrences are declared as Mineral Resources); (4) declared within (never outside) executed tenement boundaries. | |
| *In situ* metric tonnes (dry/wet) | Dry | Dry |
| Tonnage calculation | Tonnages are added from cells in geological block model of which the centroids intersect the relevant geological ore domains in the solids models which occur inside the resource shell. The volume of each ore cell is multiplied with the estimated relative density of the same cell). | Tonnages are added from cells in geological block model of which the centroids intersect the relevant geological ore domains in the solids models which occur inside the resource shell. The volume of each ore cell is multiplied with the estimated relative density of the same cell). |
| Fe grade | Weighted average above cut-off grade | Weighted average above cut-off grade |
| Fe calculation | Tonnage-weighted mean of the estimated *in situ* Mineral Resource Fe grades contained within geological block models, constrained by the relevant Resource geological ore domains and RRPEEE resource shell. | Tonnage-weighted mean of the estimated *in situ* Mineral Resource Fe grades contained within geological block models, constrained by the relevant Resource geological ore domains and RRPEEE resource shell. |
| Cut-off grade | 50% Fe | 50% Fe |
| Ore type | Haematite Ore | Haematite Ore |

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

TABLE 11B: **KOLOMELA MINE'S 2018 VS 2017 LEEUWFONTEIN MINERAL RESOURCE ESTIMATION PARAMETERS – AS AN EXAMPLE** (similar tables exist for the Klipbankfontein, Kapstevel North, Kapstevel South, Ploegfontein and Wolhaarkop ore bodies but are not reported)

| | **2018** | 2017 |
|---|---|---|
| **ESTIMATION** | | |
| **Leeuwfontein geological model** | | |
| ***Input data*** | | |
| Borehole type | Core and Percussion borehole lithological logs and associated chemical analyses | |
| Relative density measurement | Picnometer analyses on pulp samples | Picnometer analyses on pulp samples |
| KIO QA/QC protocol | KIO QC Protocol for Exploration Drilling Sampling and Sub-sampling (version 7) | |
| Primary laboratory | Anglo American Research Division of Anglo Operations Limited Chemistry Laboratory (co reg no: 1921/006730/07) | Anglo American Research Division of Anglo Operations Limited Chemistry Laboratory (co reg no: 1921/006730/07) |
| Accreditation | Accredited under International Standard ISO/IEC 17025:2005 by the South African National Accreditation System (SANAS) under the Facility Accreditation Number T0051 (valid from 1 May 2016 to 30 April 2021) | Accredited under International Standard ISO/IEC 17025:2005 by the South African National Accreditation System (SANAS) under the Facility Accreditation Number T0051 (valid from 1 May 2016 to 30 April 2021) |
| Borehole database software | acQuire | acQuire |
| Borehole database update cut-off date | 30 April 2017 | 30 April 2016 |
| Database validation conducted | Yes | Yes |
| Segmentation conducted | Yes. To allow for simplification of logged lithologies for spatial correlation purposes | |
| **STATISTICAL AND GEOSTATISTICAL EVALUATION** | | |
| Data compositing interval | 1m | 1m |
| Data compositing method | Length weighted average per lithology | Length weighted average per lithology |
| Grade parameters evaluated | % Fe, % $SiO_2$, % $Al_2O_3$, % $K_2O$, % S and % P as well as Relative Density | % Fe, % $SiO_2$, % $Al_2O_3$, % $K_2O$, % S and % P as well as Relative Density |
| Variography updated in current year | Yes | Yes |
| Search parameters updated in current year | Yes | Yes |
| **SOLIDS MODELLING** | | |
| Solids modelling software | Leapfrog | Leapfrog |
| Input | Previous 3D explicit solids model | Previous 3D explicit solids model |
| Method | Implicit modelling for all domains | Implicit modelling for all domains |
| Domaining | Yes, by lithology and structural controls | Yes, by lithology and structural controls |
| Topography and pit progression assigned | 31 December 2017 (planned pit boundary) | 31 December 2017 (planned pit boundary) |
| Validation conducted | Yes (for gaps and overlaps by software queries as well as honouring of borehole contacts) | Yes (for gaps and overlaps by software queries as well as honouring of borehole contacts) |

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

TABLE 11B: **KOLOMELA MINE'S 2018 VS 2017 LEEUWFONTEIN MINERAL RESOURCE ESTIMATION PARAMETERS – AS AN EXAMPLE** (similar tables exist for the Klipbankfontein, Kapstevel North, Kapstevel South, Ploegfontein and Wolhaarkop ore bodies but are not reported) continued

| | **2018** | 2017 |
|---|---|---|
| **GRADE ESTIMATION METHODOLOGY** | | |
| Ore segments | Ordinary (Co-) Kriging | Ordinary (Co-) Kriging |
| Waste segments | Global estimate | Global estimate |
| **GEOLOGICAL BLOCK MODELLING** | | |
| Block modelling software | Surpac | Surpac |
| Model type | Centroid Model | Centroid Model |
| Parent cell size | 40m x 40m x 10m (Kriging neighbourhood analyses) | 40m x 40m x 10m (Kriging neighbourhood analyses) |
| Minimum sub-block cell size | 5m(X) x 5m(Y) x 5m(Z) | 10m(X) x 10m(Y) x 5m(Z) |
| **CELL POPULATION METHOD** | | |
| Tonnage | Volume of lithology intersected by cell centroid and constrained by cell limits, multiplied with relative density estimate of the same lithology at same unique cell centroid position in space. | Volume of lithology intersected by cell centroid and constrained by cell limits, multiplied with relative density estimate of the same lithology at same unique cell centroid position in space. |
| Grade | Estimate of grade at unique cell centroid position in space applicable to total volume or tonnage constrained by the cell. | Estimate of grade at unique cell centroid position in space applicable to total volume or tonnage constrained by the cell. |
| Updated geological block model ID (file name + extension) | LFT18_Miningv1_3.dm | lf022017_v5a |
| Update completion date | 20 February 2018 | 17 February 2017 |
| **ESTIMATOR** | | |
| **Resource estimator** (name and surname) | Fanie Nel | Fanie Nel |
| Resource estimator status (internal Competent Person/internal technical specialist/external Competent Person/ external technical specialist) | Internal technical specialist | Internal technical specialist |
| Estimator employer | Sishen Iron Ore Company Proprietary Limited | Sishen Iron Ore Company Proprietary Limited |

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

## SISHEN MINE

### GEOLOGICAL OUTLINE

**Regional geology**

Falls within same regional geological environment (towards northern end of Northern Cape province "Iron Ore Belt") as Kolomela mine – please see Kolomela mine "Regional geology" section (page 32).

**Stratigraphy**

The carbonates of the Campbell Rand Subgroup are separated from the overlying Banded Iron Formation (BIF) of the Asbestos Hills Subgroup by a siliceous, residual breccia. This breccia is known locally as the Wolhaarkop Breccia and is developed on an irregular, karst surface.

The BIFs of the Asbestos Hills Subgroup are characteristically fractured and brecciated, especially near the contact with the Wolhaarkop breccia. Both upper and lower contacts are erosion surfaces and together with the lack of easily identifiable marker horizons make correlation of individual beds virtually impossible.

A highly altered, slickensided, intrusive sill is commonly found separating the BIF from the overlying laminated ore. At Sishen mine it is generally less than 2m thick. The sill is invariably folded into the basinal geometry and only rarely cross-cuts (intrudes) the ore bodies.

At the Sishen deposit, the upper parts of the Asbestos Hills Subgroup have been ferruginised to ore grade. These stratiform, laminated and massive ores constitute the bulk of the resource. The laminated and massive ores are commonly folded and faulted into basinal and pseudo-graben structures.

Deep palaeo-sinkholes, filled with brecciated ore and Gamagara sedimentary rocks, are found on the southern parts of the Sishen properties. The sinkholes are restricted to antiformal structures close to the Maremane Dome on the southern portions of the mine. They are an important mechanism for preserving collapse breccia ore.

They are unconformably overlain by a thick package of sedimentary rocks (conglomerates, shales, flagstone and quartzite) termed the Gamagara Subgroup (S.A.C.S., 1995). Many researchers including Beukes and Smit (1987) and Moore (pers. comm.) have correlated this unit with the Mapedi Formation, which constitutes the lowermost unit of the Olifantshoek Supergroup. The Olifantshoek Supergroup is the oldest recognised red-bed sequence in the region. It is some 400 Ma younger than the Transvaal Supergroup.

Conglomerates of ore-grade with well-rounded clasts and fine-grained, well-sorted, gritty ores are common at Sishen mine. Partly ferruginised shales, interbedded with ore conglomerates and thick flagstones are also a feature of the Gamagara Subgroup.

Along the western margin of Sishen mine, diamictite of the Makganyene Formation and lavas of the Ongeluk Formation have been thrust over the sedimentary rocks of the Gamagara Subgroup. The diamictite and lava have been eroded by later events. Tillite of the Dwyka Group and pebble beds, clay and calcrete of the Kalahari Group have been deposited on these erosional unconformities.

A few thin, diabase dykes with north-south and northeast-southwest orientations have intruded the stratigraphic sequence. They form impervious barriers and compartmentalise the groundwater.

A buried glacial valley, filled with Dwyka tillite and mudstones has been identified with reconnaissance drilling. The valley is located between the mine and Kathu. It has a north-south orientation that changes to northwest-southeast between Dibeng and the mine. The valley does not fall within the planned open pit.

The Kalahari Group comprises boulder beds, clays, calcrete, dolocrete and windblown sands. The Kalahari Group is developed to a maximum thickness of 60m. The clay beds at Sishen can attain a thickness of up to 30m on the northern parts of the deposit. The Kalahari beds of calcrete, limestone and clay and Quaternary sand and detritus, blanket more than 90% of the Sishen mining area.

A generalised version of the Sishen mine stratigraphy is depicted in **Figure 20**.

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

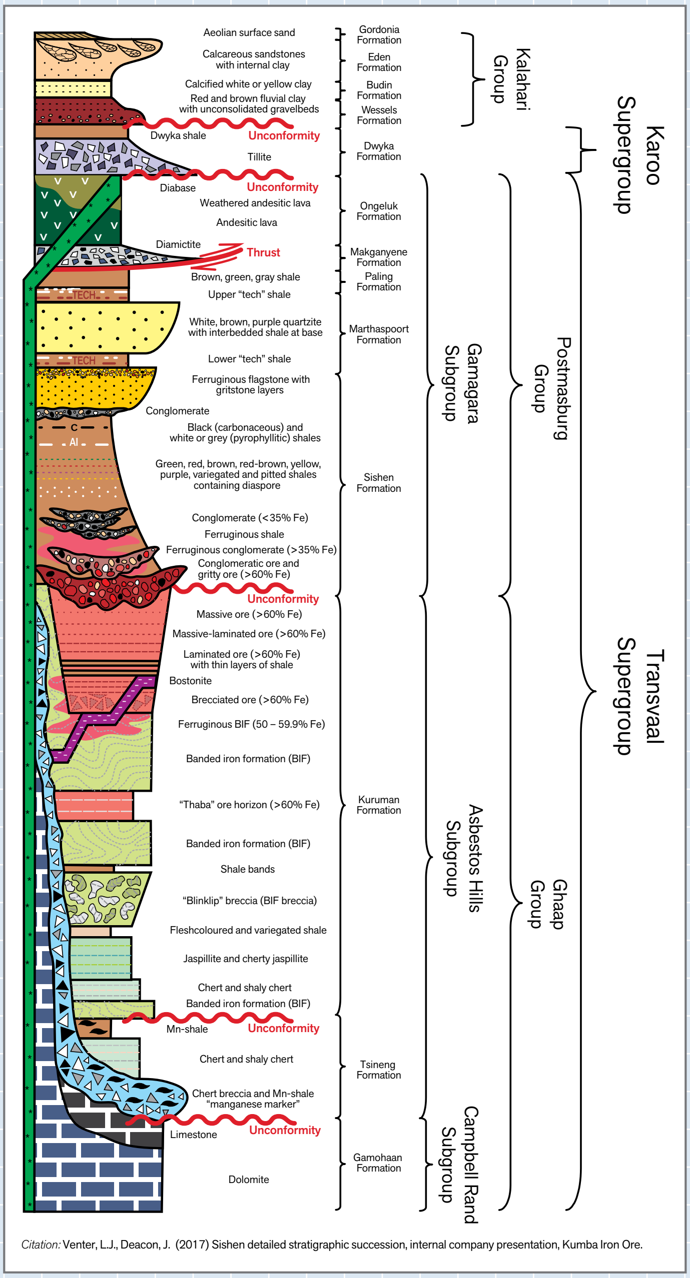



FIGURE 20: **SIMPLIFIED STRATIGRAPHIC COLUMN DEPICTING THE SISHEN LOCAL GEOLOGY**

### Tectonic setting

Structural studies by Stowe (1986), Altermann and Hälbich (1991) and Hälbich et al (1993) concluded that the lower Transvaal Supergroup exhibits at least three major phases of compressional tectonism at the western edge of the Kaapvaal Craton. The overall number of events may be significantly higher; for example, Altermann and Hälbich (1991) suggested that there were seven events.

