African Rainbow Minerals

# MINERAL RESOURCES AND MINERAL RESERVES 2017

We do it better

# CONTENTS



All monetary values in this report are stated in South African Rand unless otherwise stated. Rounding of figures may result in computational discrepancies on management and operational review tabulations.

## OUR SUITE OF REPORTS

and additional material are available at **www.arm.co.za**

### Integrated Annual Report



The Integrated Annual Report presents a holistic view of ARM and discusses the Company's operational, financial and sustainability performance as well as its governance structures and operating context. The report focuses on the Company's material matters and strategy.

### Annual Financial Statements



The Annual Financial Statements present the audited financial statements which have been prepared in accordance with the International Financial Reporting Standards (IFRS).

### Sustainability Report



The Sustainability Report provides detailed information about our sustainable development performance and how economic, social and environmental impacts are managed. The report addresses those sustainability issues that are material to ARM and its stakeholders.

### Mineral Resources and Mineral Reserves Report

The Mineral Resources and Mineral Reserves Report is prepared in accordance with the South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves (SAMREC 2016).

### Corporate Governance Report

This report summarises our commitment to the highest standards of corporate governance and how our governance structures and systems support our values and the way in which we conduct our business.

### King IV Application Register


The King IV application register summarises the King IV principles implemented and the progress made towards achieving the practices and, ultimately, the governance outcomes envisaged.

## REFERENCES

- IAR — INTEGRATED ANNUAL REPORT 2017
- SR — SUSTAINABILITY REPORT 2017
- AFS — ANNUAL FINANCIAL STATEMENTS
- CGR — CORPORATE GOVERNANCE REPORT
- R&R — MINERAL RESOURCES AND MINERAL RESERVES REPORT
- www.arm.co.za

# MINERAL RESOURCES AND MINERAL RESERVES

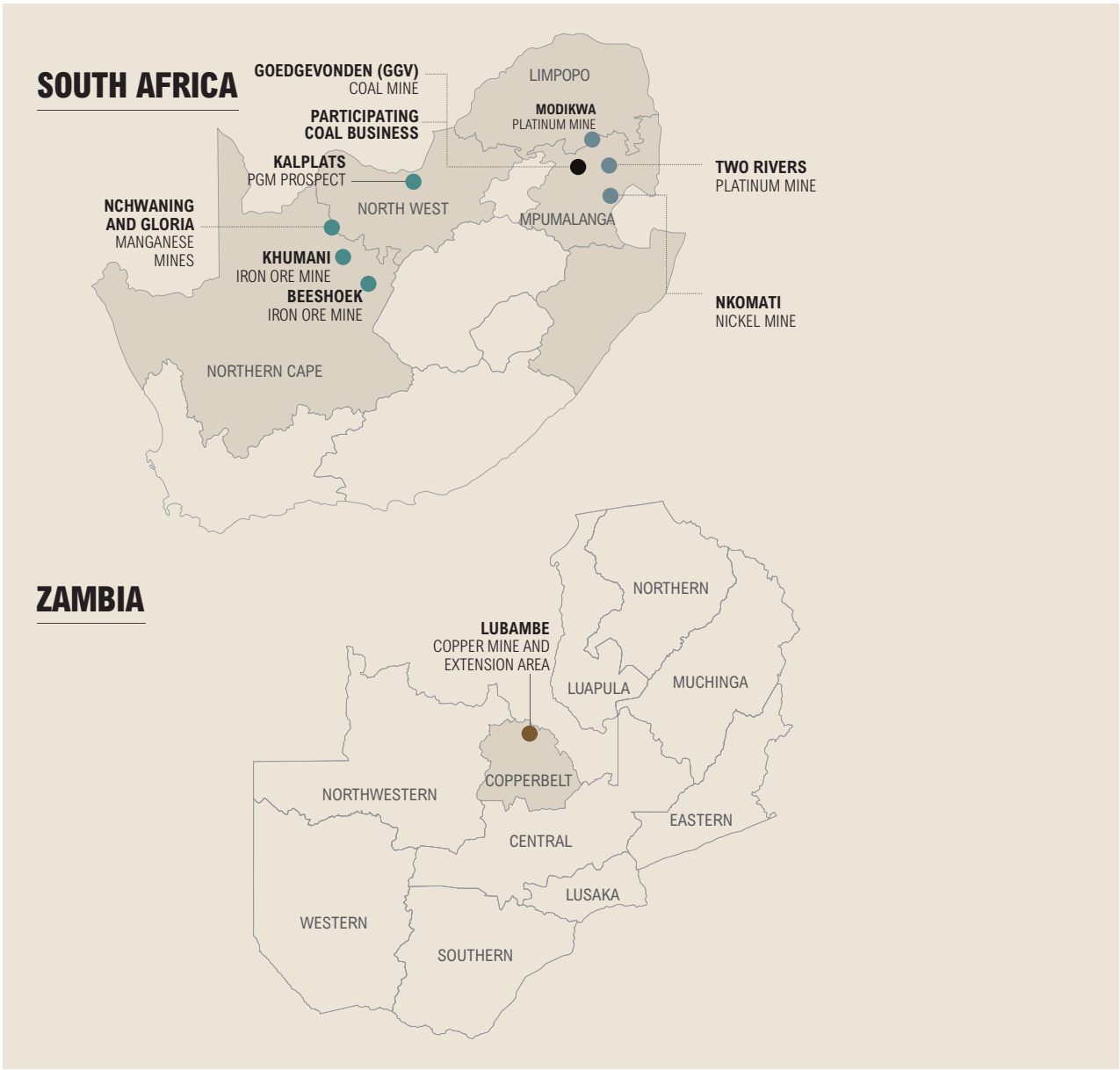
## 2017 REPORT ON MINERAL RESOURCES AND MINERAL RESERVES

The report is issued annually to inform shareholders and potential investors of the mineral assets held by African Rainbow Minerals Limited (ARM). The report is a summary of Competent Persons' Reports for ARM's mining operations and projects. ARM's method of reporting Mineral Resources and Mineral Reserves complies with the South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves (SAMREC Code of 2016) and the South African Code for the Reporting of Mineral Asset Valuation (SAMVAL Code of 2016). The report also complies with Section 12, paragraph 12.11 of the Johannesburg Stock Exchange (JSE) Listings Requirements.

IAR An abridged version is included in the ARM Integrated Annual Report for 2017, which can be found at **www.arm.co.za**.

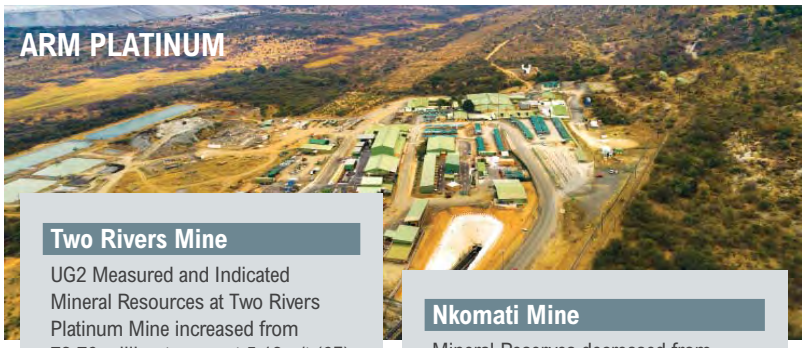
Historical ARM Mineral Resources and Mineral Reserves reports can be found on **www.arm.co.za** under Investors and Media, Annual Reports.

## LOCALITY MAPS OF ARM OPERATIONS AND PROJECTS



## SALIENT FEATURES FOR F2017

### ARM PLATINUM



#### Two Rivers Mine

UG2 Measured and Indicated Mineral Resources at Two Rivers Platinum Mine increased from 72.76 million tonnes at 5.13 g/t (6E) to 77.27 million tonnes at 5.31 g/t (6E) mainly due to the upgrade of Inferred Mineral Resources into Indicated Mineral Resources as a result of better structural interpretation. The UG2 Mineral Reserves (Proved and Probable) decreased from 43.25 million tonnes at 3.56 g/t (6E) in 2016 to 33.25 million tonnes at 3.47 g/t (6E) in 2017. The net loss in tonnage and 6E ounces is primarily due to mining depletion during the financial year 2016/2017, undercut mining in the split reef area, a reduction in the mining height in some areas as a result of remodeling and mining design changes in the faulted area on the North Decline.

#### Nkomati Mine

Mineral Reserves decreased from 94.56 million tonnes at 0.31% Ni to 88.63 million tonnes at 0.31% Ni, mainly due to mining depletion.

#### Modikwa Mine

The reporting of the UG2 Measured and Indicated Mineral Resources is now being done inclusive of that portion converted to Mineral Reserves, which is in accordance to the methodology applied at all the other ARM operations. It is due to this change that the Measured and Indicated Mineral Resources now reflect a tonnage of 189.50 million tonnes at 5.93 g/t (4E) compared to 139.60 million tonnes at 5.92 g/t (4E), reported in 2016.

### ARM FERROUS

#### Beeshoek Mine

The slight 3% decrease in Measured and Indicated Mineral Resources to 104.12 million tonnes at 64.07% Fe is due to mining depletion at Village, East and BN Pits.

#### Khumani Mine

Measured and Indicated Mineral Resource tonnage for Khumani (Bruce and King Pits) increased by 8% to 619.01 million tonnes due to application of a lower cut-off of 55% Fe. The grade consequently reduced by 3% to 62.53% Fe.

#### Black Rock Mine

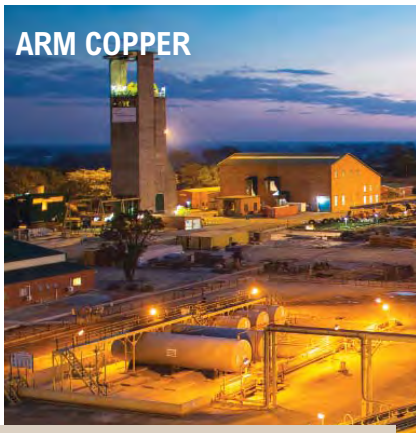
The Mineral Resources have been modelled on a composite optimal minable cut of approximately 5.0 metres on Seam 1 for Nchwaning 3 and 4.0 metres for Gloria, Nchwaning 1, Nchwaning 2 and the Graben resulting in an increase in Mineral Resources. Mineral Reserves for Nchwaning Seam 1 reduced from 97 million tonnes at a grade of 43.3% Mn in 2016 to 76.20 million tonnes at a grade of 46.0% Mn in 2017, due to the exclusion of areas close to the major geological structures and mining depletion. Nchwaning Seam 2 Mineral Reserves also reduced from 124.00 million tonnes at a grade of 41.5% Mn last year to 103.80 million tonnes at 42.9% Mn in 2017, due to the exclusion of areas close to major geological structures and areas where middling between Seam 1 and Seam 2 is less than 11 metres.

### ARM COAL

#### Goedgevonden Mine

Coal Measured and Indicated Resources reduced by 3% to 553 million tonnes, mainly due to mining depletion.

### ARM COPPER



#### Lubambe Mine

The Measured and Indicated Mineral Resources for Lubambe Copper Mine decreased slightly from 50.7 million tonnes at 2.55% TCu to 50.6 million tonnes at 2.43% TCu. The lower grade is mainly due to re-evaluation using Ordinary Kriging instead of Inverse Distance estimation techniques.

The Mineral Reserves decreased from 45.4 million tonnes at 2.18% TCu in 2016 to 41.0 million tonnes at a grade of 2.13% TCu mainly due to mining depletion. TCu grade decrease was due to new estimation methodology and application of revised modifying factors.

# F2017 MINERAL RESOURCES AND MINERAL RESERVES SUMMARY

R&R The tables below are summaries of the ARM Mineral Resources and Mineral Reserves. The detailed information on Mineral Resources and Mineral Reserves is provided per operation from page 9 in this report.