The development of this part of the Kaapvaal Craton is summarised below, in chronological order and using current azimuths, from Stowe (1986), Altermann and Hälbich (1991), Hälbich et al (1993), Friese (2007a, b) and Friese and Alchin (2007):

- ~2.78-2.64 Ga: Ventersdorp rift basin development. NE-SW trending faults, which formed graben boundaries, developed due to basin initiation and subsidence;
- ~2.64-2.6 Ga: Extrusion and deposition of the volcano sedimentary Vryburg Formation and Ventersdorp lavas;
- ~2.60-2.52 Ga: Development of a carbonate platform, during widespread marine transgression; consequent conformable deposition of the Schmidtsdrif and Campbell Rand Subgroup dolomites;
- ~2.52-2.46 Ga: Off-craton/oceanic rifting to the west, accompanied by hydrothermal deposition of manganiferous chert of the Wolhaarkop Formation. This was followed by deposition of the Asbestos Hill Subgroup (banded iron formation/ Kuruman Formation);
- ~2.46-2.35 Ga: Incipient break-up and rifting, along a set of N-S trending, W-dipping normal faults in the Kaapvaal Craton during a "second extensional stage" (Friese and Alchin, 2007). According to Dalstra and Rosière (2008), "E1" or their first extensional event occurred immediately before the "Kalahari Orogeny";
- ~2.35-2.25 Ga: The first phase of folding (F1) resulted from the E-verging "Kalahari Orogeny". Altermann and Hälbich (1991) cite the >2.24 Ga or pre-Makganyene development of the Uitkomst cataclasite as part of this event, which they attribute to a bedding-parallel thrust. F1 folds were predominantly N-S trending; therefore, the main axis of the Maremane Dome is effectively a 2.35-2.25 Ga F1 anticline or an F2-tightened F1 anticline. Pre-existing, predominantly rift-related normal faults were inverted and underwent a component of strike-slip reactivation, concomitant with this eastward tectonic vergence; their adjacent, uplifted blocks were eroded. An additional feature of this event appears to be the formation of conjugate NE- and SE-trending strike-slip faults which are radially distributed around the eastern curve of the Maremane Dome. This orogeny also caused uplift and erosion of underlying units, including the Ghaap Group, to form the Postmasburg Unconformity, which is

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

pivotal in regional ore development and/or preservation. The deposition of the Makganyene Formation of the Lower Postmasburg Group, which has a minimum age of 2.22 Ga, probably resulted from this event;

- ~2.24-1.83 Ga: Reactivation of faults related to both the N-S-trending passive margin rift and the Ventersdorp Rift, causing deposition of the fault-controlled or fault-bounded, volcano-sedimentary/volcanoclastic Upper Postmasburg Group. Ongeluk lavas signify the peak of mafic lava extrusion at c. ~2.22 Ga, via feeder dykes that exploited reactivated NNE- to NE-trending faults (Friese and Alchin, 2007; Figure 1). Dalstra and Rosière (2008) correctly inferred that dykes locally recrystallised ores. Within this interval, deposition of clastic sediments in the form of conglomerate, "grit", quartzite and shale of the lower Olifantshoek Supergroup took place at ~2.05-1.93 Ga, thereby forming and terminating the deposition of the Gamagara/Mapedi Formation, which formed within a shallow-water rift environment (Beukes, 1983). The second extensional event or "E2" of Dalstra and Rosière (2008) occurred during or shortly after this period, as reactivated normal faults displaced or offset the lower Olifantshoek Group, although such structures tend to pre-date the Kheis Orogeny (see below). Apparently overlapping in age with this extensional event is the formation of south-verging folds and thrusts, which, according to Altermann and Hälbich (1991), are the oldest post-Matsap event at 2.07-1.88 Ga;
- ~1.83-1.73 Ga: The Kheis Orogeny or tectono-metamorphic event, like the Kalahari Orogeny, showed eastward tectonic vergence that was accompanied by thrusting and folding (Stowe, 1986; Beukes and Smit, 1987; Altermann and Hälbich, 1991; Hälbich et al (1993). The Kheis Orogeny is more precisely dated at ~1,780 Ma, using a 39Ar-40Ar metamorphic age derived from the Groblershoek Schist Formation of the Olifantshoek Supergroup (Schlegel, 1988). Rift structures of the Postmasburg Group and Olifantshoek Supergroup depositional settings were reactivated while F2 folding and thin-skinned thrusting occurred along major unconformities and lithological contacts. In some areas, F1 folds were tightened co-axially during F2 folding. In the Sishen area, thrusting was concentrated at the shale-dominated, tectonised margins of a quartzite member within the upper Olifantshoek Group; these horizons are termed "tectonised shale" in drill core, although this sequence appears to be very poorly developed at the Heuningkranz prospect. Friese (2007a, b) and Friese and Alchin (2007) have termed these and other low-angle thrusts "principal décollements"; and
- ~1.15-1.0 Ga: The NNW-directed Lomanian (Namaqua-Natal) Orogeny caused deformation along the southern margin of the Kaapvaal Craton. The effects of this were manifold: reactivation and buckling of N-S trending normal and inverted normal faults, reactivation of the 2.35-2.24 Ga NE- and SE-trending conjugate strike-slip faults, usually with upthrow to the SE and SW, respectively, the development of ENE-trending F3 folds, which may have contributed to broad F2/F3 fold interference patterns (q.v. Mortimer, 1994, 1995). This may also have contributed to the geometry of the Maremane Dome, which is effectively a large-scale "Ramsay style" interference fold with a radial set of fractures/faults, in which conjugate relationships may still be observed (**Figure 1**).

  The Dimoten and Ongeluk-Witwater Synclines, wherein the Postmasburg Group is preserved, are situated towards the eastern foreland of the Maremane Dome.

It has been suggested that the interference or intersection of F2 synclines and F3 synclines have resulted in deep, steep-sided, circular or ovoid depressions in which ore (and banded iron formation) is notably thicker (eg Mortimer, 1994; 1995). This must be weighed against other models which suggest that areas of very thick, deep ore occupy palaeo-sinkholes, ie occur within palaeokarst topography within the Campbell Rand Subgroup (Beukes et al (2002)).

A third model is that of Dalstra and Rosière (2008), which advocates a close association between structures and mineralisation and/or between structures and the preservation of mineralisation. Due to the complex structural and stratigraphic evolution of the area, it is entirely possible that there is a component of all three mechanisms present in a given deposit, albeit substantially complicated by variable preservation.

Subsequent tectonism, including the breakup of Gondwana and Pan-African reworking, had only a minor effect on the modelled volume. Regionally, Bushveld-age gabbroic rocks intruded into the Ghaap and Postmasburg Groups within a clearly-defined NE-trending graben, essentially accommodated by the reactivation of Ventersdorp faults (Friese and Alchin, 2007).

### Local geology

A total of 17,186 core, reverse-circulation and percussion exploration drill holes (approximately 1,685,000m) as per Figure 21 have been drilled at the operation, resulting in a highly developed understanding of the mineral asset.

Sishen mine is situated on the northern extremity of the Maremane anticline. At this location the lithologies strike north-south and plunge from the centre of the anticline in a northerly direction. The bulk of the resource comprises high-grade, laminated and massive ores belonging to the Asbestos Hills Subgroup.

The ore bodies are intensely folded and faulted. Dips vary according to local structures, but at Sishen, a regional dip of 11° in a westerly direction prevails.

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

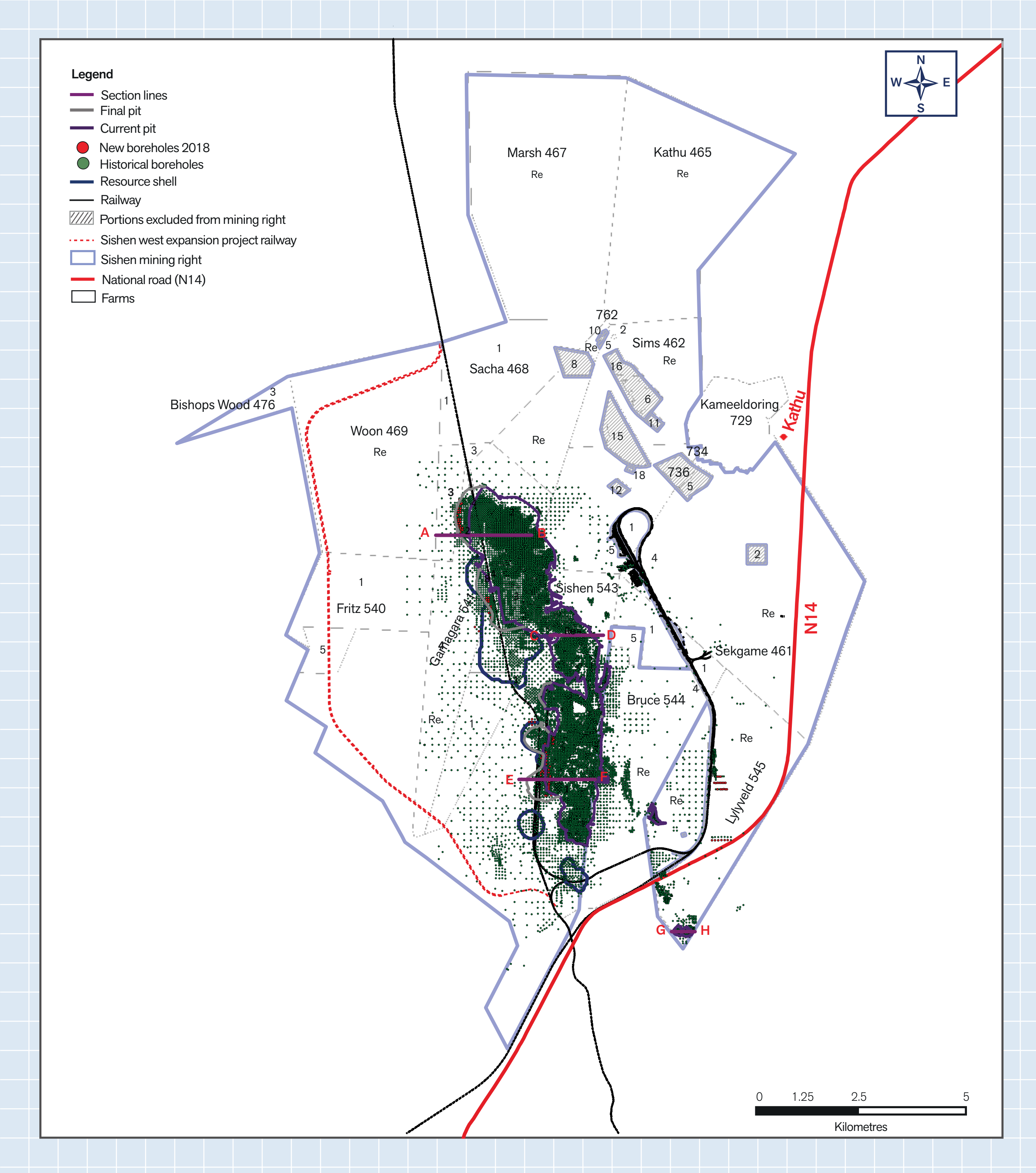



**FIGURE 21: SISHEN MINING RIGHT AREA NEAR THE TOWN OF KATHU IN THE NORTHERN CAPE PROVINCE (BOREHOLES SUNK IN 2018 INDICATED IN RED DOTS)**

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

The geometry of the lithologies are depicted via cross-sections (referenced in **Figure 21**) taken through the latest three-dimensional Sishen geological model:

- **Figure 22** is a west-east cross-section through the Sishen north mine area; the top frame depicting the geology; the bottom frame the spatial geological confidence classification of the high-, medium-, and low-grade ore portions.
- **Figure 23** is a west-east cross-section through the Sishen middle mine area; the top frame depicting the geology; the bottom frame the spatial geological confidence classification of the high-, medium-, and low-grade ore portions.
- **Figure 24** is a west-east cross-section through the Sishen south mine area; the top frame depicting the geology; the bottom frame the spatial geological confidence classification of the high-, medium-, and low-grade ore portions.
- **Figure 25** is a west-east cross-section through the Lylyveld satellite mine area; the top frame depicting the geology; the bottom frame the spatial geological confidence classification of the high-, medium-, and low-grade ore portions.

It can be noticed in some of these figures that the pit layout boundaries in some instances exceed the resource shell in size. This is possible where during pit optimisation ore geology is the limiting factor and not economic viability, and when the pit shell is engineered into a safe pit layout or design, the layout boundaries in some areas exceed the resource shell.

Also, the vertical scale has been exaggerated in all the cross-sections, for better illustrative purposes, resulting in ore body dip angles appearing steeper than actual.

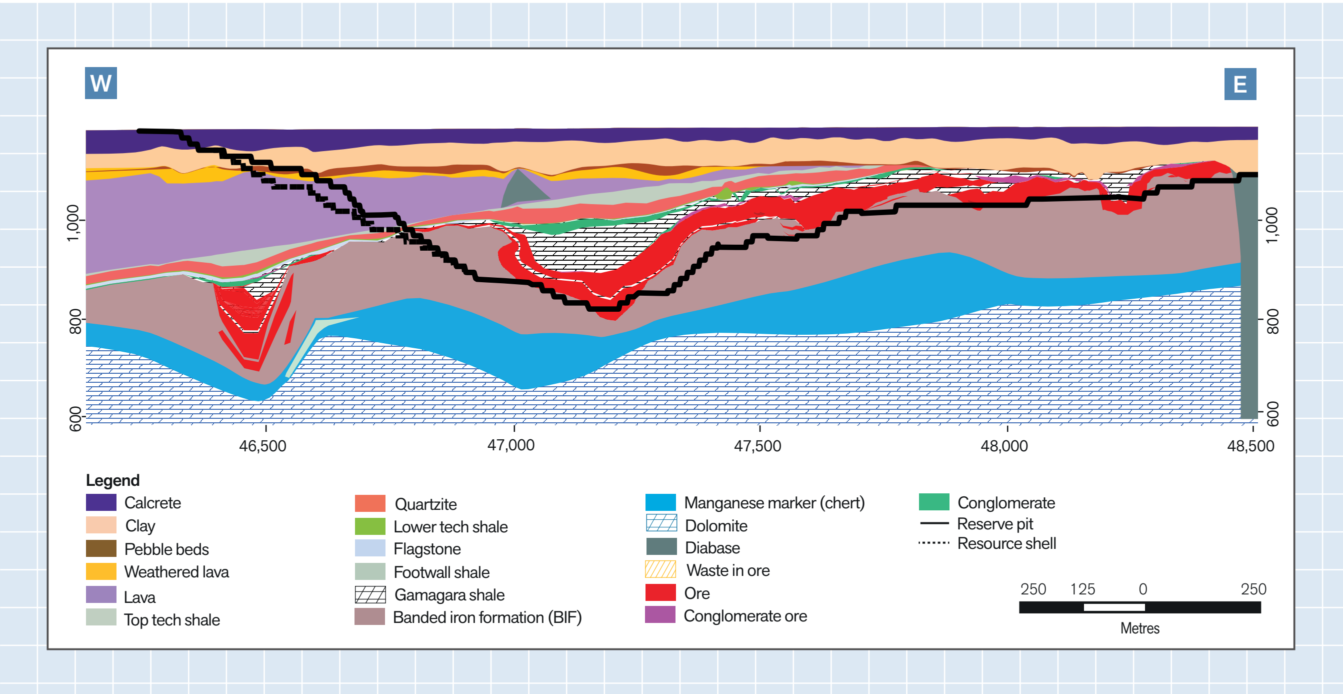



FIGURE 22: **WEST-EAST CROSS-SECTION ASSOCIATED GEOLOGICAL CONFIDENCE CLASSIFICATION OF HIGH-, MEDIUM- AND LOW-GRADE ORE PORTIONS (BOTTOM) THROUGH THE SISHEN NORTH MINE AREA**

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

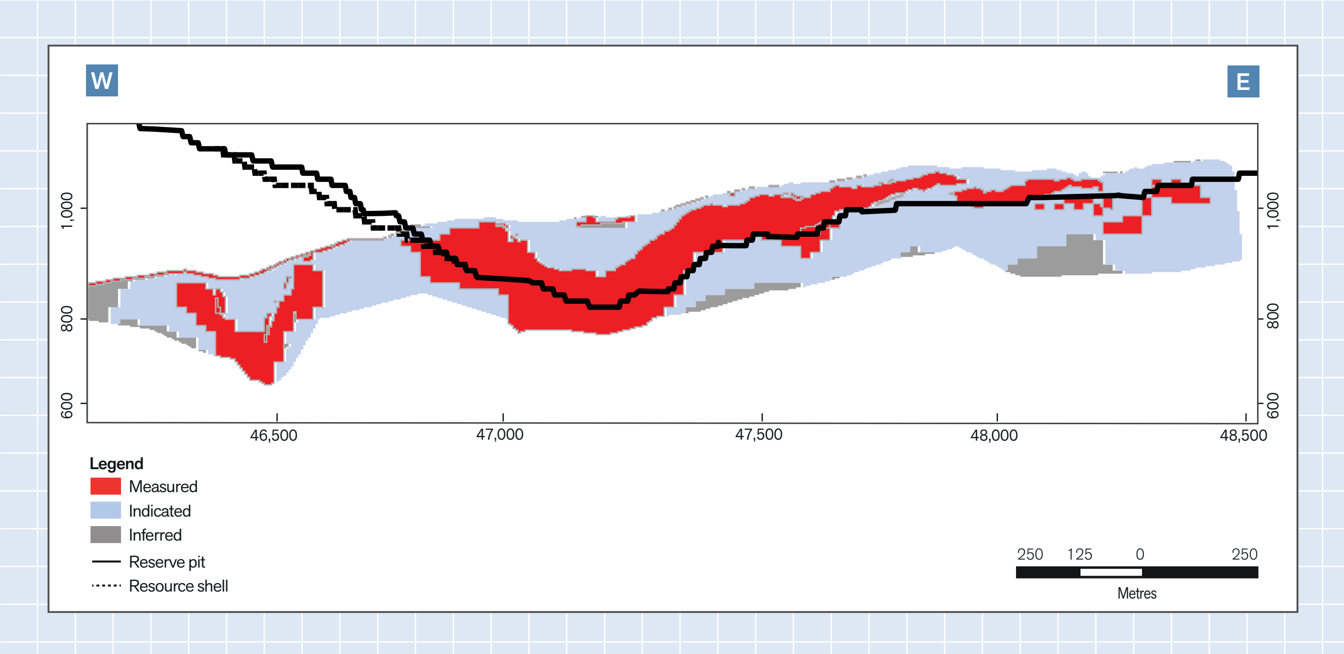



FIGURE 22: **WEST-EAST CROSS-SECTION ASSOCIATED GEOLOGICAL CONFIDENCE CLASSIFICATION OF HIGH-, MEDIUM- AND LOW-GRADE ORE PORTIONS (BOTTOM) THROUGH THE SISHEN NORTH MINE AREA**

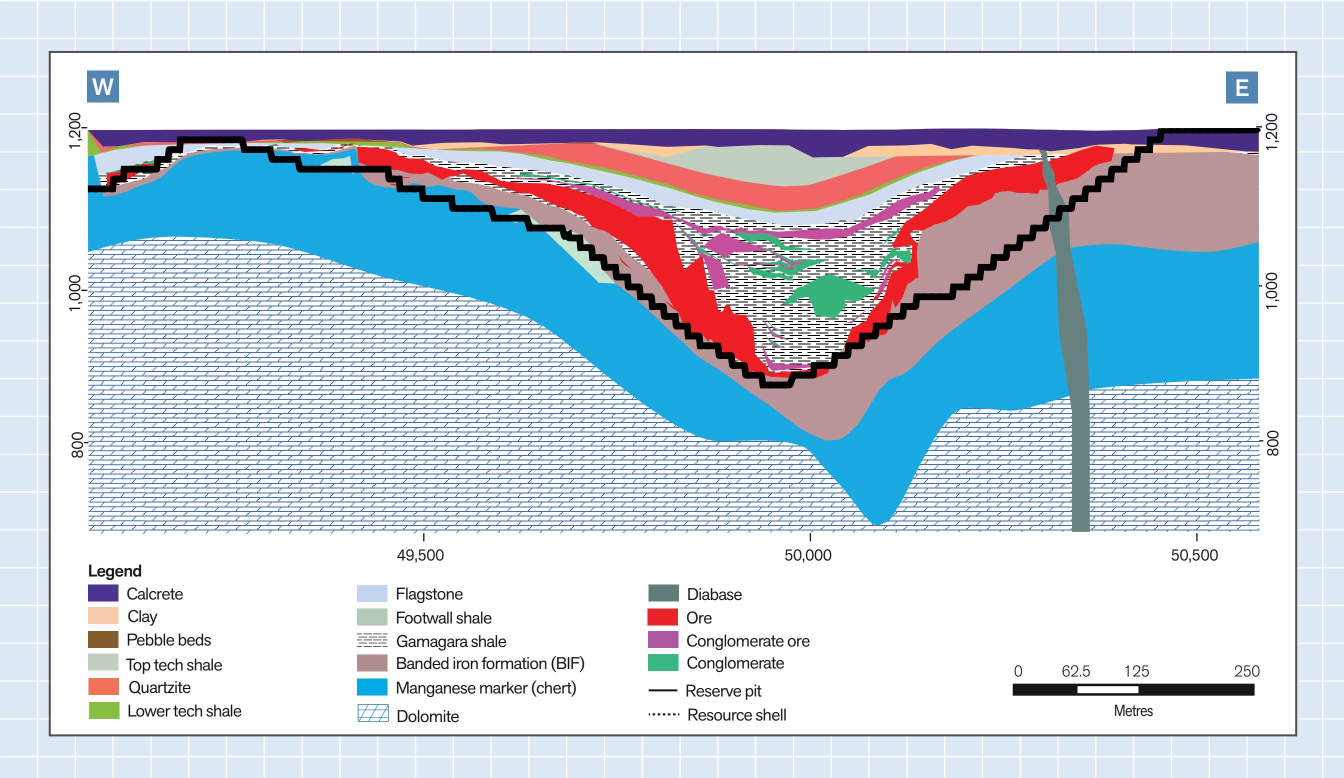



FIGURE 23: **WEST-EAST CROSS-SECTION ASSOCIATED GEOLOGICAL CONFIDENCE CLASSIFICATION OF HIGH-, MEDIUM- AND LOW-GRADE ORE PORTIONS (BOTTOM) THROUGH THE SISHEN MIDDLE MINE AREA**

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

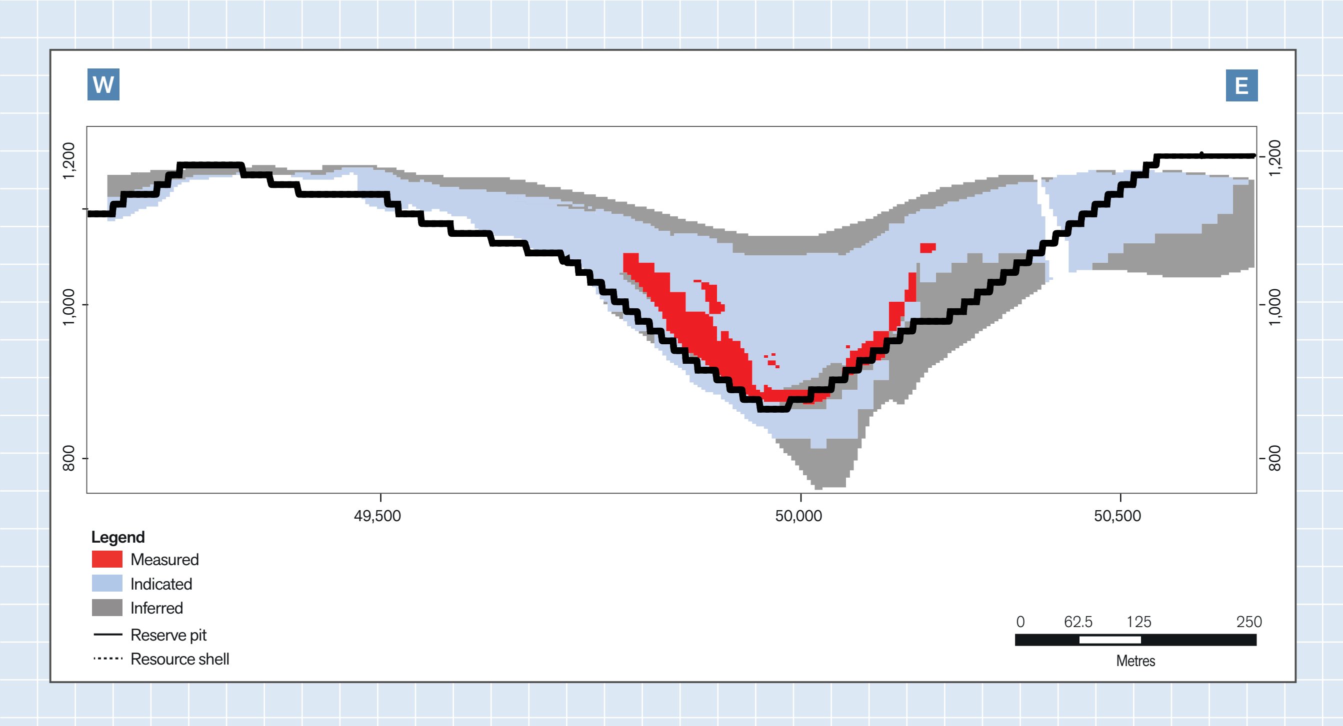



FIGURE 23: **WEST-EAST CROSS-SECTION ASSOCIATED GEOLOGICAL CONFIDENCE CLASSIFICATION OF HIGH-, MEDIUM- AND LOW-GRADE ORE PORTIONS (BOTTOM) THROUGH THE SISHEN MIDDLE MINE AREA**