## ARM PLATINUM OPERATIONS

### Platinum Group Elements

| * Mineral Resources and Mineral Reserves are reported on a 100% basis. | Mineral Resources | | | | | | | | Mineral Reserves | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Measured | | Indicated | | Measured and Indicated | | Inferred | | Proved | | Probable | | Total Reserves | | |
| | Mt | Grade g/t | Mt | Grade g/t | **Mt** | **Grade g/t** | Mt | Grade g/t | Mt | Grade g/t | Mt | Grade g/t | **Mt** | **Grade g/t** | **Moz** |
| **Two Rivers Mine** | | | | | | | | | | | | | | | |
| UG2 (grade reported as 6E) | 15.22 | 5.42 | 62.05 | 5.28 | **77.27** | **5.31** | 80.64 | 5.60 | 10.72 | 3.64 | 22.53 | 3.39 | **33.25** | **3.47** | **3.71** |
| Merensky (grade reported as 6E) | | | 60.57 | 3.11 | **60.57** | **3.11** | 99.19 | 3.92 | | | | | | | |
| **Tamboti Platinum (Kalkfontein RE)** | | | | | | | | | | | | | | | |
| UG2 (grade reported as 6E) | 0.38 | 5.99 | 18.34 | 6.00 | **18.72** | **6.00** | 0.77 | 6.70 | | | | | | | |
| Merensky (grade reported as 6E) | | | 14.39 | 4.31 | **14.39** | **4.31** | 5.50 | 3.44 | | | | | | | |
| **Modikwa Mine**** | | | | | | | | | | | | | | | |
| UG2 (grade reported as 4E) | 87.30 | 5.95 | 102.20 | 5.92 | **189.50** | **5.93** | 76.50 | 6.21 | 12.34 | 4.95 | 29.88 | 4.76 | **42.21** | **4.82** | **6.54** |
| Merensky (grade reported as 4E) | 18.54 | 2.93 | 55.73 | 2.72 | **74.27** | **2.78** | 138.59 | 2.65 | | | | | | | |
| **Kalplats PGM Prospect** | | | | | | | | | | | | | | | |
| (grade reported as 3E) | 14.04 | 1.59 | 55.88 | 1.46 | **69.91** | **1.48** | 67.44 | 1.57 | | | | | | | |

***6E*** *= platinum + palladium + rhodium + iridium + ruthenium + gold*
***4E*** *= platinum + palladium + rhodium + gold*
***3E*** *= platinum + palladium + gold*

*The Mineral Resources are inclusive of those modified to produce Mineral Reserves.*
** *Modikwa Mine UG2 Measured and Indicated previously reported "**exclusive**" of those converted to Mineral Reserves are now reported as "**inclusive**" of those modified to Mineral Reserves.*
* ***Two Rivers Platinum Mine attributable interests (ARM 51%; Impala Platinum 49%).***
* ***Tamboti Platinum attributable interests (ARM 100%).***
* ***Modikwa Platinum Mine attributable interests (ARM 41.5%; Modikwa Communities 8.5%; Anglo American Platinum 50%).***
* ***Kalplats PGM Prospect attributable interests (ARM 46%; Stella Platinum 44%; and Anglo American Prospecting Services 10%).***

### Nickel

| * Mineral Resources and Mineral Reserves are reported on a 100% basis. | Mineral Resources | | | | | | | | Mineral Reserves | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Measured | | Indicated | | Measured and Indicated | | Inferred | | Proved | | Probable | | Total Reserves | |
| | Mt | Ni% | Mt | Ni% | **Mt** | **Ni%** | Mt | Ni% | Mt | Ni% | Mt | Ni% | **Mt** | **Ni%** |
| **Nkomati Mine** (MMZ+PCMZ) | 85.91 | 0.32 | 96.50 | 0.37 | **182.41** | **0.35** | 46.35 | 0.40 | 58.22 | 0.30 | 30.42 | 0.33 | **88.63** | **0.31** |
| **Nkomati Mine** (MMZ Stockpiles) | | | | | | | | | 0.32 | 0.44 | | | **0.32** | **0.44** |
| **Nkomati Mine** (PCMZ Stockpiles) | | | | | | | | | 0.88 | 0.18 | | | **0.88** | **0.18** |

*The Mineral Resources are inclusive of those modified to produce Mineral Reserves.*
***MMZ*** *– Main Mineralised Zone;* ***PCMZ*** *– Chromititic Peridotite Mineralised Zone.*
*Nkomati Mine MMZ Mineral Resources and Mineral Reserves also contain Cu, Co, and PGEs.*
*Nkomati Mine PCMZ Mineral Resources and Mineral Reserves also contain Cu, Co, PGEs and $Cr_2O_3$.*

* ***Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).***

# F2017 MINERAL RESOURCES AND MINERAL RESERVES SUMMARY continued

## Chrome

| * Mineral Resources and Mineral Reserves are reported on a 100% basis. | Mineral Resources | | | | | | Mineral Reserves | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Measured | | Indicated | | Measured and Indicated | | Proved | | Probable | | Total Reserves | |
| | Mt | $Cr_2O_3$% | Mt | $Cr_2O_3$% | **Mt** | **$Cr_2O_3$%** | Mt | $Cr_2O_3$% | Mt | $Cr_2O_3$% | **Mt** | **$Cr_2O_3$%** |
| **Nkomati Mine** | | | | | | | | | | | | |
| Oxidised | | | | | | | | | | | | |
| Massive | | | | | | | | | | | | |
| Chromitite | 0.13 | 25.40 | | | **0.13** | **25.40** | 0.06 | 25.60 | 0.06 | 21.61 | **0.12** | **23.61** |
| Un-oxidised | | | | | | | | | | | | |
| Massive | | | | | | | | | | | | |
| Chromitite | 6.16 | 28.98 | | | **6.16** | **28.98** | 0.76 | 17.48 | 0.56 | 19.79 | **1.32** | **18.46** |
| Chromite | | | | | | | | | | | | |
| Stockpiles | | | | | | | 2.33 | 19.25 | | | **2.33** | **19.25** |

*The Mineral Resources are inclusive of those modified to produce Mineral Reserves.*

** Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).*

# ARM FERROUS OPERATIONS

## Manganese

| * Mineral Resources and Mineral Reserves are reported on a 100% basis. | Mineral Resources | | | | | | | | Mineral Reserves | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Measured | | Indicated | | Measured and Indicated | | Inferred | | Proved | | Probable | | Total Reserves | |
| | Mt | Mn% | Mt | Mn% | **Mt** | **Mn%** | Mt | Mn% | Mt | Mn% | Mt | Mn% | **Mt** | **Mn%** |
| **Black Rock Mine (Nchwaning Mine)** | | | | | | | | | | | | | | |
| Seam 1 | 73.22 | 44.6 | 62.40 | 41.8 | **135.62** | **43.3** | | | 29.00 | 45.3 | 47.20 | 46.4 | **76.20** | **46.0** |
| Seam 2 | 108.90 | 42.5 | 89.83 | 42.1 | **198.73** | **42.3** | | | 66.40 | 42.7 | 37.40 | 43.2 | **103.80** | **42.9** |
| **Black Rock (Koppie area)** | | | | | | | | | | | | | | |
| Seam 1 | 9.03 | 40.3 | 34.57 | 40.7 | **43.60** | **40.6** | | | | | | | | |
| Seam 2 | 8.23 | 37.4 | 18.58 | 39.2 | **26.81** | **38.6** | | | | | | | | |
| **Black Rock Mine (Gloria Mine)** | | | | | | | | | | | | | | |
| Seam 1 | 63.90 | 37.4 | 93.83 | 37.7 | **157.73** | **37.6** | 31.50 | 37.0 | 43.20 | 37.3 | 75.00 | 37.6 | **118.20** | **37.5** |
| Seam 2 | | | 34.81 | 28.4 | **34.81** | **28.4** | 133.46 | 30.0 | | | | | | |

*The Mineral Resources are inclusive of those modified to produce Mineral Reserves.*

** Black Rock Manganese Mine attributable interests (ARM 50%; Assore 50%).*

## Iron Ore

| * Mineral Resources and Mineral Reserves are reported on a 100% basis. | Mineral Resources | | | | | | | | Mineral Reserves | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Measured | | Indicated | | Measured and Indicated | | Inferred | | Proved | | Probable | | Total Reserves | |
| | Mt | Fe% | Mt | Fe% | **Mt** | **Fe%** | Mt | Fe% | Mt | Fe% | Mt | Fe% | **Mt** | **Fe%** |
| **Beeshoek Mine** | | | | | | | | | | | | | | |
| All pits | 94.50 | 64.09 | 9.62 | 63.81 | **104.12** | **64.07** | 2.55 | 60.04 | 39.88 | 64.79 | 3.85 | 63.95 | **43.73** | **64.71** |
| Stockpiles | | | | | | | | | | | 4.97 | 55.49 | **4.97** | **55.49** |
| **Khumani Mine** | | | | | | | | | | | | | | |
| Bruce and King/ Mokaning | 480.36 | 62.54 | 138.65 | 62.53 | **619.01** | **62.53** | 40.35 | 59.66 | 361.80 | 62.18 | 89.70 | 62.06 | **451.50** | **62.15** |
| Stockpiles | | | | | | | | | | | 3.90 | 55.22 | **3.90** | **55.22** |

*The Mineral Resources are inclusive of those modified to produce Mineral Reserves.*

* ***Iron Ore Operations attributable interests (ARM 50%; Assore 50%).***

# ARM COAL OPERATION

## Coal

| * Coal Resources and Coal Reserves are reported on a 100% basis. | Coal Resources | | | | | | Coal Reserves (ROM) | | | | | | Coal Reserves (Saleable) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Measured | | Indicated | | Measured and Indicated | | Proved | | Probable | | Total Reserves | | Proved | | Probable | | Total Reserves | |
| | Mt | CV (MJ/kg) | Mt | CV (MJ/kg) | **Mt** | **CV (MJ/kg)** | Mt | CV (MJ/kg) | Mt | CV (MJ/kg) | **Mt** | **CV (MJ/kg)** | Mt | ** | Mt | ** | **Mt** | ** |
| **Goedgevonden Coal Mine** | 540 | 19.73 | 13 | 21.45 | **553** | **19.77** | 290 | 19.57 | 11 | 19.57 | **301** | **19.57** | 180 | ** | 6 | ** | **186** | ** |

*The Coal Resources are inclusive of those modified to produce Coal Reserves.*

** *[HG Export (84 Mt); Export CV (6000 Kcal/kg)] and [LG Export (102 Mt); LG Export CV (21.5 MJ/kg)].*

* ***Goedgevonden Coal Mine attributable interests (ARM 26%; Glencore Operations 74%).***

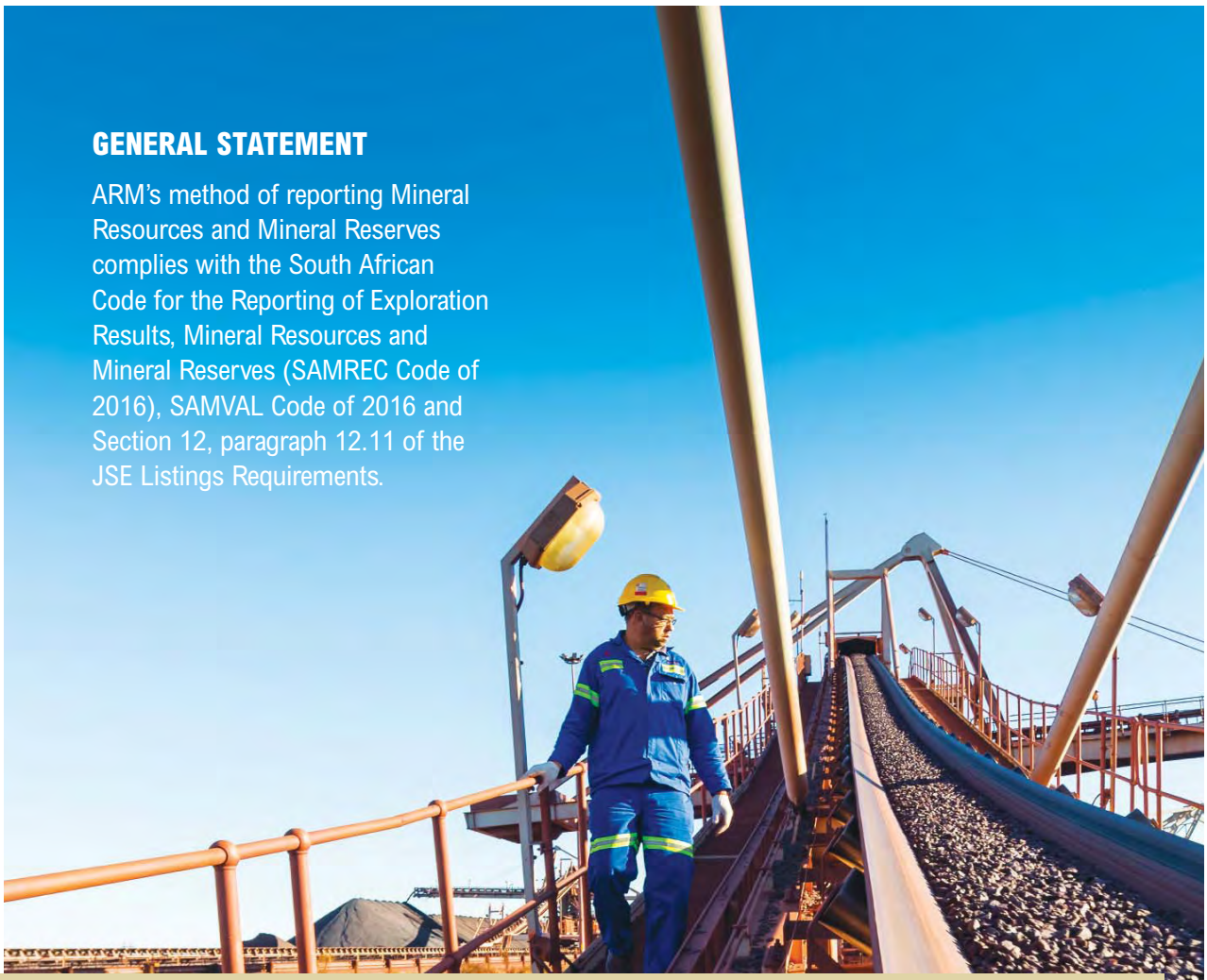
# ARM COPPER OPERATION

## Copper

| * Mineral Resources and Mineral Reserves are reported on a 100% basis. | Mineral Resources | | | | | | | | Mineral Reserves | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Measured | | Indicated | | Measured and Indicated | | Inferred | | Proved | | Probable | | Total Reserves | |
| | Mt | TCu% | Mt | TCu% | **Mt** | **TCu%** | Mt | TCu% | Mt | TCu% | Mt | TCu% | **Mt** | **TCu%** |
| Lubambe Mine | 8.9 | 2.50 | 41.7 | 2.41 | **50.6** | **2.43** | 25.8 | 1.97 | 7.00 | 2.18 | 34.0 | 2.12 | **41.0** | **2.13** |
| Lubambe Extension Target Area | | | 90.0 | 3.73 | **90.0** | **3.73** | 44.0 | 4.78 | | | | | | |
| Lubambe Extension (Outside Target Area) | | | | | | | 79.0 | 2.80 | | | | | | |

*The Mineral Resources are inclusive of those modified to produce Mineral Reserves.*

* ***Lubambe Copper Mine attributable interests (ARM 40%; Vale 40%; ZCCM-IH 20%).***



## GENERAL STATEMENT

ARM's method of reporting Mineral Resources and Mineral Reserves complies with the South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves (SAMREC Code of 2016), SAMVAL Code of 2016 and Section 12, paragraph 12.11 of the JSE Listings Requirements.

The SAMREC Code 2016 sets out minimum standards, recommendations and guidelines for Public Reporting of Exploration Results, Mineral Resources and Mineral Reserves in South Africa. It was launched and adopted by the Johannesburg Stock Exchange (JSE) in May 2016. The 2017 Mineral Resources and Mineral Reserves Report is based on the SAMREC Code of 2016.

The convention adopted in this report is that the Measured and Indicated Mineral Resources are reported inclusive of that portion converted to Mineral Reserves. Previously Modikwa's Measured and Indicated Mineral Resources were reported exclusive of that portion converted to Mineral Reserves, but this has been changed to reporting the Measured and Indicated Mineral Resources inclusive of that portion converted to Mineral Reserves. Inferred Mineral Resources have not been included in feasibility studies or Life of Mine Plans. Mineral Resources and Mineral Reserves are quoted as at 30 June 2017, unless stated otherwise.

External consulting firms audit the Mineral Resources and Mineral Reserves of the ARM operations when substantial geological borehole data has been added to the database. Underground Resources are *in situ* tonnages at the postulated mining width, after deductions for geological losses. Underground Mineral Reserves reflect tonnages that will be mined and processed while surface Mineral Reserves consist of stockpiles already mined and ready for processing. Both are quoted at the grade fed to the plant. Open-pit Mineral Resources are quoted as *in situ* tonnages and Mineral Reserves are tonnages falling within an economic pit-shell.

The classification into Measured, Indicated and Inferred Mineral Resources is done by consideration of geo-statistical parameters, spacing of boreholes, geological structures and continuity of the mineralisation.

The Mineral Resources and Mineral Reserves are reported on a **100% basis** and the attributable interest is noted in the footnotes of the tabulations. Maps, plans and reports supporting Mineral Resources and Mineral Reserves are available for inspection at ARM's registered office and at the relevant mines.

ARM's Prospecting and Mining Rights details are provided in this report for each project and operation (refer to the relevant sections of the operations and projects). Rounding of figures may result in computational discrepancies on the Mineral Resources and Mineral Reserves tabulations.

# DEFINITIONS

The definitions of Mineral Resources and Mineral Reserves, quoted from the SAMREC Code (2016 Edition), are as follows:

## Mineral Resources

### A 'Mineral Resource'

is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling.

### A 'Measured Mineral Resource'

is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, and physical characteristics are estimated with confidence sufficient to allow the application of Modifying Factors to support detailed mine planning and final evaluation of the economic viability of the deposit. Geological evidence is derived from detailed and reliable exploration, sampling and testing and is sufficient to confirm geological and grade or quality continuity between points of observation. A Measured Mineral Resource has a higher level of confidence than that applying to either an Indicated Mineral Resource or an Inferred Mineral Resource. It may be converted to a Proved Mineral Reserve or to a Probable Mineral Reserve.

### An 'Indicated Mineral Resource'

is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to assume geological and grade or quality continuity between points of observation.

### An 'Inferred Mineral Resource'

is that part of a Mineral Resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity. An Inferred Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.

## Mineral Reserves

### A 'Mineral Reserve'

is the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified. The reference point at which Mineral Reserves are defined, usually the point where the ore is delivered to the processing plant, must be stated. It is important that, in all situations where the reference point is different, such as for a saleable product, a clarifying statement is included to ensure that the reader is fully informed as to what is being reported.

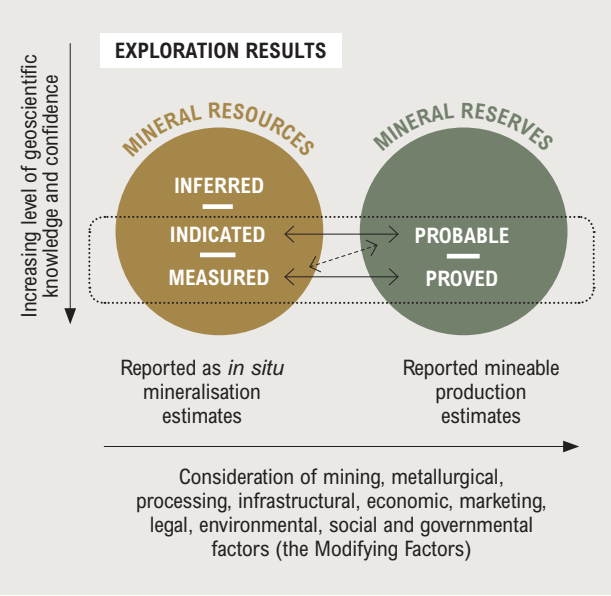
### A 'Proved Mineral Reserve'

is the economically mineable part of a Measured Mineral Resource. A Proved Mineral Reserve implies a high degree of confidence in the Modifying Factors.

### A 'Probable Mineral Reserve'

is the economically mineable part of an Indicated, and in some circumstances, a Measured Mineral Resource. The confidence in the Modifying Factors applying to a Probable Mineral Reserve is lower than that applying to a Proved Mineral Reserve.

## RELATIONSHIP BETWEEN EXPLORATION RESULTS, MINERAL RESOURCES AND MINERAL RESERVES




## COMPETENCE

The Competent Person with overall responsibility for the compilation of the 2017 Mineral Resources and Mineral Reserves Report is Shepherd Kadzviti (Pr.Sci.Nat.), an ARM employee working at the ARM corporate office. He confirms that the information in this report complies with the SAMREC Code and that it may be published in the form and context in which it was intended.

Shepherd Kadzviti graduated with a BSc in Geology and Mathematics and MSc in Exploration Geology from the University of Zimbabwe. He later completed a Graduate Diploma in Mining Engineering (GDE) at the University of the Witwatersrand. He worked at RioZim's Renco Gold Mine for 14 years in various capacities as Geologist, Technical Services Superintendent and Mine Manager. In 2005, he joined Anglo American Platinum at Union Mine as an Evaluation Geologist with responsibilities for geological database management and Mineral Resource estimation. After two years at the mine, he was transferred to the Anglo American Platinum corporate office where he was appointed Resource Geologist. He then joined ARM as Mineral Resources Specialist in 2008, and was involved in the evaluation of the various mineral deposits for the Group. In 2012, he was appointed Group Mineral Resources Manager for ARM. He is registered with the South African Council for Natural Scientific Professions (SACNASP) as a Professional Natural Scientist (Pr. Sci.Nat) in the field of practice of geological science, registration number 400164/05. He has a total of 27 years' experience in various aspects of Mining and Exploration Geology, database management and Mineral Resource estimation and as such is considered to be a Competent Person. SACNASP is based in the Management Enterprise Building, Mark Shuttleworth Street, Innovation Hub, Pretoria, 0087, South Africa.

All Competent Persons at ARM corporate office and the operations have sufficient relevant experience in the type of deposit and in the activity for which they have taken responsibility. Details of ARM's Competent Persons are available from the Company Secretary on written request.

The following ARM corporate office Competent Persons were involved in compiling some aspects of the Mineral Resources and Mineral Reserves report or general review of the report. They are employed by ARM:

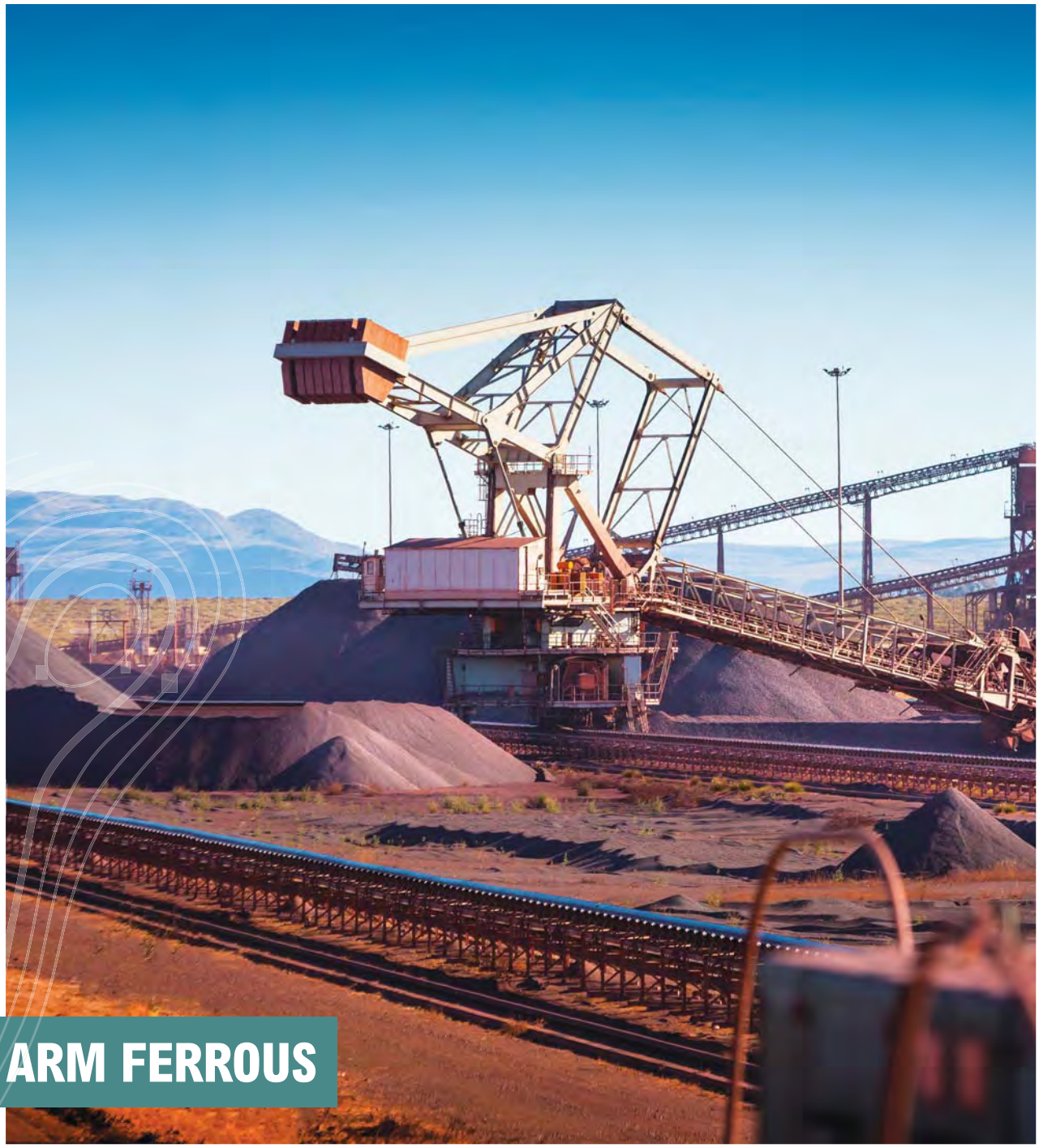
| ARM corporate office | | | | |
|---|---|---|---|---|
| Competent Person | Professional Organisation | Membership Number | Qualifications | Relevant Experience |
| C Schlegel | SACNASP | 400149/90 | BSc, BSc Hons (Geology), MSc (Geology) | 31 years |
| M Mabuza | SACNASP | 400081/94 | BSc, BSc Hons (Geology), MSc (Geology), GDE (Mining Engineering) | 27 years |
| V Moyo | SACNASP | 400305/11 | BSc, BSc Hons (Geology), MSc (Project Management) | 20 years |

The Competent Persons consent to the inclusion of the Exploration Results, Mineral Resources and Mineral Reserves information in this report, in the form and context in which it appears.