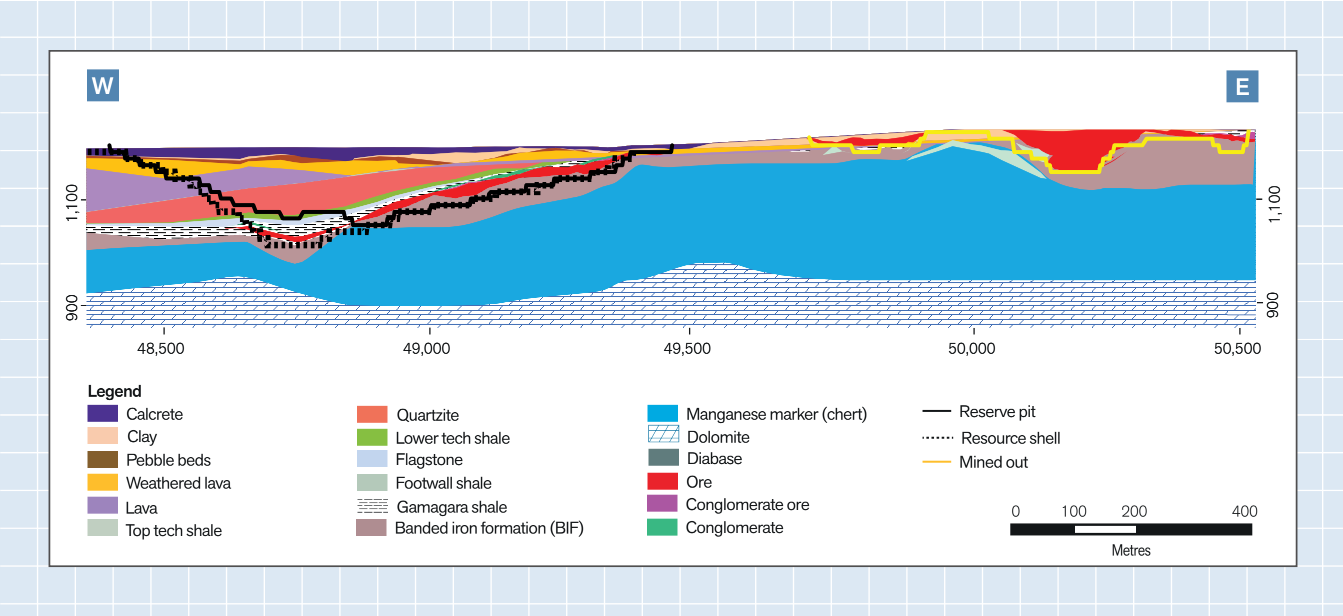



FIGURE 24: **WEST-EAST CROSS-SECTION (LINE EF IN FIGURE 21) DEPICTING THE LOCAL GEOLOGY THROUGH THE SISHEN SOUTH MINE AREA**

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

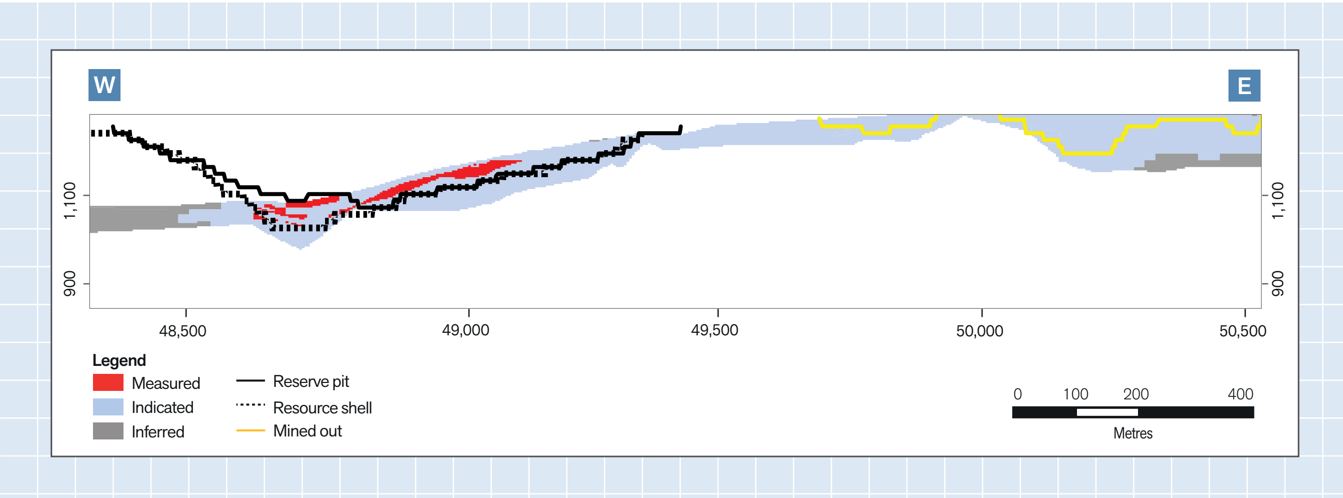



FIGURE 24: WEST-EAST CROSS-SECTION ASSOCIATED GEOLOGICAL CONFIDENCE CLASSIFICATION OF HIGH-, MEDIUM- AND LOW-GRADE ORE PORTIONS (BOTTOM) THROUGH THE SISHEN SOUTH MINE AREA

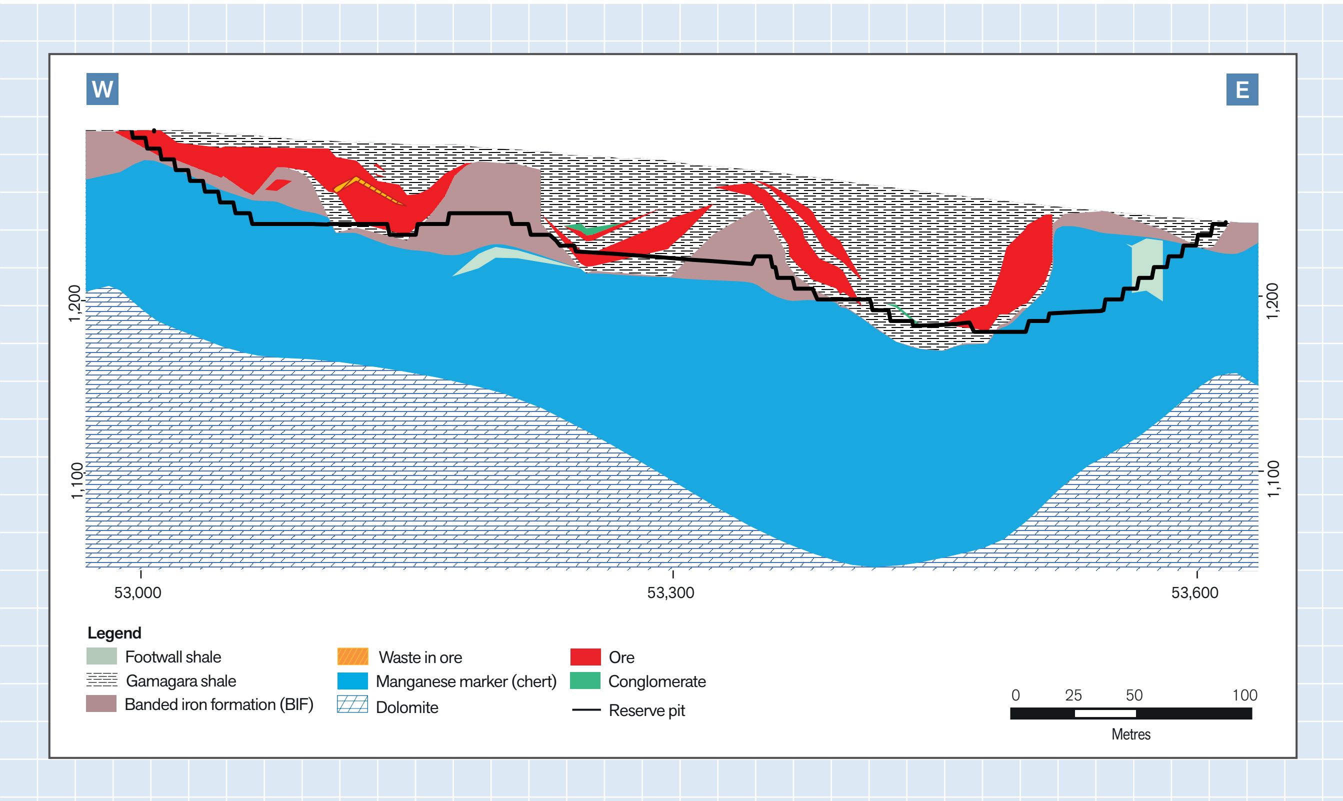



FIGURE 25: WEST-EAST CROSS-SECTION (LINE GH IN FIGURE 21) DEPICTING THE LOCAL GEOLOGY

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

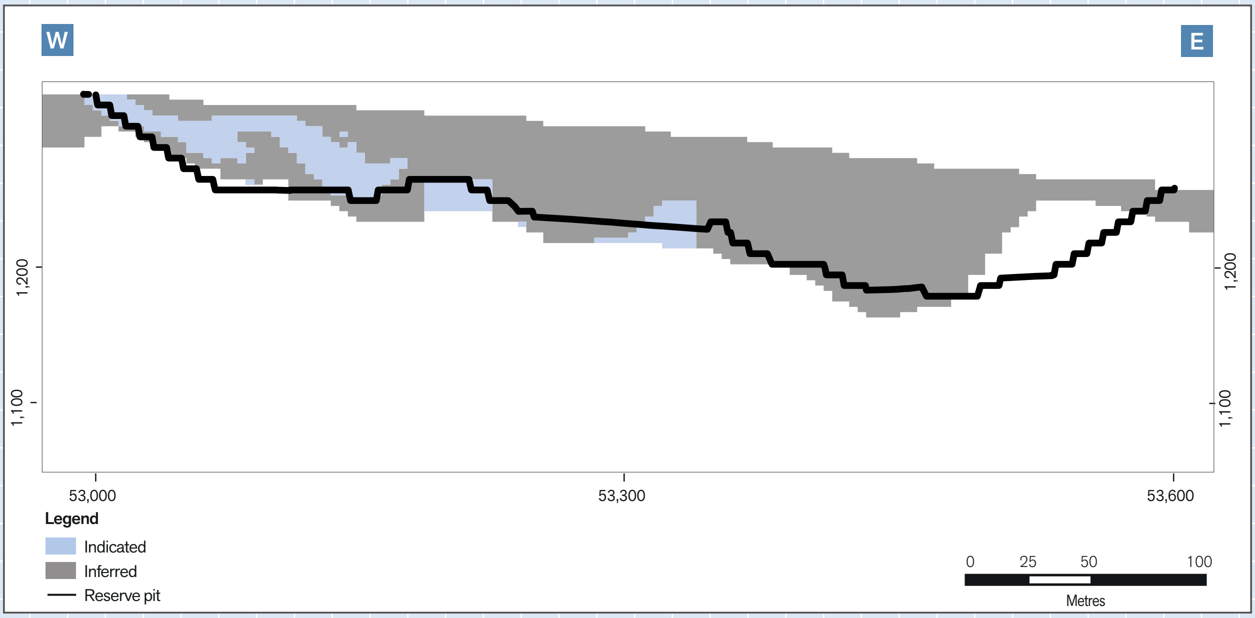



FIGURE 25: **WEST-EAST CROSS-SECTION ASSOCIATED GEOLOGICAL CONFIDENCE CLASSIFICATION OF HIGH-, MEDIUM- AND LOW-GRADE ORE PORTIONS (BOTTOM) THROUGH THE LYLYVELD SATELLITE MINE AREA**

### Operational outline

Sishen mine currently comprises a conventional truck and shovel open-pit operation, processing run-of-mine (RoM) material through two processing facilities: a dense media separation (DMS) plant and a Jig plant that includes a modular ultra-high dense medium separation (UHDMS) facility on a portion of the Jig plant discard stream. The combined RoM capacity of the processing facilities is 47 Mtpa (26 Mtpa for the DMS plant and 21 Mtpa for the Jig plant), which relates to a 34.6 Mtpa Saleable Product output design capacity.

The current mining process entails topsoil removal and stockpiling for later use during the waste dump rehabilitation process, followed by drilling and blasting of waste and ore. The waste material is in-pit dumped where such areas are available, or hauled to waste rock dumps. The iron ore is loaded according to blend (grade) requirements and hauled to designated run-of-mine buffer stockpiles or the beneficiation plants, where it is crushed, screened and beneficiated. The screened ore size fractions are beneficiated using a ferrosilicon dense media (DMS or UHDMS) or through a jigging process before being stockpiled on the product beds. Plant slimes are not beneficiated and are pumped to evaporation dams while the DMS and Jig (and UHDMS) discard material is stacked on a plant discard dump.

Seven iron ore products (conforming to different chemical and physical specifications) are produced. The ores are reclaimed from the product beds and loaded into trains, to be transported to local steel mills and Saldanha Bay for export to international markets.

Kumba has an agreement with ArcelorMittal SA to supply them domestically with a maximum of 6.25 Mtpa of Saleable Product of which a maximum of 1.8 Mtpa is to be delivered to Saldanha Steel. The remainder of the production is exported via the Saldanha Port to various international steel markets.

It is estimated at the time of reporting that the total tonnes extracted from the pit at Sishen mine increased by 6% from 199.5 Mt in 2017 to 212.1 Mt in 2018, of which ex-pit waste mined in 2018 equates to 161.4 Mt, with ex-pit ore equating to 50.7 Mt. Total run-of-mine production at Sishen mine has decreased by 11% from 44.9 Mt in 2017 to an estimated 40.3 Mt (including 2.1 Mt Inferred Mineral Resources as well as 3.4 Mt of Ore Reserves from buffer stockpiles). The resulting Saleable Product is estimated at 29.9 Mt at an average annual yield of 74.2%.

The forecast sales for 2018 are 29.7 Mt.