**Shepherd Kadzviti (Pr.Sci.Nat)**
Group Mineral Resources Manager

African Rainbow Minerals
24 Impala Road, Chislehurston,
Sandton, South Africa.

10 October 2017



# ARM FERROUS

## ASSMANG PROPRIETARY LIMITED (ASSMANG) OPERATIONS

ARM's attributable beneficial interest in Assmang operations is 50%. The other 50% is held by Assore Limited. Assmang operations comprise Black Rock Manganese Mines as well as Khumani and Beeshoek Iron Ore Mines.

## MANGANESE MINES

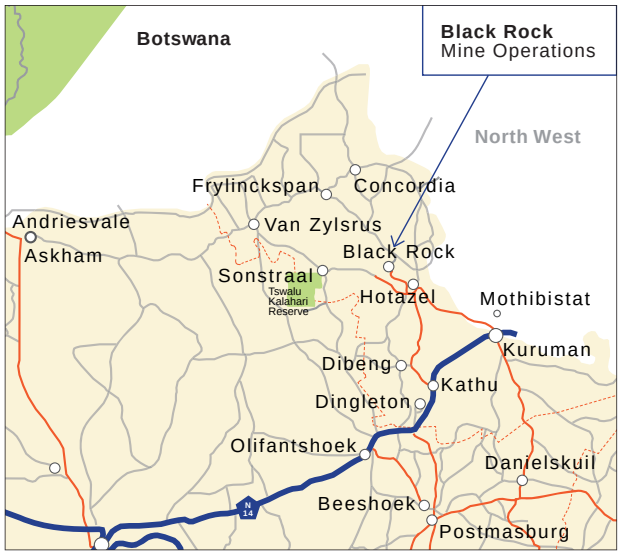
### Locality

Black Rock Manganese Mines encompass Nchwaning and Gloria mines which are situated approximately 80 kilometres north-west of the town of Kuruman in the Northern Cape Province of South Africa. Located at latitude 27°07'50"S longitude 22°50'50"E, the mines are accessed via the national N14 route between Johannesburg and Kuruman, and the provincial R31 road.

Nchwaning 3 and Nchwaning 2 (including Graben area) shafts are situated on portions of Nchwaning 267, Belgravia 264 and Santoy 230 farms while Gloria Mine is on Portion 1 of Gloria 266. The Nchwaning and the adjoining Gloria mining rights are bounded by the farms Wessels 227, Dibiaghomo 226 and Dikgathlong 268 in the north, Rhodes 269, East 270 and Kipling 271 in the east, Umtu 281 and Mukulu 265 to the south.

ARM FERROUS continued

## LOCALITY OF BLACK ROCK MANGANESE OPERATION




## History

In 1940, ARM Ferrous acquired a manganese ore outcrop on a small hillock known as Black Rock. Several large properties underlain by ore were subsequently found and acquired. Today, the Black Rock area is considered to be one of the largest and richest manganese deposits in the world. Manganese mining operations were extended and today include the Gloria and Nchwaning underground mines. Manganese ore is supplied locally to the Assmang-owned Cato Ridge Smelter, and is exported through Port Elizabeth, Durban and Richards Bay.

## Competence

The following Competent Persons were involved in the estimation of Black Rock Mineral Resources and Mineral Reserves. They are employed by Assmang.

| Competent Person | Professional Organisation | Membership Number | Qualifications | Relevant Experience |
|---|---|---|---|---|
| B Ruzive (Mineral Resources) | SACNASP | 400238/07 | BSc, BSc Hons (Geology), MSc (Exploration Geology), MBA | 17 years |
| J Smuts (Mineral Reserves) | ECSA | 201270097 | B-Tech (Mining Engineering) | 6 years |

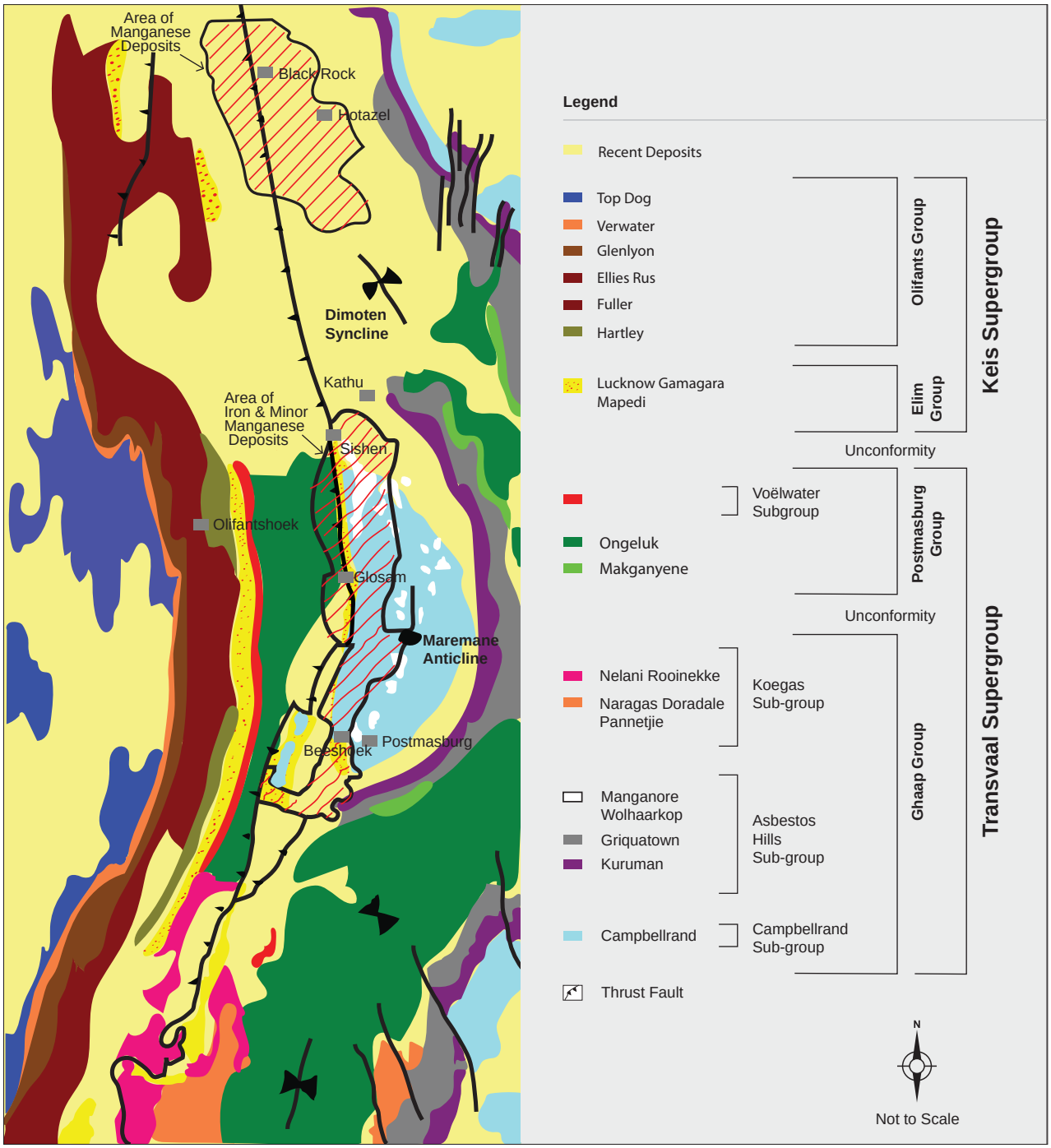
## Mining authorisation

| Legal Entitlement | Minerals covered by Mining Right | Comment | Period of Mining Right (years) | Known Impediments on Legal Entitlement |
|---|---|---|---|---|
| Mining Right NC 30/5/1/2/2/203 MRC | Manganese ore | None | 30 Years 13 July 2011 to 12 July 2041 | None |

## Geology

The manganese ores of the Kalahari Manganese Field are contained within sediments of the Hotazel Formation in the Postmasburg Group of the Griqualand West Sequence, a sub-division of the Proterozoic Transvaal Supergroup. The Griqualand West Sequence comprises a basal dolomite and banded ironstones dominating the Ghaap, Postmasburg and the Olifantshoek Groups. The Postmasburg Group consists of basal basaltic andesites of the Ongeluk lava and banded ironstone and manganese of the Hotazel Formation.

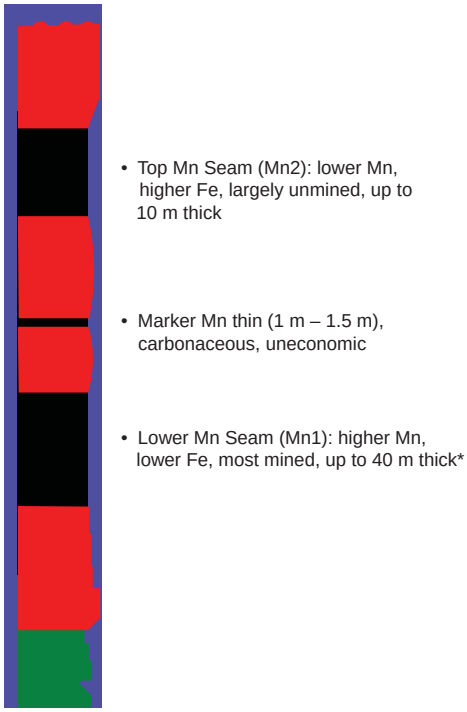
### REGIONAL GEOLOGICAL MAP




On Belgravia, Santoy and Nchwaning farms the Hotazel Formation and overlying Mapedi shales and Lucknow quartzite sequences have been duplicated by thrusting. The thrusted ore bodies were mined from surface at the Kalahari Manganese Field discovery outcrop – the Black Rock Koppie and at two other down dip interconnected Belgravia 1 and Belgravia 2 shafts. Mining reached depths of approximately 200 metres. The manganese resources hosted in the thrusted orebodies are reported, collectively, under Black Rock (Koppie Area) orebodies. The average thickness of the Hotazel Formation is approximately 40 metres, with the banded iron formation (BIF) hosted manganese ore bodies occurring as three stratabound and stratiform units of variable thickness. The lowermost ore body (Seam 1) is higher grade in comparison to the topmost ore body (Seam 2). Seam 3, which occurs in between Seam 1 and Seam 2, is thin and uneconomic.

ARM FERROUS continued

**GENERALISED STRATIGRAPHY OF MANGANESE UNITS IN THE HOTAZEL FORMATION**




** Mn seams tend to be thicker in lower grade Mamatwan/Gloria type ore compared to the higher grade Wessels/Nchwaning type ore.*

The manganese ore bodies exhibit a complex mineralogy and more than 200 ore and gangue mineral species have been identified. Hydrothermal upgrading has resulted in zoning of the ore body adjacent to fault positions. Distal areas exhibit more original and low-grade kutnohorite and braunite assemblages, while areas immediately adjacent to faults exhibit high-grade hausmannite rich ore. The intermediate areas exhibit mineralogy which includes bixbyite, braunite and jacobsite among a host of other manganese-bearing minerals. Similar zonation also exists in the vertical sense. At the top and bottom contacts it is common to have high iron (Fe) and low manganese (Mn) contents while the reverse is true towards the centre of the seam. This vertical zoning has given rise to a mining practice where only the 4.0 to 5.0 metre-high centre portion of the seam is being mined.

## Exploration Activities

There was no exploration expenditure for the year. A capital application for a three-year in-fill drilling campaign will be submitted in the 2017/2018 financial year. The areas planned for drilling are: Nchwaning 3, Graben and Gloria areas.

## Mining Methods and Infrastructure

Trackless mechanised equipment is used in the Bord and Pillar mining method. Two manganese seams are mined. The lowermost (Seam 1) at Nchwaning 3 is up to 6 metres thick, of which up to 5 metres is mined. There is, therefore, minimum dilution. Limited mining of Nchwaning Seam 2 has been done, while no mining has been undertaken to date on Gloria Seam 2. Gloria Seam 1 is approximately 14 metres thick, but only an optimum cut of 4.0 metres is mined.

## Nchwaning Mine Mineral Resources

Nchwaning Mine was diamond drilled from surface at 330 metre grid centres and the data is captured in a Geological Database Management System (GDMS) developed by Datamine. The core is logged and 0.5 metre-long, half-core, diamond-saw cut samples are submitted to Assmang's laboratory at Black Rock for X-ray fluorescence (XRF) analyses. Mn and Fe values are checked by Wet Chemical analyses. Several standards are used to calibrate the XRF equipment, and results are compared with other laboratories on a regular basis.

At Nchwaning, boreholes and underground sample sections were considered in the geological modelling and grade estimation for Nchwaning Seam 1 and Seam 2 resource modelling. The geological modelling and the grade estimation was undertaken using Datamine Studio 3 software. The resource models were built on 50 metres x 50 metres x optimal minable cut. The optimal minable cuts were 4 to 5 metres for Nchwaning Seam 1, 2, and 3 and Graben. The blocks were sub-split in the X and Y directions to accurately follow the geological boundaries.

Statistical and geostatistical analysis was done on the following variables: Mn, Fe, $Al_2O_3$, BaO, CaO, $K_2O$, MgO, $Na_2O$, P, S and $SiO_2$. Ordinary Kriging interpolation within Datamine Studio 3 was used to estimate the grade of each block. Borehole and/or underground sample data composited to the optimal minable cut was used in the estimation of grades. The relative density of the Nchwaning manganese Seams 1 and 2 was determined as 4.3 $t/m^3$. Mineral Resource classification at Nchwaning Mine is based on a number of parameters: Kriging variance, Kriging efficiency, regression slope, geological continuity of the manganese seams, geological structures and quality of assay data. Each of these parameters contributes to the overall classification depending on a weighting assigned to each of the parameters. Measured and Indicated Resources have been declared for Nchwaning.

## Nchwaning Mine Mineral Reserves

Conversion of the Mineral Resources to Mineral Reserves is done for the Measured and Indicated Mineral Resources. The main modifying factors for the conversion are: plant recovery factor, manganese prices and mining extraction factors. Details of these factors are listed below the Mineral Reserves tables.

Mining in the eastern extremity of Nchwaning occurs at a depth of 200 metres, while the deepest (current) excavations are 519 metres below surface. Ore from Nchwaning No 2 Mine is crushed underground before being hoisted to a surface stockpile via a vertical shaft. Similarly, ore from the Nchwaning No 3 Mine is crushed underground before being conveyed to a surface stockpile via a declined conveyor system. Ore is withdrawn from the surface stockpile and undergoes two stages of crushing, dry screening and wet screening to yield lumpy and fine products.

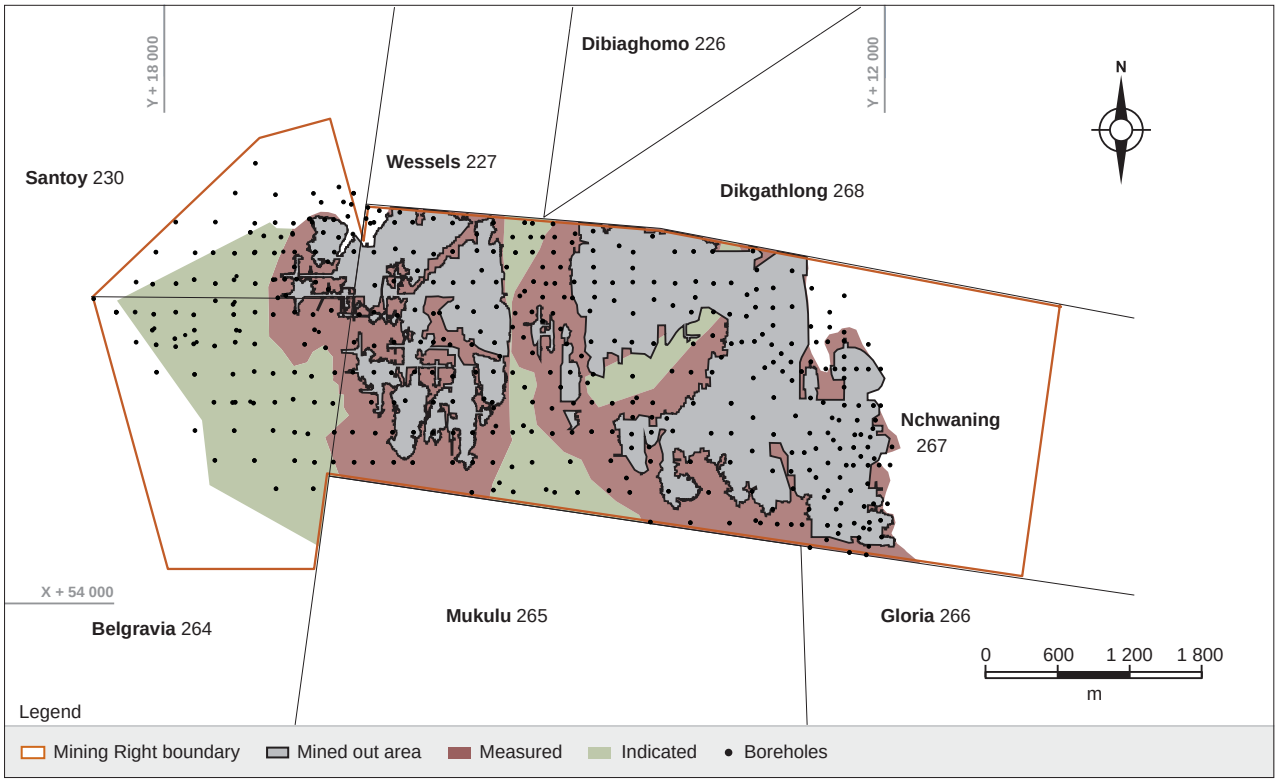
At the plant, the finer fractions are stockpiled while the coarser fractions are extracted from the respective product boxes into road haulers, sampled, weighed and stored on stacks ahead of despatch. Samples from each stack are analysed for chemical content and size distribution. This ensures good quality control and enables the ore control department to blend various stacks according to customer requirements.

## NCHWANING MINE: SEAM 1 MANGANESE MINERAL RESOURCES AND MINERAL RESERVES

| * Mineral Resources and Mineral Reserves are reported on a 100% basis. | Mineral Resources | | | | Mineral Reserves | | |
|---|---|---|---|---|---|---|---|
| | Mt | Mn% | Fe% | | Mt | Mn% | Fe% |
| Measured | 73.22 | 44.6 | 8.9 | Proved | 29.00 | 45.3 | 9.1 |
| Indicated | 62.40 | 41.8 | 8.5 | Probable | 47.20 | 46.4 | 9.0 |
| **Total Resources (Seam 1) 2017** | **135.62** | **43.3** | **8.7** | **Total Reserves (Seam 1) 2017** | **76.20** | **46.0** | **9.0** |
| Total Resources (Seam 1) 2016 | 129.89 | 43.3 | 8.5 | Total Reserves (Seam 1) 2016 | 97.00 | 43.3 | 8.5 |

*The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.*
*Totals are rounded off.*
***Key assumptions for Mineral Resources:***
*True thickness cut-off: 4.0 m – 5.0 m*
*Density: 4.3 t/m³*
***Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:***
*Tramming loss factor: 1%*
*Plant Recovery: 89%*
*Mine Extraction Factor: 72% – 78%*
*Price ranges: Based on market related long term view*
*Exchange Rate used: Market related*
** **Black Rock Manganese Mine attributable interests (ARM 50%; Assore 50%).***

## NCHWANING MANGANESE SEAM 1 MINERAL RESOURCES CLASSIFICATION



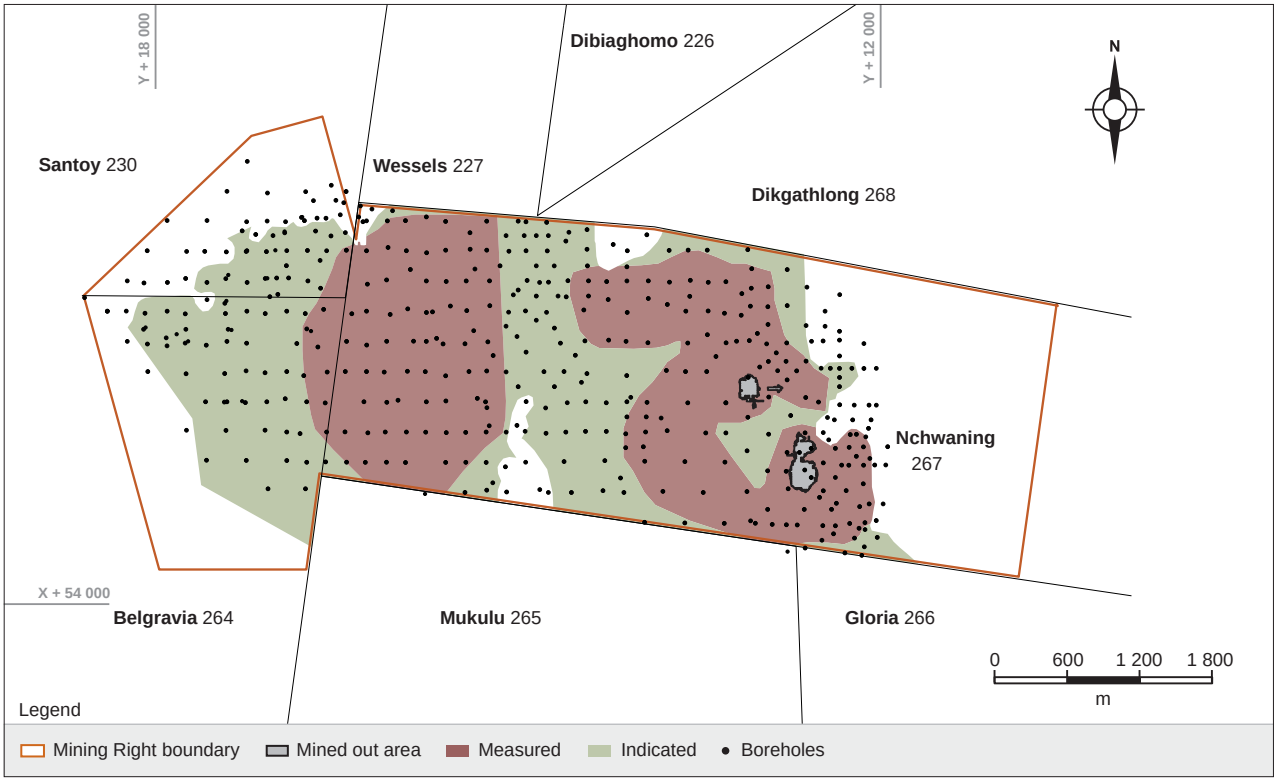
ARM FERROUS continued

## NCHWANING MINE: SEAM 2 MANGANESE MINERAL RESOURCES AND MINERAL RESERVES

| * Mineral Resources and Mineral Reserves are reported on a 100% basis. | Mineral Resources | | | | Mineral Reserves | | |
|---|---|---|---|---|---|---|---|
| | Mt | Mn% | Fe% | | Mt | Mn% | Fe% |
| Measured | 108.90 | 42.5 | 15.9 | Proved | 66.40 | 42.7 | 15.1 |
| Indicated | 89.83 | 42.1 | 15.4 | Probable | 37.40 | 43.2 | 15.4 |
| **Total Resources (Seam 2) 2017** | **198.73** | **42.3** | **15.7** | **Total Reserves (Seam 2) 2017** | **103.80** | **42.9** | **15.2** |
| Total Resources (Seam 2) 2016 | 179.78 | 42.3 | 16.0 | Total Reserves (Seam 2) 2016 | 124.00 | 41.5 | 16.1 |

*The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.*
*Totals are rounded off.*
***Key assumptions for Mineral Resources:***
*True thickness cut-off: 4.0 m*
*Density: 4.3 t/m³*
***Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:***
*Tramming loss factor: 1%*
*Plant Recovery: 89%*
*Mine Extraction Factor: 72% – 78%*
*Price ranges: Based on market related long term view*
*Exchange Rate used: Market related*
** **Black Rock Manganese Mine attributable interests (ARM 50%; Assore 50%).***

## NCHWANING MANGANESE SEAM 2 MINERAL RESOURCES CLASSIFICATION



### NCHWANING YEAR-ON-YEAR CHANGE

The Mineral Resources for Seam 1 increased by 4.4% from 129.89 million tonnes to 135.61 million tonnes at 43.3% Mn mainly due to the increase in the optimal cut to 5 metres for Nchwaning 3. Nchwaning Seam 2 Mineral Resources increased from 179.78 million tonnes to 198.73 million tonnes due to the remodelling of the seam at a 4 metre height.

Mineral Reserves tonnage for Nchwaning Seam 1 decreased from 97.00 million tonnes at 43.3% Mn to 76.20 million tonnes at 46.0% Mn. Mineral Reserves for Nchwaning Seam 2 similarly decreased to 103.80 million tonnes at 42.9% Mn from 124.0 million tonnes at 41.5% Mn. The main reasons for the decrease in the Mineral Reserves are:

- mining depletion;
- provision of mining loss close to the major faults in the mining design;
- Seam 2 mining excluded at depths below 580 metres below surface;
- Seam 2 mining excluded where the seam middling with Seam 1 is less than 11 metres, for geotechnical reasons; and
- areas with excessive dips excluded due to limitations of using trackless machinery.