The difference between the ex-pit ore figure and the run-of-mine figure, including a draw-down of the stockpiles, is 10.4 Mt. This is low-grade ore material (classified as Mineral Resources but not yet declared as Ore Reserves) that is being stockpiled on long-term stockpiles.

Sishen mine's key operational parameters are summarised in **Table 12**.

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

TABLE 12: **SISHEN MINE OPERATIONAL OUTLINE SUMMARY**

| Key details | |
|---|---|
| Ownership (AA plc) | 53.2% |
| Ownership (KIO) | 76.3% |
| Commodity | Iron Ore |
| Country | Republic of South Africa |
| Mining method | Open pit – conventional |
| Reserve life | 14 years |
| Estimated Saleable Product Lump : Fine ratio | 71.8 : 28.2 |
| Saleable Product design capacity | 34.7 Mt |
| Estimated 2018 run-of-mine production | 40.3 Mt |
| Estimated 2018 Saleable Product | 29.9 Mt |
| Estimated 2018 waste production | 161.4 Mt |
| Overall planned stripping ratio | 3.4 : 1 |
| Estimated product sold in 2018 | 29.7 Mt |
| Product types | Primarily Lump – 69% of products (63.2 – 65.2% Fe), Fines (63.2 – 64.4% Fe). In total three Lump and Fine product types of varying grade is produced |
| Mining right expiry date | 10 November 2039 |

* Reserve life includes all consecutive years in the LoMP where the Proved and Probable Ore Reserves makes up >25% of the year's run-of-mine.

**Production history**

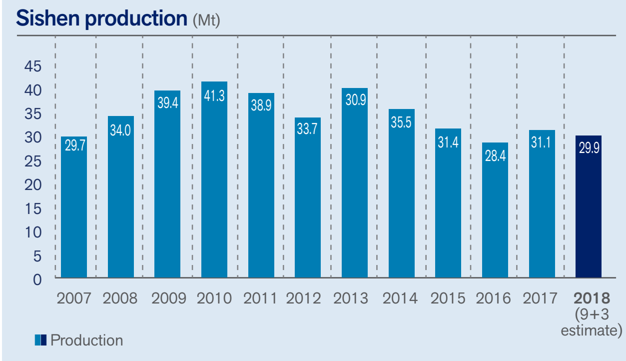



FIGURE 26: **SISHEN MINE PRODUCTION HISTORY**

**Latest LoMP Saleable Product profile**

The Sishen mine 2018 LoMP Saleable Product profile is depicted in **Figure 27**.

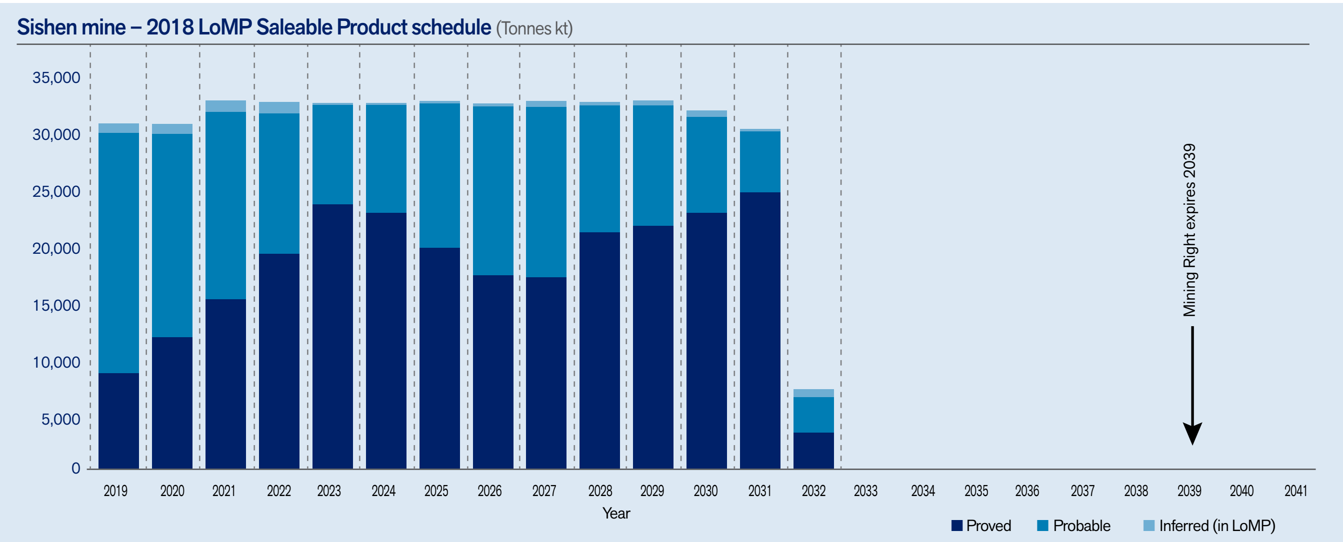



FIGURE 27: **SISHEN MINE'S 2018 LoMP ANNUAL SALEABLE PRODUCT PROFILE** (including modified beneficiated Inferred Mineral Resources)

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

## ZANDRIVIERSPOORT PROJECT

### GEOLOGICAL OUTLINE

**Regional geology**

Zandrivierspoort (ZRP) is a low-grade magnetite deposit in the Palaeo proterozoic Rhenosterkoppies Greenstone Belt or Rhenosterkoppies Fragment (RF), which occurs to the northwest of the main, northeast-trending Pietersburg Greenstone Belt (**Figure 28**).

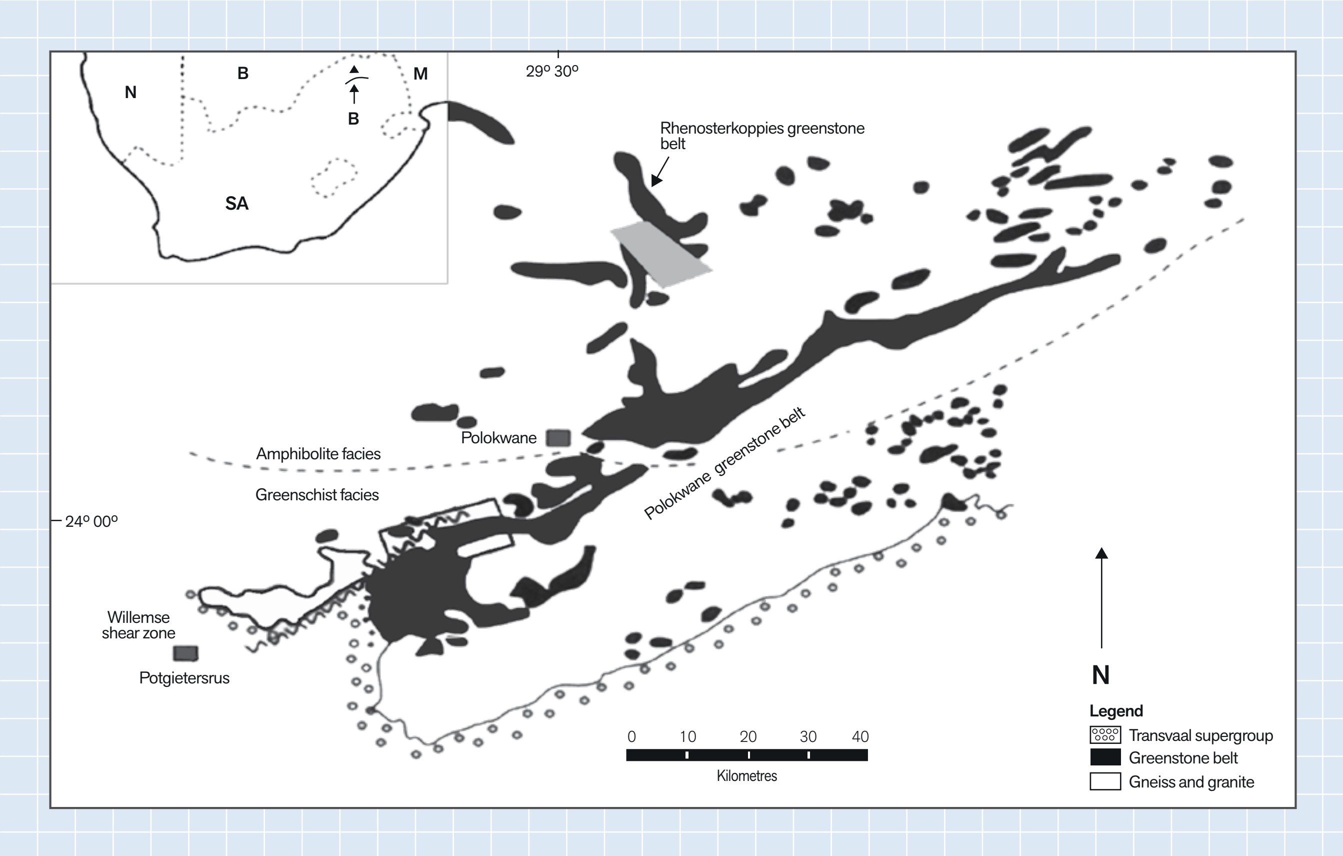



FIGURE 28: **SIMPLIFIED GEOLOGICAL MAP OF GREENSTONE BELTS IN THE VICINITY OF POLOKWANE.** The approximate position of the Zandrivierspoort prospect, within the Rhenosterkoppies Greenstone Belt or Fragment, is shown as a light-grey polygon (base map modified from Franey, 1987).

The ZRP prospect occurs within the SE-trending fold hinge zone of the RF, a feature which some authors have considered to be significant in the thickening or duplication of relatively thin banded ironstone (BIS) units. Both the Pietersburg and the Rhenosterkoppies Greenstone Belts are enclosed in granites, which display the "pinched-in" or "keel-like" morphology that is typical of greenstone belts within granite-gneiss terrains of southern Africa.

The RF is unique in that it, firstly, contains relatively little of the Archaean Uitkyk formation, which consists of greenschist to amphibolite facies immature sandstones, siltstones, "grits", conglomerates and breccias (Kalbskopf and Barton, 2003). Rather, it is dominated by metavolcanics – in the form of amphibolites – and relict banded ironstone units. Secondly, the RF does not trend NE, in contrast to the majority of southern African greenstone belts.

The form of underlying gneisses resulted in a certain "compartmentalisation" of the RF in the vicinity of the Zandrivierspoort project. Such compartmentalisation is accentuated in outcropping geology and is also defined by major lineaments, interpreted from regional aeromagnetic data. A single, large diabase dyke runs NNE across the approximate centre of the ZRP prospect.

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

### Stratigraphy

The stratigraphic column depicting the local geology of the Zandrivierspoort project is illustrated in **Figure 29**.

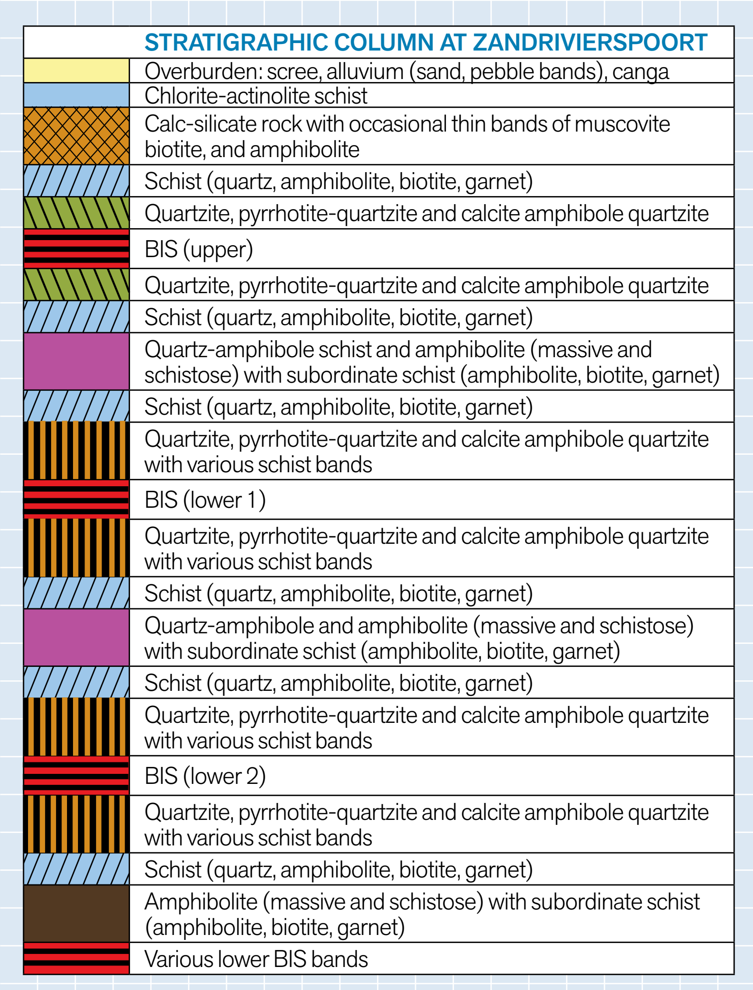



FIGURE 29: **SIMPLIFIED STRATIGRAPHIC COLUMN DEPICTING THE LOCAL ZANDRIVIERSPOORT PROJECT GEOLOGY**

### Tectonic setting

It is KIO's understanding that the geology of the Zandrivierspoort project has been influenced by three tectonic events.