### HISTORICAL MANGANESE PRODUCTION AT NCHWANING MINE

| | ROM | Saleable |
|---|---|---|
| **Financial year** | Mt | Mt |
| 2012/2013 | 2.79 | 2.40 |
| 2013/2014 | 3.15 | 2.69 |
| 2014/2015 | 3.05 | 2.48 |
| 2015/2016 | 2.91 | 2.39 |
| 2016/2017 | 3.00 | 2.35 |

## Black Rock "Koppie" Mineral Resources

The Black Rock ore bodies occur in the Black Rock Koppie, Belgravia 1 and Belgravia 2 areas. They are all part of a large thrust complex. Modelling of these ore bodies was undertaken using 151 Nchwaning boreholes that intersected the thrust complex and 174 Black Rock in-fill boreholes. A 38% manganese cut-off was used in the modelling. Seams 1 and 2 were modelled at variable thicknesses. No mining is currently being done at Black Rock Koppie.

### BLACK ROCK (KOPPIE AREA): SEAM 1 MANGANESE MINERAL RESOURCES

| * Mineral Resources are reported on a 100% basis. | Mineral Resources | | |
|---|---|---|---|
| | Mt | Mn% | Fe% |
| Measured | 9.03 | 40.3 | 18.1 |
| Indicated | 34.57 | 40.7 | 18.1 |
| **Total Resources (Seam 1) 2017** | **43.60** | **40.6** | **18.1** |
| Total Resources (Seam 1) 2016 | 43.60 | 40.6 | 18.1 |

*Totals are rounded off.*
***Key Resources assumptions:***
*Density: 4.0 t/m$^3$*
* ***Black Rock Manganese Mine attributable interests (ARM 50%; Assore 50%).***

### BLACK ROCK (KOPPIE AREA): SEAM 2 MANGANESE MINERAL RESOURCES

| * Mineral Resources are reported on a 100% basis. | Mineral Resources | | |
|---|---|---|---|
| | Mt | Mn% | Fe% |
| Measured | 8.23 | 37.4 | 19.8 |
| Indicated | 18.58 | 39.2 | 19.8 |
| **Total Resources (Seam 2) 2017** | **26.81** | **38.6** | **19.8** |
| Total Resources (Seam 2) 2016 | 26.81 | 38.6 | 19.8 |

*Totals are rounded off.*
***Key Resources assumptions:***
*Density: 4.0 t/m$^3$*
* ***Black Rock Manganese Mine attributable interests (ARM 50%; Assore 50%).***

## Gloria Mine Mineral Resources

Procedures for drilling and assaying at Gloria Mine are the same as at Nchwaning. Both boreholes and underground sample sections were considered in the evaluation of Gloria Seam 1. Gloria was modelled similarly to Nchwaning using Datamine Studio 3 software for the geological modelling and for the grade estimation. The geological block model was created for an optimum cut of 4 metres for Seam 1 and Seam 2. Block sizes in the X and Y directions were 50 x 50 metres allowing for sub-splitting. A relative density was determined as 3.8 t/m$^3$. The full vertical extent of both Seams 1 and 2 were modelled respectively.

Statistical and geostatistical analysis for the following variables: Mn, Fe, $Al_2O_3$, BaO, CaO, $K_2O$, MgO, $Na_2O$, P, S and $SiO_2$ was undertaken. Ordinary Kriging interpolation within Studio 3 was used to estimate the grade in the 50 x 50 x 4 metre blocks using borehole and/or underground sample data. Mineral Resource classification methods were similar to those applied at Nchwaning Mine.

## Gloria Mine Mineral Reserves

Conversion of the Mineral Resources to Mineral Reserves is done for Measured and Indicated Mineral Resources. The main modifying factors for the conversion are: plant recovery factor, manganese prices and mining extraction factors. Details of these factors are listed below the Mineral Reserves tables.

Manganese is extracted at depths that vary between 180 to 250 metres. Ore is crushed underground before being conveyed to a surface stockpile via a decline shaft. Ore is withdrawn from the surface stockpile and forwarded to two stages of crushing, dry screening, and wet screening to yield lumpy and fine products. At the plant, the ore is processed similarly to Nchwaning run of mine ore.

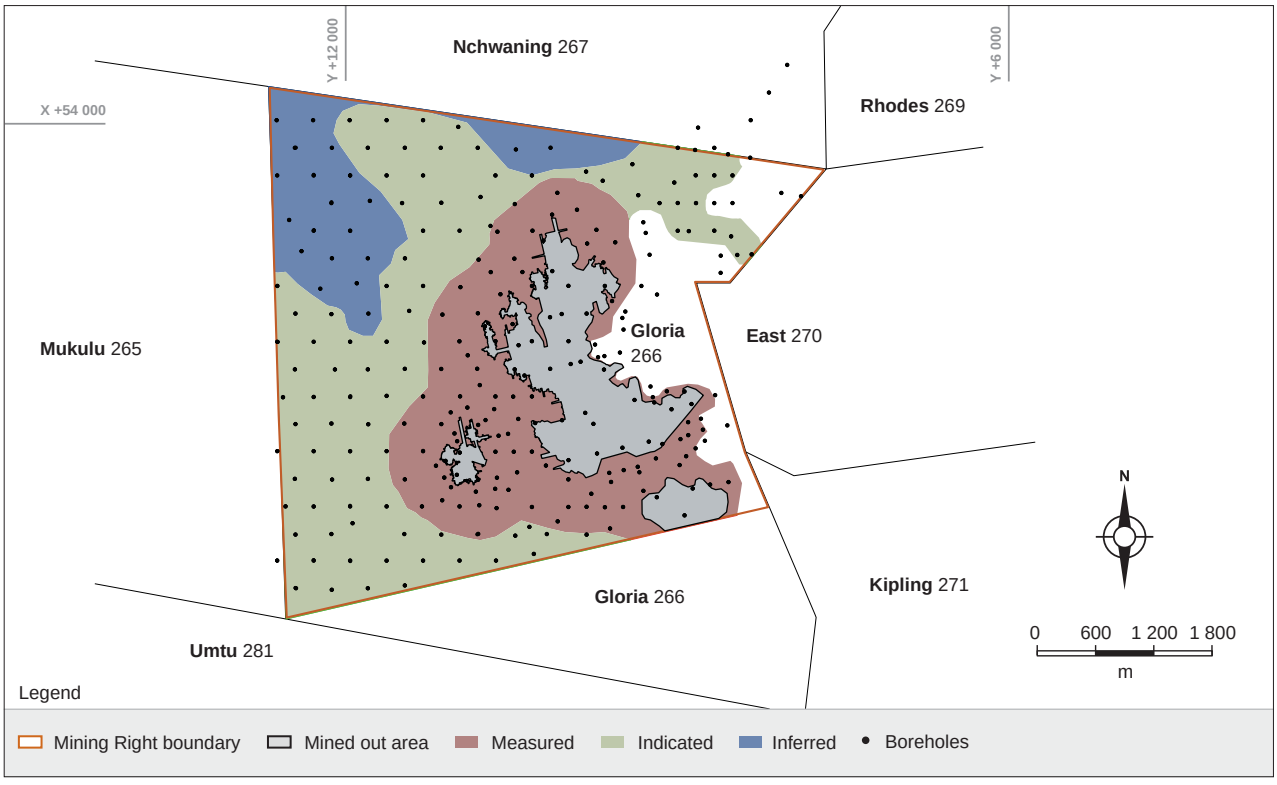
ARM FERROUS continued

## GLORIA MINE: SEAM 1 MANGANESE MINERAL RESOURCES AND MINERAL RESERVES

| * Mineral Resources and Mineral Reserves are reported on a 100% basis. | Mineral Resources Mt | Mn% | Fe% | | Mineral Reserves Mt | Mn% | Fe% |
|---|---|---|---|---|---|---|---|
| Measured | 63.90 | 37.4 | 4.9 | Proved | 43.20 | 37.3 | 4.7 |
| Indicated | 93.83 | 37.7 | 4.9 | Probable | 75.00 | 37.6 | 4.8 |
| **Total Measured and Indicated (Seam 1) 2017** | **157.73** | **37.6** | **4.9** | **Total Reserves (Seam 1) 2017** | **118.20** | **37.5** | **4.8** |
| Total Measured and indicated (Seam 1) 2016 | 149.25 | 37.4 | 5.0 | Total Reserves (Seam 1) 2016 | 122.20 | 36.1 | 5.1 |
| **Inferred 2017** | **31.50** | **37.0** | **5.5** | | | | |
| Inferred 2016 | 29.02 | 36.2 | 6.1 | | | | |

*The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.*
*Totals are rounded off.*
***Key assumptions for Mineral Resources:***
*True thickness cut-off: 4 m*
*Density: 3.8 t/m$^3$*
***Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:***
*Tramming loss factor: 1%*
*Plant Recovery: 89%*
*Mine Extraction Factor: 82%*
*Price ranges: Based on market related long term view*
*Exchange Rate used: Market related*
** **Black Rock Manganese Mine attributable interests (ARM 50%; Assore 50%).***

## GLORIA MANGANESE SEAM 1 MINERAL RESOURCES CLASSIFICATION

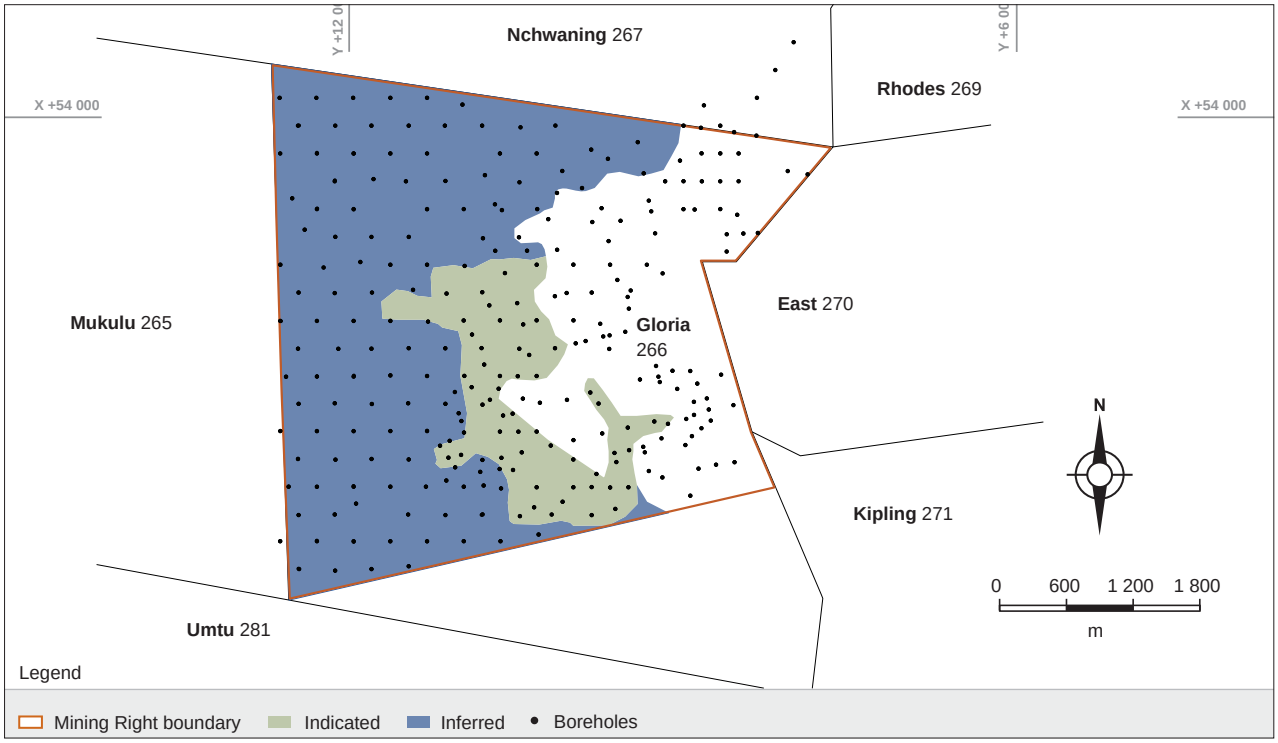


## GLORIA MINE: SEAM 2 MANGANESE MINERAL RESOURCES

| * Mineral Resources and Mineral Reserves are reported on a 100% basis. | Mineral Resources | | |
|---|---|---|---|
| | Mt | Mn% | Fe% |
| Measured<br>Indicated | 34.81 | 28.4 | 9.4 |
| **Total Measured and Indicated (Seam 2) 2017** | **34.81** | **28.4** | **9.4** |
| Total Measured and Indicated (Seam 2) 2016 | 32.04 | 28.3 | 9.4 |
| **Inferred 2017** | **133.46** | **30.0** | **9.7** |
| Inferred 2016 | 122.60 | 30.0 | 9.6 |

*Totals are rounded off.*
***Key assumptions for Mineral Resources:***
*True thickness cut-off: 4.0 m*
*Density: 3.8 t/m³*
* ***Black Rock Manganese Mine attributable interests (ARM 50%; Assore 50%).***

## GLORIA MANGANESE SEAM 2 MINERAL RESOURCES CLASSIFICATION




## GLORIA YEAR-ON-YEAR CHANGE

The Gloria manganese seams were remodelled at an optimum mining cut of 4 metres, leading to an increase in Mineral Resources. The Mineral Resources (Measured and Indicated) for Seam 1 tonnage increased by 6% from 149.25 million tonnes at 37.4% Mn to 157.73 million tonnes at 37.6% Mn. Gloria Seam 2 Indicated Mineral Resources increased by 9% from 32.04 million tonnes to 34.81 million tonnes at a grade of 28.4% Mn.

Gloria Seam 1 Mineral Reserves at 118.20 million tonnes at a grade of 37.5% Mn are 3% lower than the 2016 Mineral Reserves mainly due to:

- mining depletion and
- provision of mining loss close to the major faults in the mining design.

## HISTORICAL MANGANESE PRODUCTION AT GLORIA MINE

| Financial year | ROM | Saleable |
|---|---|---|
| | Mt | Mt |
| 2012/2013 | 0.82 | 0.75 |
| 2013/2014 | 0.79 | 0.67 |
| 2014/2015 | 0.74 | 0.61 |
| 2015/2016 | 0.56 | 0.55 |
| 2016/2017 | 0.72 | 0.72 |

ARM FERROUS continued

# IRON ORE MINES

## Locality

The Iron Ore Division is made up of Beeshoek Mine located on the farms Beesthoek 448 and Olyn Fontein 475 and Khumani Mine situated on farms Bruce 544, King 561 and Mokaning 560. All properties are approximately 200 kilometres west of Kimberley in the Northern Cape. The Beeshoek open-pit operations are situated 7 kilometres west of Postmasburg and the Khumani open pits are adjacent to, and south-east of Kumba Iron Ore's Sishen Mine. Beeshoek and Khumani mines are located at latitude 28°30'00''S/longitude 23°01'00''E, and latitude 27°45'00''S/longitude 23°00'00''E respectively.

## History

Mining of iron ore (mainly specularite) was undertaken as early as 40 000 BC on the farm Doornfontein which is due north of Beeshoek. The potential of iron ore in this region was discovered in 1909, but, due to lack of demand and limited infrastructure, this commodity was given little attention. In 1929, the railway line was extended from Koopmansfontein (near Kimberley) to service a manganese mine at Beeshoek. In 1935, the Associated Manganese Mines of South Africa Limited (Assmang) was formed, and in 1964, Beeshoek Iron Ore Mine was established, with a basic hand-sorting operation. In 1975, a full washing and screening plant was installed at Beeshoek Mine. The Khumani Iron Ore Mine was commissioned in 2007.

## Competence

The following Competent Persons were involved in the estimation of Mineral Resources and Mineral Reserves for the Iron Ore operations. S Kadzviti is employed by ARM while the rest are employed by Assmang.

| Mining Operation | Competent Person | Professional Organisation | Membership Number | Qualifications | Relevant Experience |
|---|---|---|---|---|---|
| Beeshoek Mine | S Kadzviti (Mineral Resources) | SACNASP | 400164/05 | BSc (Geology and Mathematics), MSc (Exploration Geology), GDE (Mining Engineering) | 27 years |
| | M Burger (Mineral Reserves) | SACNASP | 400233/08 | BSc (Geology), BSc Hons (Geology), GDE (Mining Engineering) | 16 years |
| Khumani Mine | M Burger (Mineral Resources and Mineral Reserves) | SACNASP | 400086/03 | BSc (Geochemestry), BSc Hons (Geochemistry), GDE (Mining Engineering) | 34 years |
| | I van Niekerk (Mineral Resources) | SACNASP | 400006/94 | BSc Hons (Geology) | 27 years |

## MINING AUTHORISATION

| Mining Operation | Legal Entitlement | Minerals covered by Mining Right | Comment | Period of Mining Right (years) | Known Impediments on Legal Entitlement |
|---|---|---|---|---|---|
| Beeshoek Mine | Mining Right NC 223 MRC | Iron ore | None | 30 Years 16 March 2012 to 15 March 2042 | None |
| Khumani Mine | Mining Right NC 50/5/1/2/5/2/70 MR | Iron ore | None | 30 Years 25 January 2007 to 24 January 2037 | None |

## Geology

Beeshoek and Khumani mines are situated within a sequence of early Proterozoic sediments of the Transvaal Supergroup. Both mines are symmetrically located on the Maremane Anticline in the Griqualand West Sequence of the Transvaal Supergroup, as well as the Elim Group of the Keis Supergroup.

R&R Refer to the regional geological map on page 11 and detailed map on page 20.

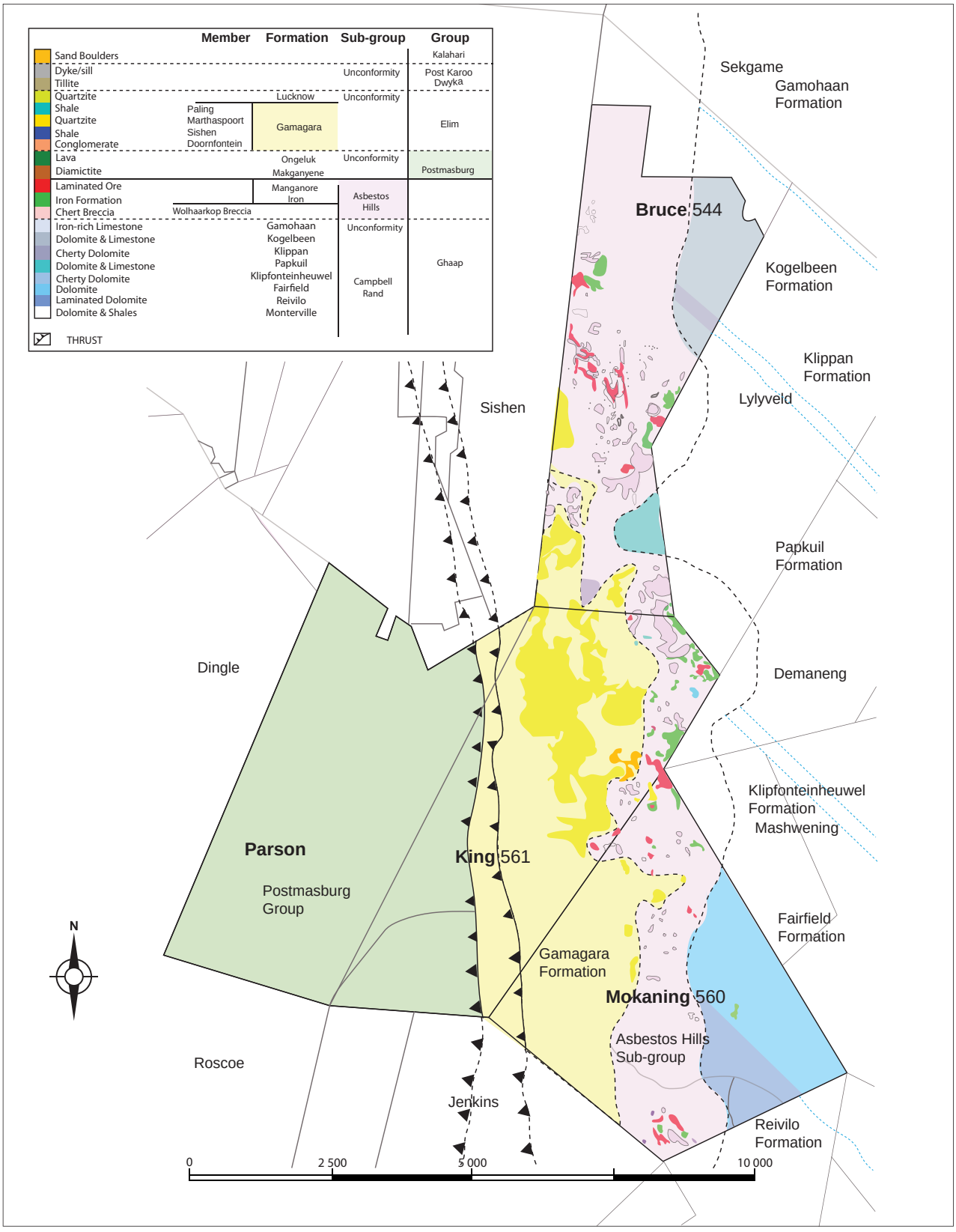
In general, two ore types are present: laminated haematite ore, forming part of the Manganore Iron Formation, and conglomerate ore, belonging to the Doornfontein Conglomerate Member at the base of the Gamagara Formation. The laminated ore types occur in the upper portion of the Manganore Iron Formation as enriched high-grade hematite bodies. The boundaries of high-grade hematite ore bodies cross-cut primary sedimentary bedding, indicating that secondary hematitisation of the iron formation took place. In all of these, some of the stratigraphic and sedimentological features of the original iron formation are preserved. The conglomeratic ore found in the Doornfontein Conglomerate Member of the Gamagara Formation, is lenticular but not consistently developed along strike. It consists of stacked, upward fining conglomerate-gritstone-shale sedimentary cycles.

The lowest conglomerates and gritstones tend to be rich in sub-rounded to rounded hematite ore pebbles and granules and form the largest part of the resource. The amount of iron ore pebbles decreases upwards in the sequence so that upper conglomerates normally consist of poorly sorted, angular to rounded chert and banded iron formation pebbles. Hematite is the predominant ore mineral, but limonite and specularite also occur.

Erosion in the Khumani deposit is less than in the Beeshoek area. This results in Khumani being characterised by larger stratiform bodies and prominent hanging-wall outcrops. The down-dip portions are well preserved and developed, but in the outcrop the deposits are thin and isolated. Numerous deeper iron ore extensions occur into the basins due to karst development. A prominent north-south strike of the ore bodies dipping to the west is notable. The southern Beeshoek ore bodies were exposed to more erosion and hence are more localised and smaller. Outcrops are limited to the higher topography on the eastern side of the properties. Down-dip to the west, the ore is thin and deep. The strike of the ore bodies is also in a north-south direction dipping to the west, but less continuous.

ARM FERROUS continued

## KHUMANI SURFACE GEOLOGY MAP



## Exploration Activities

At Beeshoek, exploration expenditure figure for the past financial year up to end May 2017 was R9.6 million. A total of 35 percussion and 23 diamond drillholes were drilled. Percussion drillholes were only drilled as pilot holes before reaching the mineralisation. The exploration drilling was mainly for infill drilling in areas around Village Pit where the grid spacing was large. Results of samples taken are still awaited. The 2017 to 2018 exploration plan include continuation of this infill drilling and grid expansion on the western and south-western portion of the current Village Pit as well as exploration on the BF to Oppikopi area to the far south east of the current Village Pit.

Exploration drilling expenditure for Khumani was R27.09 million. Drilling was targeted at reducing the drilling grid to 50 x 50 metres or 25 x 25 metres depending on the area. A five-year, R100 million in-fill and exploration drilling programme is planned for the Bruce A and B, King and Mokaning properties.

R&R Refer to Khumani deposits map on page 25.

## Mining Methods and Infrastructure

Mining operations are all open-pit, based on the conventional drill-and-blast, truck-and-shovel operations. Run-of-mine ore is crushed and stored as 'on-' or 'off-grade' on blending stockpiles. Ore from the stockpiles is either sent to the wash-and-screen plants or, if 'off-grade', to the beneficiation plants. The washing and screening plants consist primarily of tertiary crushing, washing, screening, conveying and stacking equipment. The beneficiation plants consist of tertiary crushers; scrubbers; coarse and fine jigs; lumpy and fines product stockpiles; and a rapid load-out facility. No chemicals are being used in any of the treatment plants.

## Mineral Resources

The methodology followed to identify exploration targets is initiated with geological mapping, followed by geophysics (ground magnetics and gravity). Numerous exploration programmes have been completed in the past. Percussion drilling is used to pilot holes through overlying waste rock down to the iron ore bodies. Diamond drilling is the next phase, which is usually on a 200 x 200 metre grid. Further in-fill drilling is carried out at spacing ranging from 100 x 100 metres to 25 x 25 metres, depending on the complexity of the geological structures. Core samples are logged and split by means of a diamond saw and the half-core is sampled at 0.5 metre intervals. The half-cores are crushed, split and pulverised and submitted to the owner-managed laboratory for assaying. All holes and blast holes in mineralisation are sampled and analysed for Fe, $K_2O$, $Na_2O$, $SiO_2$, $Al_2O_3$, P, S, CaO, MgO, Mn and BaO. The analytical technique for elemental analyses is XRF spectroscopy. Volumetric titration is used as verification method for the determination of total iron in the ore. International standards (e.g. SARM11) and in-house iron standards are used for the calibration of the XRF spectrometer. The Khumani laboratory undertakes stringent quality control and assurance methods, including 'round robin' analysis with 11 laboratories for verification of assay results. A Datamine 'Fusion' database with all the borehole data has been established.