- D1 – First Ductile Deformation Event: D1 is attributed either to "atectonic" processes, such as soft-sediment slumping during early basinal deformation (Collins, 1986), the major fold orientations of which were constrained by the local down-dip direction of the developing basin. Moore (1975), Sweby (1984), Pearce (1983) and Pearce and Pearce (1983, 1984) attribute the local thickening and duplication of BIS and surrounding units to recumbent isoclinal folding. Thickening or duplication is particularly well-developed in areas where there are stacked isoclinal fold hinge zones. Sweby (1984) also cites evidence for very low-angle, northward-verging thrusting in the NW portion of the project area as being the cause of, or at least being related to, isoclinal folding. "D1" may have been preceded by earlier deformation phases, such as southward-directed thrusting or back-thrusting, but these phases will be obscured by the dominant D1/F1 event. Post-D1/F1 deformation events appear to have had only a minor effect on the structural morphology.
- D2 – Second Ductile Deformation Event: There is confusion regarding D2/F2 and D3/F3. Collins (1986) proposed extensive, EW- to ESE-trending F2 folds across the ZRP area (see Figures 2 and 3). These open or gentle folds merely reorient the dominant S1 such that it is locally either very shallowly N- or S-dipping. A further effect of D2 is apparently the development of laterally extensive, E-W to ESE-trending faults that truncate BIS units. These faults effectively exploit the incipient fracture cleavage developed in the hinge zones of F2 faults. A fault of this type possibly occurs to the NNE of the exposed BIS mapped by Pearce and Pearce. Due to the sub-vertical drilling and the minor offset proposed by previous authors, it's not clear what effect, in terms of offset or a "damage or contact strain" zone, these faults will have on BIS units. One possible effect, when combined with more easily observed, NE-trending diabase dykes, is to segment the BIS units into a series of blocks along NE- and ESE-trending lines. Further data is needed to confirm or disprove this. Upright, open, NE-SW-trending, gently plunging folds are attributed by Sweby (1984) as D2 in age, while Collins (1986) suggests that they are superimposed on the broad, open E-W to ESE-trending folds produced in his D2/F2 classification (described above), ie that they are D3 in age/sequence.
- D3 – Third Ductile Deformation Event: As detailed in the preceding paragraphs, D3 of Collins comprises NE-SW-trending, shallowly-plunging folds, with moderately-developed axial planar cleavage. This cleavage is exploited by the later intrusion of NE-SW-trending diabase dykes. The D3 event of Sweby (1984) and the D4 event of Collins (1986) bear a strong resemblance to the D2 event of Collins (1986), ie NW-SE trending gentle refolding of "F1" and "F2". Therefore, it's not clear if the gentle, flat-lying E-W to ESE trending folds refold the NE-SW trending upright folds, or vice versa.

In summary, the main or controlling deformation events produced early, isoclinal, recumbent folds, which were refolded by essentially co-axial, open to closed, upright folds. The combination of these events resulted in NE-SW-trending, non-cylindrical folds, ie folds which die out along strike and which appear to have very gently refolded axes.

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

This structural style is, moreover, suggested by Moore (1975) and Sweby (1984). Such folds appear to be largely N- or NNW-verging, according to Kalbskopf and Barton (2003) and from observations made by Kumba.

### Local geology

The banded ironstone (BIS) occurs as fine to medium grained units with well-banded layers of predominantly magnetite and quartz.

Three BIS units have been identified by Kumba and spatially modelled as separate units, ie the Upper BIS, the Lower 1 BIS and the Lower 2 BIS, with BIS units beneath the Lower 2 BIS unit ignored in the geological modelling because of insufficient data to prove geometric continuity. The top portion of the Upper BIS has been weathered into what KIO refers to as a haematite cap and this has been sub-domained.

The geometry of the lithologies are depicted via cross-sections (referenced in **Figure 30**) taken through the latest three-dimensional Sishen geological model:

- **Figure 31** is a west-east section through the centre of the Zandrivierspoort deposit, depicting the local geology (top) as well as the associated spatial geological confidence classification of the ore body portions of the lithology for the same cross-section (bottom).
- **Figure 32** is a north-west – south-east section through the western portion of the Zandrivierspoort deposit, depicting the local geology (top) as well as the associated spatial geological confidence classification of the ore body portions of the lithology for the same cross-section (bottom).
- **Figure 33** is a north-west – south-east section through the eastern portion of the Zandrivierspoort deposit, depicting the local geology (top) as well as the associated spatial geological confidence classification of the ore body portions of the lithology for the same cross-section (bottom).

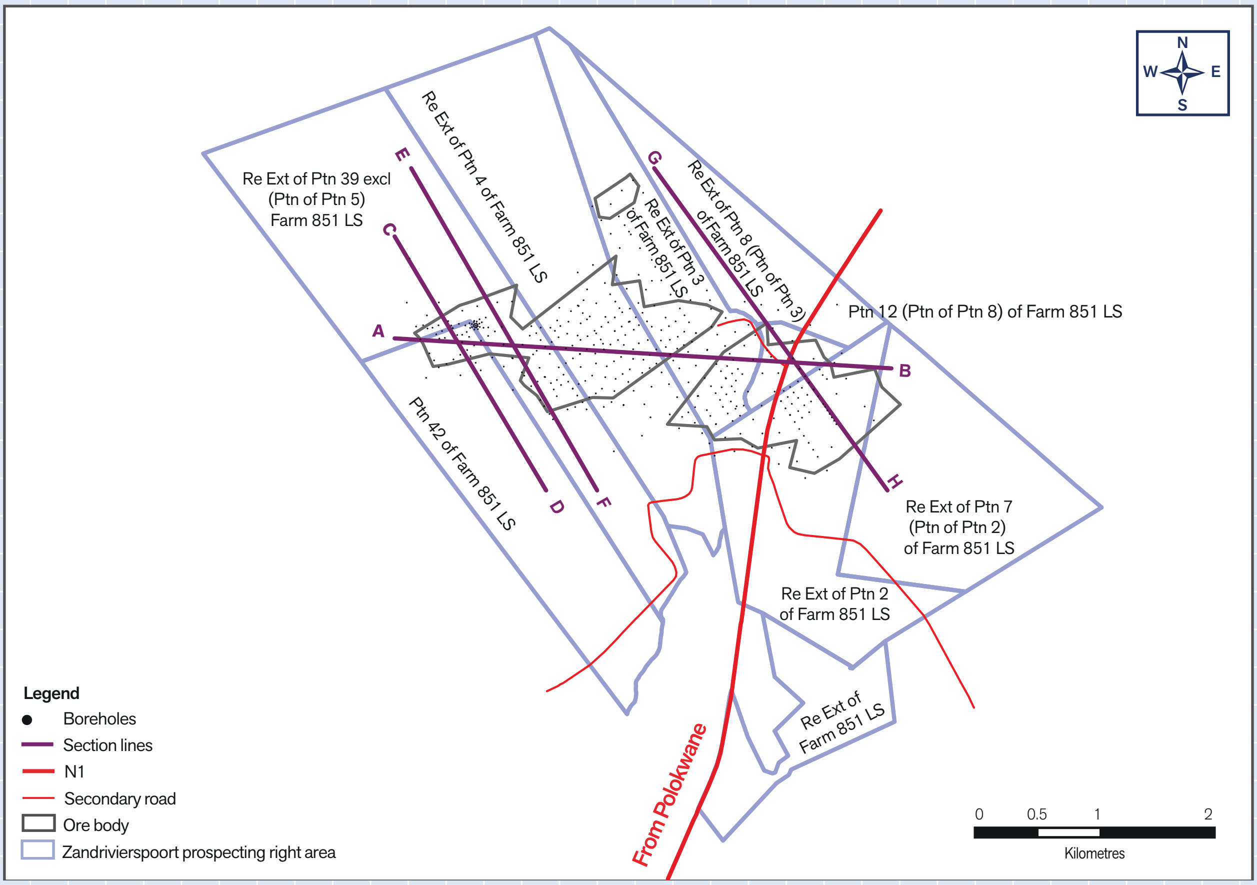
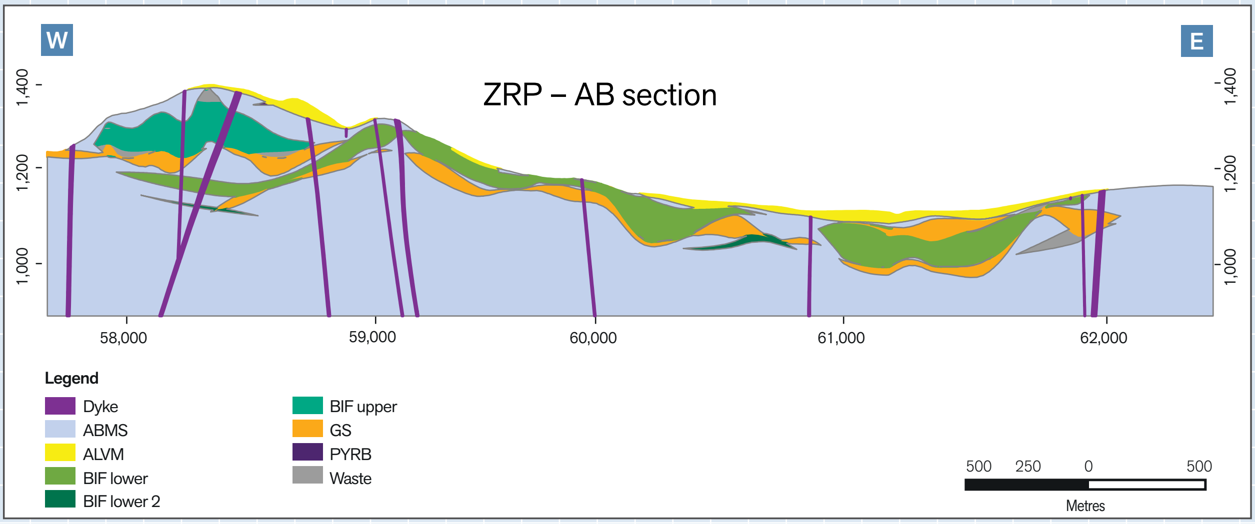



FIGURE 30: **ZANDRIVIERSPOORT REFERENCE MAP FOR GEOLOGICAL CROSS-SECTIONS**

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED



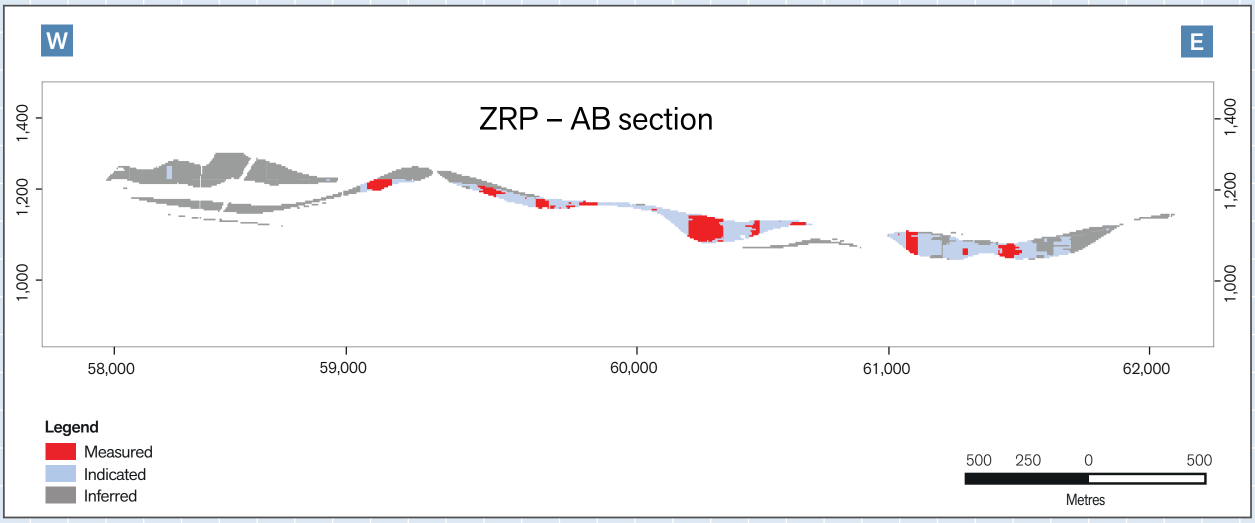
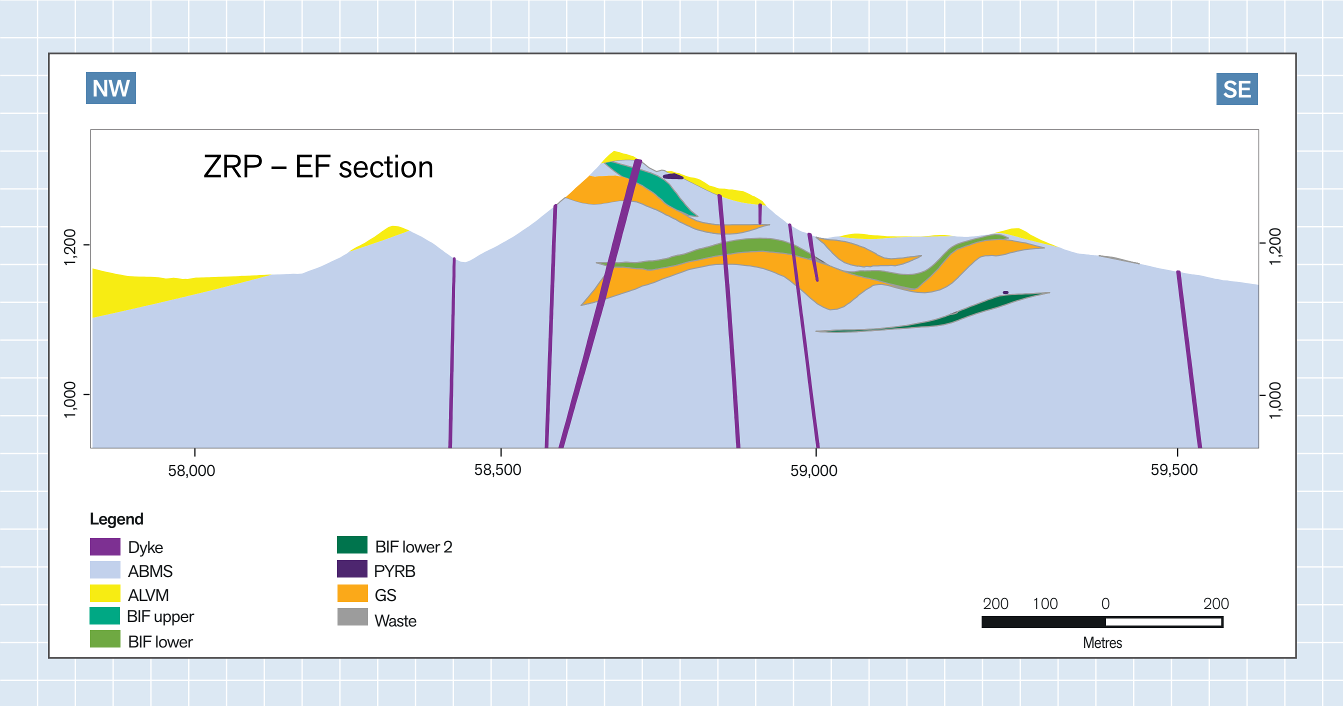




FIGURE 31: **WEST-EAST CROSS-SECTION (LINE AB IN FIGURE 30) DEPICTING THE LOCAL GEOLOGY (TOP) AND THE ASSOCIATED GEOLOGICAL CONFIDENCE CLASSIFICATION (BOTTOM) THROUGH THE CENTRE PORTION OF THE ZANDRIVIERSPOORT DEPOSIT**

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED



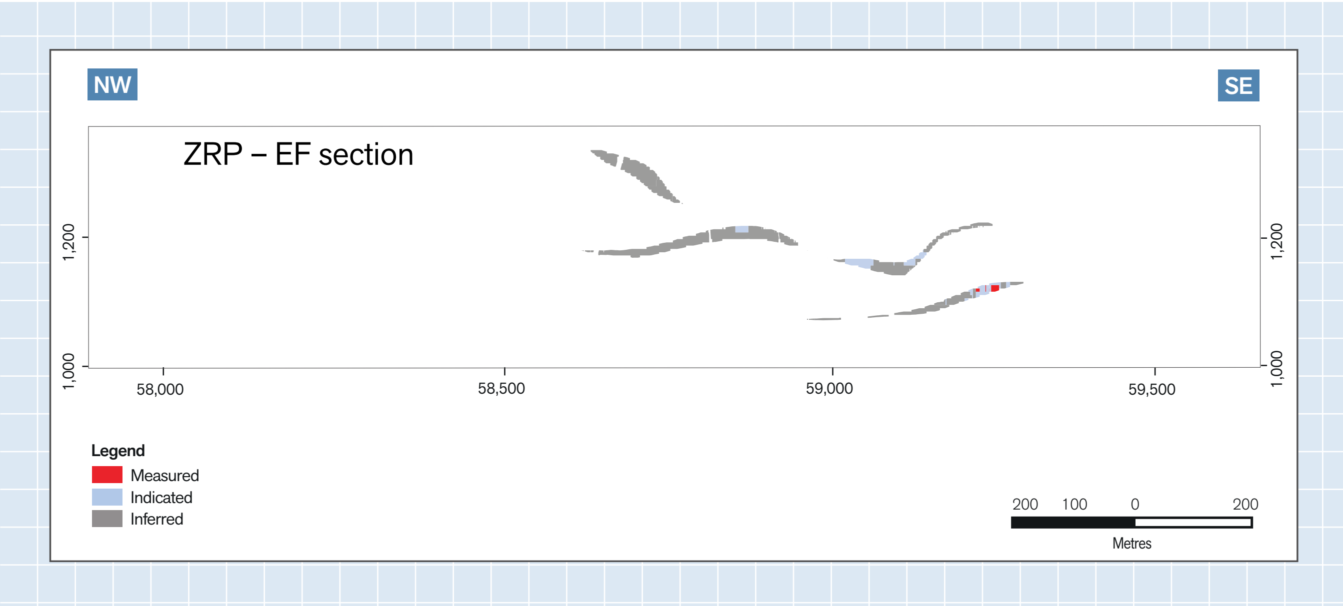
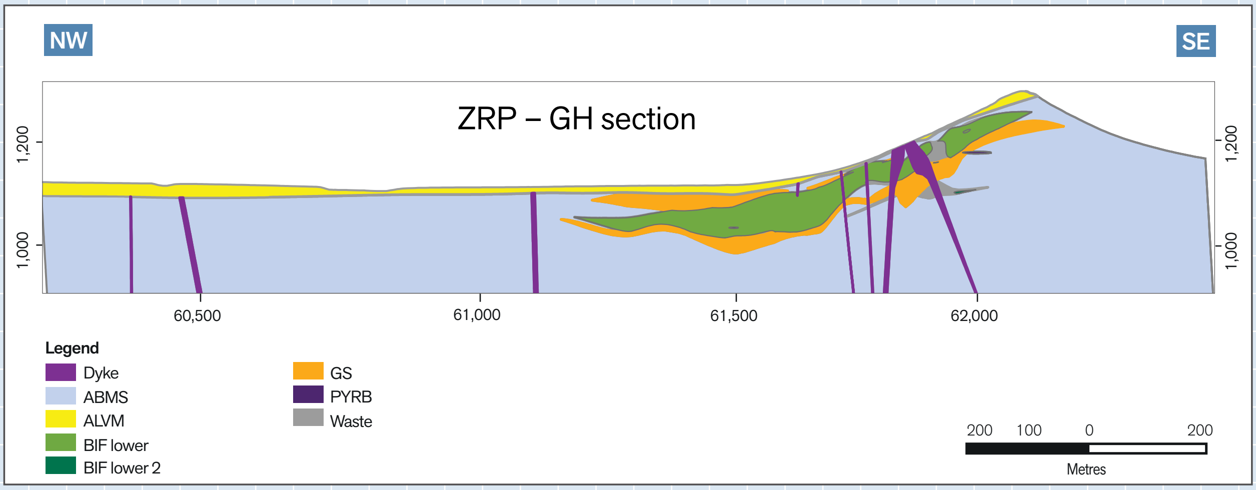




FIGURE 32: **NORTH-WEST – SOUTH-EAST CROSS-SECTION (LINE EF IN FIGURE 30) DEPICTING THE LOCAL GEOLOGY (TOP) AND THE ASSOCIATED GEOLOGICAL CONFIDENCE CLASSIFICATION (BOTTOM) THROUGH THE WESTERN PORTION OF THE ZANDRIVIERSPOORT DEPOSIT**

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED



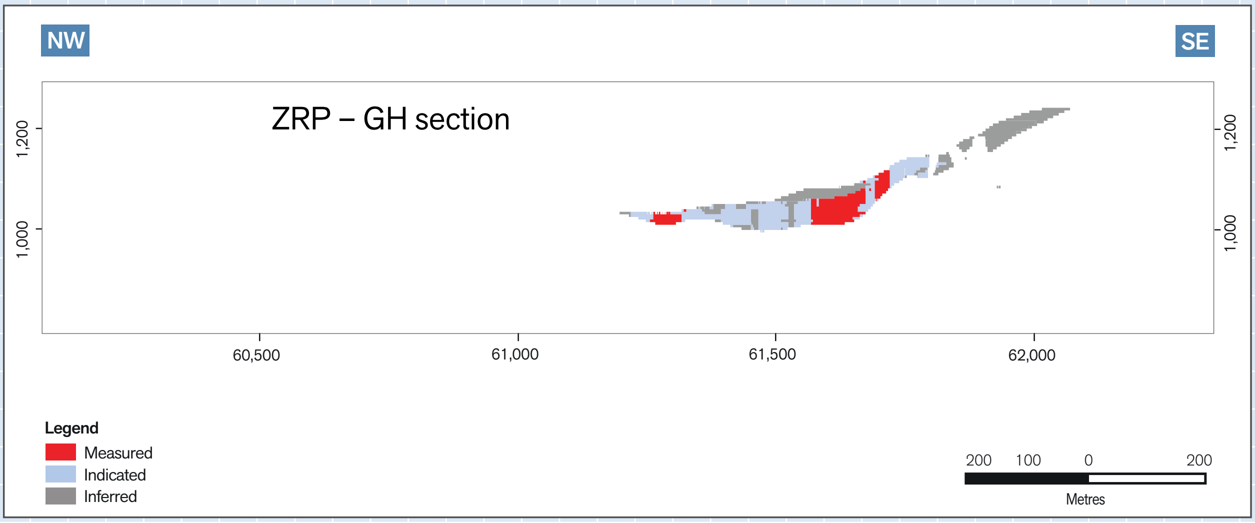




FIGURE 33: **NORTH-WEST – SOUTH-EAST CROSS-SECTION (LINE GH IN FIGURE 30) DEPICTING THE LOCAL GEOLOGY (TOP) AND THE ASSOCIATED GEOLOGICAL CONFIDENCE CLASSIFICATION (BOTTOM) THROUGH THE EASTERN PORTION OF THE ZANDRIVIERSPOORT DEPOSIT**

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

### Project outline

The Kumba Business Development Department conducted a high-level review of the Zandrivierspoort project's business case in 2018. A standalone mine for the project producing magnetite concentrate as a final product via two-stage beneficiation has been shown not to be economically viable. Alternative business cases were evaluated, and value addition test work has shown that it is technically feasible to utilise the ZRP magnetites as a feedstock for the "AusIron" iron making process. Using the magnetite, together with thermal coal as a direct charge has been demonstrated in trials at the 'AusIron' pilot plant in Australia. As a result of the use of coal as a reductant, significant off-gasses are produced which can be converted into electricity through off-the-shelf cogeneration technology.

A small mine concept was developed for ZRP producing 3.0 Mtpa of concentrate. This was the base on which the value addition model was developed. At a production rate of 3.0 Mtpa concentrate, 1.8 Mtpa of pig-iron can be produced through the "AusIron" technology.

The project business case is capital intensive and is sensitive to the electricity price and pig-iron revenue.

The project outline is summarised in **Table 13**.

TABLE 13: **ZANDRIVIERSPOORT PROJECT OUTLINE SUMMARY**

| Key details | |
|---|---|
| Ownership (AA plc) | 26.6% |
| Ownership (KIO) | 38.2% |
| Commodity | Iron Ore |
| Country | Republic of South Africa |
| Prospecting right status | Applied for renewal |
| Exploration type | Greenfields |
| Exploration phase | Concept |
| Foreseen mining method | Open pit conventional truck-and-shovel |
| Foreseen beneficiation method | Low Intensity Magnetic Separation with downstream Rare Earth Drum Separation/Flotation and subsequent AusIron Conversion to pig-iron |
| Foreseen product types | Pig-iron |
| Foreseen market | Domestic |
| Prospecting right expiry date | 21 March 2020 |

Because no pre-feasibility study has been completed for the project, no Ore Reserves have been declared for the Zandrivierspoort project.

### Mineral Resource ancillary information

The Zandrivierspoort Mineral Resource ancillary information is summarised in **Table 14** (background information) and **Table 15** (Mineral Resource estimation parameters).

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

## TABLE 14: ZANDRIVIERSPOORT PROJECT'S 2018 VS 2017 MINERAL RESOURCE BACKGROUND INFORMATION

| ZANDRIVIERSPOORT PROJECT | 2018 | 2017 |
|---|---|---|
| **LOCATION** | | |
| Country | Republic of South Africa | Republic of South Africa |
| Province | Limpopo | Limpopo |
| **OWNERSHIP** | | |
| Sishen Iron Ore Company Proprietary Limited | 50.0% | 50.0% |
| Kumba Iron Ore Limited | 38.2% | 38.2% |
| AA plc group | 26.6% | 26.6% |
| **SECURITY OF TENURE** | | |
| Number of applicable prospecting rights | 1 | 1 |
| Prospecting right expiry date(s) | 21 March 2020 | 21 March 2020 |
| **EXPLORATION STATUS** | | |
| Exploration type | Greenfields | Greenfields |
| Exploration phase | Pre-feasibility | Pre-feasibility |
| **GOVERNANCE** | | |
| Code | THE SAMREC CODE – 2016 EDITION | THE SAMREC CODE – 2016 EDITION |
| AA plc group technical standard | AA_GTS_22 (Reporting of Exploration Results, Mineral Resources and Ore Reserves in Anglo American) | |
| KIO reporting policy | http://www.angloamericankumba.com/sd_policies.php | http://www.angloamericankumba.com/sd_policies.php |
| KIO reporting protocols | KIOReportingProcedure(2017) | KIOReportingProcedure(2013) |
| | KIO Resource Classification Guideline (version 2) | KIO Resource Classification Guideline (version 2) |
| KIO reporting template | Mineral Resource (and Mineral Inventory) Reporting Template (2017) | KIO_R&R_Reporting_Template_092013 |
| **REPORTING METHOD** | | |
| Approach | Mineral Resources are reported exclusive of Ore Reserves and not factoring in attributable ownership and only if: (1) spatially modelled; (2) spatially classified; (3) spatially constrained in terms of reasonable and realistic prospects for eventual economic extraction (occurring within an RRPEEE defined envelope, in other words not all mineral occurrences are declared as Mineral Resources) and (4) declared within (never outside) executed tenement boundaries. | |
| *In situ* metric tonnes (dry/wet) | Dry | Dry |
| Tonnage calculation | Tonnages are added from cells in geological block model of which the centroids intersect the relevant geological ore domains in the solids models which occur inside the resource shell. The volume of each ore cell is multiplied with the estimated relative density of the same cell). | Tonnages are added from cells in geological block model of which the centroids intersect the relevant geological ore domains in the solids models which occur inside the resource shell. The volume of each ore cell is multiplied with the estimated relative density of the same cell). |
| $Fe_3O_4$ grade | Weighted average above cut-off grade | Weighted average above cut-off grade |
| $Fe_3O_4$ calculation | Tonnage-weighted mean of the estimated *in situ* Mineral Resource $Fe_3O_4$ grades contained within geological block models, constrained by the relevant Resource geological ore domains and RRPEEE resource shell. | Tonnage-weighted mean of the estimated *in situ* Mineral Resource $Fe_3O_4$ grades contained within geological block models, constrained by the relevant Resource geological ore domains and RRPEEE resource shell. |
| Cut-off grade | 20.2% Fe | 21.7% Fe |
| Ore type | Magnetite Ore | Magnetite Ore |

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

## TABLE 15: ZANDRIVIERSPOORT PROJECT'S 2018 VS 2017 MINERAL RESOURCE ESTIMATION PARAMETERS

| | **2018** | 2017 |
|---|---|---|
| **ESTIMATION** | | |
| **Zandrivierspoort geological model** | | |
| ***Input data*** | | |
| Borehole type | Core and Percussion borehole lithological logs and associated chemical analyses | |
| Relative density measurement | Picnometer analyses on pulp samples (2010 to present) | Picnometer analyses on pulp samples (2010 to present) |
| KIO QA/QC protocol | KIO QC Protocol for Exploration Drilling Sampling and Sub-sampling (version 2) | |
| Primary laboratory | Anglo American Research Division of Anglo Operations Limited Chemistry Laboratory (co reg no: 1921/006730/07) | Anglo American Research Division of Anglo Operations Limited Chemistry Laboratory (co reg no: 1921/006730/07) |
| Accreditation | Accredited under International Standard ISO/IEC 17025:2005 by the South African National Accreditation System (SANAS) under the Facility Accreditation Number T0051 (valid from 1 May 2016 to 30 April 2021) | Accredited under International Standard ISO/IEC 17025:2005 by the South African National Accreditation System (SANAS) under the Facility Accreditation Number T0051 (valid from 1 May 2011 to 30 April 2016) |
| Borehole database software | acQuire | acQuire |
| Borehole database update cut-off date | 17 July 2018 | 30 April 2013 |
| Database validation conducted in current year | No | No |
| Segmentation conducted | Yes. To allow for simplification of logged lithologies for spatial correlation purposes and to simplify the assay composite extractions. | |
| **STATISTICAL AND GEOSTATISTICAL EVALUATION** | | |
| Data compositing interval | 1m | 1m |
| Data compositing method | Length used to weight per lithology | Length used to weight per lithology |
| Grade parameters evaluated | % Fe, % $SiO_2$, % $Al_2O_3$, % $K_2O$, % P, % S, % $Fe_2$+, % $Fe_2O_3$, % $Fe_3O_4$, Relative Density | % Fe, % $SiO_2$, % $Al_2O_3$, % $K_2O$, % P, % S, % $Fe_2O_3$, % $Fe_3O_4$, Relative Density and Satmagan values for % $Fe_2O_3$, % $Fe_3O_4$ |
| Variography updated in current year | Yes | No |
| Search parameters updated in current year | Yes | No |
| **Solids modelling** | | |
| Solids modelling software | Leapfrog | Surpac |
| Input | New lithological codes | Previous solid models |
| Method | Implicitly captured lithological contacts from boreholes coded accordingly. | Digitally captured two-dimensional sections interpreted on borehole profiles. |
| | Solid models for all ore and waste domains. | Digital terrain models for alluvium waste types |
| Domaining | Domaining conducted per lithology. Lenses smaller than 1.5m in thickness are not separately domained. | Domaining conducted per lithology. Segments smaller than 3m in thickness are not separately domained. |
| Topography and pit progression assigned | Surface DTM based on high resolution aerial survey. | Surface DTM based on high resolution aerial survey. |
| Validation conducted | Yes (for gaps and overlaps by software queries as well as honouring of borehole contacts) and by standard software validation tools (open sides, self-intersecting triangles) as well as a visual peer review by exploration geologists. | Yes (for gaps and overlaps by software queries as well as honouring of borehole contacts) and by standard software validation tools (open sides, self-intersecting triangles) as well as a visual peer review by exploration geologists. |

# ANCILLARY RESERVE AND RESOURCE INFORMATION PER OPERATION AND PROJECT CONTINUED

## TABLE 15: ZANDRIVIERSPOORT PROJECT'S 2018 VS 2017 MINERAL RESOURCE ESTIMATION PARAMETERS continued

| | **2018** | 2017 |
|---|---|---|
| **GRADE ESTIMATION METHODOLOGY** | | |
| Ore segments | Other (specify below) | Other (specify below) |
| | Ordinary (Co-) Kriging | Ordinary Kriging with Dynamic Anisostropy |
| Waste segments | Simple (Co-) Kriging | Global Estimate |
| **GEOLOGICAL BLOCK MODELLING** | | |
| Block modelling software | Isatis and Datamine | Surpac |
| Model type | Centroid Model | Centroid Model |
| Parent cell size | 40m(X) x 40m(Y) x 10m(Z) | 80m(X) x 80m(Y) x 10m(Z) |
| Minimum sub-block cell size | 5m(X) x 5m(Y) x 5m(Z) | 10m(X) x 10m(Y) x 5m(Z) |
| **CELL POPULATION METHOD** | | |
| Tonnage | Volume of lithology intersected by cell centroid and constrained by cell limits, multiplied with relative density estimate of the same lithology at same unique cell centroid position in space. | Volume of lithology intersected by cell centroid and constrained by cell limits, multiplied with relative density estimate of the same lithology at same unique cell centroid position in space. |
| Grade | Estimate of grade at unique cell centroid position in space applicable to total volume or tonnage constrained by the cell. | Estimate of grade at unique cell centroid position in space applicable to total volume or tonnage constrained by the cell. |
| Updated geological block model ID (file name + extension) | ZRP180831f_am | ZRP_11_2013.fbm |
| Update completion date | 31 August 2018 | 1 November 2013 |
| **ESTIMATOR** | | |
| Resource estimator (name and surname) | Elelwani Machaka | Pietrè Smit |
| Resource estimator status | Internal technical specialist | Internal technical specialist |
| Estimator employer | Sishen Iron Ore Company Proprietary Limited | Sishen Iron Ore Company Proprietary Limited |

# ENDORSEMENT

**The persons that accept overall responsibility (Lead Competent Persons) and accountability (Chief Executive Officer) for the declaration of the 2018 Kumba Ore Reserve and Mineral Resource estimates.**

The persons at Kumba Iron Ore who are designated to take respective “corporate responsibility” for Mineral Resources and Ore Reserves are Jean Britz and Theunis Otto. They have extensively reviewed the Mineral Resource and Ore Reserve estimates reported for 2018 and consider it to be SAMREC compliant, and consent to the inclusion of these estimates in the form and context in which they appear in this online statement.

Jean Britz is a professional natural scientist, registered (400423/04) with the South African Council for Natural Scientific Professions. He has a BSc (Hons) in Geology and an MEng in Mining and has 25 years of experience as a mining and exploration geologist in coal and iron ore, of which 14 are specific to iron ore Mineral Resource estimation and evaluation.

**Jean Britz**
Principal, Mineral Resources and Geometallurgy – Kumba Iron Ore Geosciences

Theunis Otto is a professional mining engineer registered (990072) with the Engineering Council of South Africa. He has an MSc in Mining Engineering and has 23 years of experience as a mining engineer in production management and technical roles in coal and iron ore mining, of which 14 are specific to iron ore Mineral Reserve estimation and evaluation.

**Theunis Otto**
Head, Kumba Iron Ore Mining Engineering

Kumba Iron Ore’s CEO and board member, Mr Themba Mkhwanazi, endorses the Mineral Resource and Ore Reserve estimates presented in this document, and acknowledges that the Kumba Iron Ore Policy which governs Mineral Resource and Ore Reserve reporting has been adhered to.

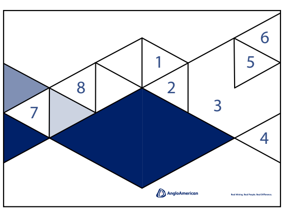
**Themba Mkhwanazi**
Chief Executive Officer, Kumba Iron Ore

# GLOSSARY OF TERMS AND ACRONYMS

| | |
|---|---|
| **AA plc** | Anglo American plc |
| **ABAS** | Anglo American's Business Assurance Services |
| **AFS** | Annual financial statements |
| **ASA** | Anglo South Africa Proprietary Limited |
| **BIF** | Banded iron formation |
| **BIS** | Banded ironstone |
| **CP** | Competent Person |
| **DMR** | Department of Mineral Resources |
| **DMS** | Dense media separation |
| **DSO** | Direct shipping ore |
| **ECSA** | Engineering Council of South Africa |
| **FOB** | Free on board |
| **FOR** | Free on rail |
| **Ga** | Giga annum |
| **IFRS** | International Financial Reporting Standards |
| **IR** | Integrated report |
| **JSE** | Johannesburg Stock Exchange |
| **KIO** | Kumba Iron Ore |
| **Kumba** | Kumba Iron Ore Limited |
| **LoM** | Life-of-mine |
| **LoMP** | Life-of-mine plan |
| **Ma** | Mega annum |
| **MPRDA** | Mineral and Petroleum Resources Development Act No 28 of 2002 |
| **Mt** | Million tonnes |
| **MTD** | Mine-to-design |
| **Mtpa** | Million tonnes per annum |
| **MWP** | Mining work programme |
| **NATA** | National (Australian) Association of Testing Authorities |
| **OREX** | Ore export line – Sishen-Saldanha line |
| **ORMR** | Ore reserve (and saleable product) and mineral resources report |

# GLOSSARY OF TERMS AND ACRONYMS CONTINUED

| | |
|---|---|
| **Platts IODEX** | Platts Iron Ore Index |
| **QA/QC** | Quality assurance and quality control |
| **RC** | Reverse circulation drilling |
| **RDP** | Resource Development Process |
| **RF** | Rhenosterkoppies fragment |
| **RoM** | Run of mine |
| **R&R** | Resource and reserve |
| **RRPEEE** | Reasonable and realistic prospects for eventual economic extraction |
| **SACNASP** | South African Council for Natural Scientific Professions |
| **SAMREC Code** | The South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves – SAMREC Code 2016 edition |
| **SANAS** | South African National Accreditation System |
| **SIOC** | Sishen Iron Ore Company Proprietary Limited |
| **SR** | Sustainability report |
| **TARP** | Trigger action response plan |
| **TS** | Anglo Technical Solutions |
| **UHDMS** | Ultra-high density media separation |
| **ZRP** | Zandrivierspoort |




Cover images

1. A DJI Matrice 600 Pro Hexacopter Drone used for engineering inspections such as fixed plant infrastructure and to perform blast clearance monitoring at both Sishen and Kolomela mines.
2. Magdeline Locko, Reggent Segoneo and Joel Tihaole, all Sishen mine employees working at the loadout station control room monitoring the loadout process.
3. Stockpiles of ore ready to ship from Sishen on the IOEC rail to Saldanha Bay port.
4. Joey Bekser, a Haultruck Operator and Eshwin Cloete, an acting Safety Officer conducting a SLAM in front of a Komatsu 730 truck.
5. Sibongile Makganye a Pit Geologist, logging and inspecting drilling samples at the Welgevonden Farm House near Kolomela.
6. Magdeline Locko, Reggent Segoneo and Joel Tihaole, all Sishen mine employees working at the loadout station control room monitoring the loadout process.
7. Johannes Banda, a Strata control officer and Eduan Hattingh, a geotechnical engineer at the Kapstevel pit in Kolomela mine selecting the scan area for the ground probe SSR-FX radar to monitor high wall stability.
8. Portia Booysen and Jacques Kradenburg carrying out a lock out and isolation procedure at the life-of-mine truck workshop at Sishen mine.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