At Khumani the geological model is built with Datamine's Strat3D modelling functionality to create a 3D representation of the stratigraphy using all validated borehole information. The stratigraphy is modelled from the surface geology to the stratigraphic unit below the lowest mineralised zone. Within the host stratigraphic units, Doornfontein (conglomeritic mineralisation) and Manganore (laminated mineralisation) outlines for mineralisation above a cut-off of 55% Fe are interpreted and solid wireframes created. Any lower-grade samples inside the ore body are defined as internal waste and modelled separately. Ordinary Kriging interpolation is used to estimate the grade of each 25 x 25 x 10 metre block generated within the geological model for the following separate units: mineralised envelopes (Fe>=55%), internal shales and banded iron stone, Doornfontein and Manganore units outside the Fe>=55% envelope. Densities in the resource model are calculated using a fourth degree polynomial fit applied to the estimated Fe grade. Mineral Resource classification is based on both geostatistical parameters as well as the geological continuity of the mineralisation. The geostatistical parameters that are considered are: Kriging efficiency, Kriging variance, number of samples, search volume and regression slope. The final assessment of the classification is done by the lead Competent Person who may make adjustments as necessary. The geological modelling of the ore body at Beeshoek is similar to Khumani, although the lower cut-off grade used is 60% Fe.

ARM FERROUS continued

## Mineral Reserves

Only Measured and Indicated Mineral Resources are converted to Proved and Probable Reserves respectively. Modifying factors are applied to these Mineral Resources and are financially optimised. The financial parameters are used to define the optimal pit outline. The pit designs are based on geotechnical parameters, mining fleet and selective mining unit (SMU). The combined waste and mineralisation models are reblocked at 6.25 x 6.25 x 10 metre blocks. The Resources within this mining constraint (optimised pit-shell) with grades of greater than 55% Fe (Khumani) and greater than 60% Fe (Beeshoek), are defined as Reserves. These are categorised into different product types, destined for the different plant processes and then scheduled for mining. The average Fe, $K_2O$, $Al_2O_3$ and $SiO_2$ grades of the SMUs are used to define 'On Grade' (wash and screen) feed as well as 'Off Grade' (Jig) feed.

### BEESHOEK IRON ORE MINE: MINERAL RESOURCES AND MINERAL RESERVES

| * Mineral Resources and Mineral Reserves are reported on a 100% basis. | Measured Resources | | Indicated Resources | | Measured and Indicated Resources | | Inferred Resources | | Proved Reserves | | Probable Reserves | | Total Reserves | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pit/Area** | Mt | Fe% | Mt | Fe% | Mt | Fe% | Mt | Fe% | Mt | Fe% | Mt | Fe% | Mt | Fe% |
| BN Pit | 10.04 | 63.04 | | | 10.04 | 63.04 | | | 5.23 | 63.39 | | | 5.23 | 63.39 |
| HF/HB Pit | 16.00 | 64.10 | | | 16.00 | 64.10 | | | 6.87 | 64.27 | | | 6.87 | 64.27 |
| BF Pit | 7.50 | 63.51 | 0.23 | 63.54 | 7.73 | 63.51 | 0.001 | 65.24 | 0.60 | 61.59 | | | 0.60 | 61.59 |
| East Pit | 4.32 | 65.04 | 0.03 | 64.50 | 4.35 | 65.04 | | | 1.89 | 65.10 | | | 1.89 | 65.10 |
| Village Pit | 41.80 | 64.55 | 9.25 | 63.83 | 51.05 | 64.42 | | | 25.29 | 65.27 | 3.85 | 63.95 | 29.14 | 65.10 |
| GF Pit | 3.13 | 63.81 | 0.09 | 61.80 | 3.22 | 63.75 | | | | | | | | |
| HH Ext Pit | 0.28 | 62.63 | | | 0.28 | 62.63 | | | | | | | | |
| HL Pit | 1.98 | 64.82 | 0.02 | 65.21 | 2.00 | 64.82 | | | | | | | | |
| West Pit | 9.45 | 63.19 | | | 9.45 | 63.19 | 0.050 | 61.88 | | | | | | |
| Detrital* | | | | | | | 2.500 | 60.00 | | | | | | |
| **Total 2017** | **94.50** | **64.09** | **9.62** | **63.81** | **104.12** | **64.07** | **2.551** | **60.04** | **39.88** | **64.79** | **3.85** | **63.95** | **43.73** | **64.71** |
| Total 2016 | 98.08 | 64.09 | 9.63 | 63.81 | 107.71 | 64.06 | 2.551 | 60.04 | 42.94 | 64.74 | 3.85 | 63.95 | 46.79 | 64.67 |

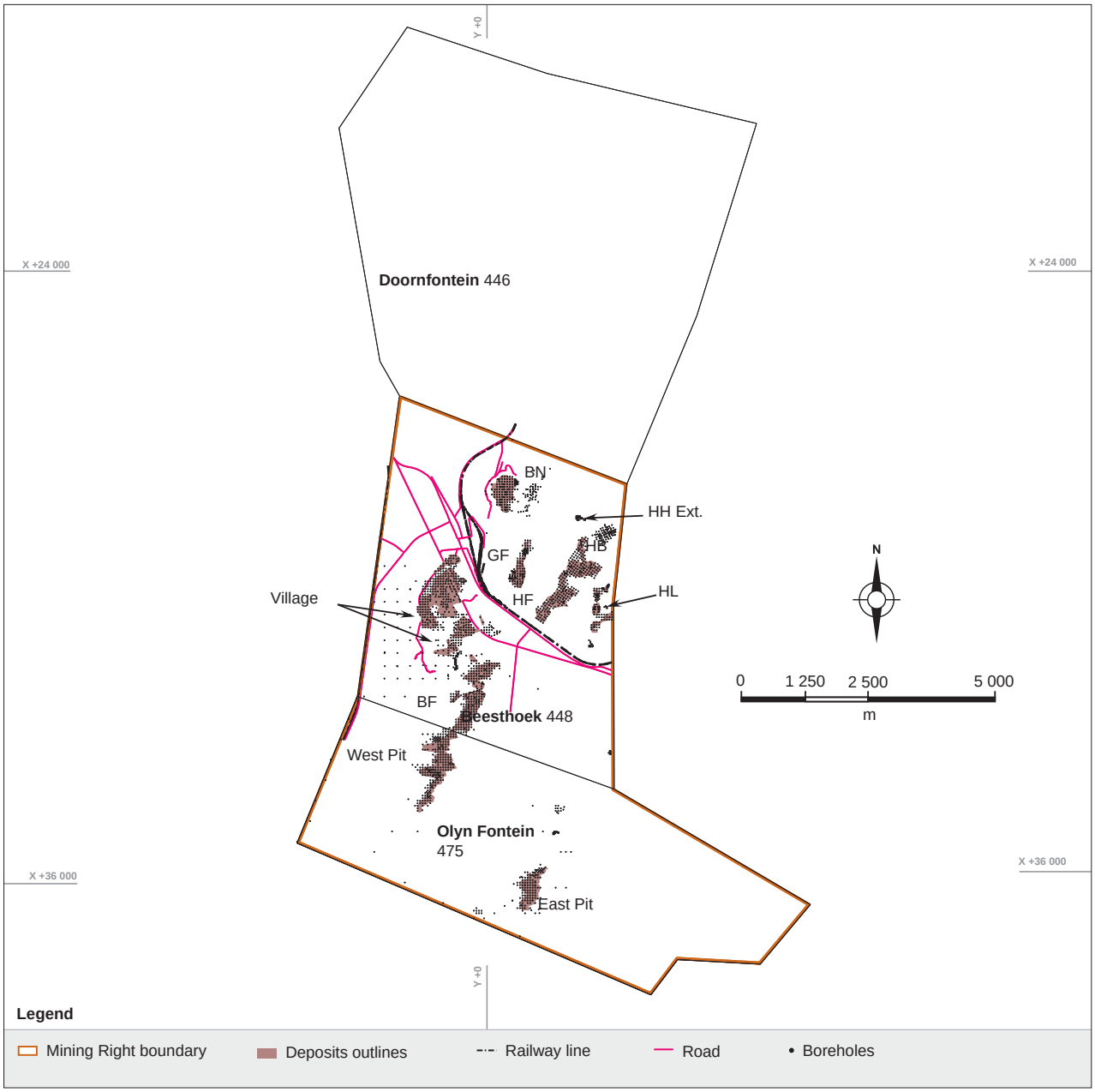
*The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.*
*Totals are rounded off.*
* *Detrital is loose fragmented material occurring in various areas at Beeshoek.*
***Key assumptions for Mineral Resources:***
*Grade cut-off: 60% Fe*
***Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:***
*Grade cut-off: 60% Fe*
*Plant Yield: 55% – 85% (depending on material type)*
*Price used for Iron Ore: Based on market related long term view and customer contracts related.*
*Exchange Rate used: Market related.*
* ***Beeshoek Iron Ore Mine attributable interests (ARM 50%; Assore 50%).***

### BEESHOEK STOCKPILES

| * Mineral Reserves are reported on a 100% basis. | Proved Reserves | | Probable Reserves | | Total Reserves | |
|---|---|---|---|---|---|---|
| **Area** | Mt | Fe% | Mt | Fe% | Mt | Fe% |
| North Mine (ROM On-Grade) | | | 0.1 | 64.00 | 0.10 | 64.00 |
| North Mine (B ROM Off-Grade**) | | | 0.04 | 55.00 | 0.04 | 55.00 |
| North Mine (C Off-Grade) | | | 1.69 | 55.00 | 1.69 | 55.00 |
| South Mine Village Pit (Off-Grade) | | | 0.51 | 55.00 | 0.51 | 55.00 |
| South Mine Village Pit (On-Grade) | | | 0.07 | 64.00 | 0.07 | 64.00 |
| South Mine East Pit (ROM On-Grade) | | | 0.10 | 64.00 | 0.10 | 64.00 |
| South Mine East Pit (B ROM Off-Grade) | | | 0.16 | 55.00 | 0.16 | 55.00 |
| South Mine (C Off-Grade) | | | 2.30 | 55.00 | 2.30 | 55.00 |
| **Total 2017 Stockpiles** | | | **4.97** | **55.49** | **4.97** | **55.49** |
| Total 2016 Stockpiles | | | 6.06 | 55.15 | 6.06 | 55.15 |

*Totals are rounded off.*
** *ROM Off-Grade ore is beneficiated to produce a saleable product.*
* ***Beeshoek Iron Ore Mine attributable interests (ARM 50%; Assore 50%).***

## BEESHOEK DEPOSITS MAP




## BEESHOEK YEAR-ON-YEAR CHANGE

Measured and Indicated Mineral Resources for Beeshoek Mine decreased from 107.71 million tonnes to 104.12 million tonnes mainly due to mining depletion. Total Mineral Reserves also decreased by 7% to 43.73 million tonnes for the same reason.

## HISTORICAL PRODUCTION AT BEESHOEK MINE

| | ROM | Saleable |
|---|---|---|
| **Financial year** | Mt | Mt |
| 2012/2013 | 2.88 | 2.94 |
| 2013/2014 | 2.06 | 3.12 |
| 2014/2015 | 3.35 | 3.43 |
| 2015/2016 | 3.05 | 3.11 |
| 2016/2017 | 3.39 | 3.15 |

ARM FERROUS continued

## KHUMANI IRON MINE: MINERAL RESOURCES AND MINERAL RESERVES

| * Mineral Resources and Mineral Reserves are reported on a 100% basis. | Measured Resources | | Indicated Resources | | Measured and Indicated Resources | | Inferred Resources | | Proved Reserves | | Probable Reserves | | Total Reserves | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pit/Area** | Mt | Fe% | Mt | Fe% | Mt | Fe% | Mt | Fe% | Mt | Fe% | Mt | Fe% | Mt | Fe% |
| Bruce A | 52.65 | 62.92 | 72.86 | 63.77 | 125.51 | 63.41 | | | 47.49 | 60.28 | 66.58 | 62.29 | 114.07 | 61.45 |
| Bruce B | 70.19 | 61.92 | 18.65 | 61.07 | 88.84 | 61.74 | 2.38 | 58.71 | 50.21 | 61.75 | 13.73 | 60.37 | 63.94 | 61.46 |
| Bruce C | 13.05 | 62.91 | | | 13.05 | 62.91 | | | 6.93 | 61.33 | | | 6.93 | 61.33 |
| **Total for Bruce Pits** | **135.89** | **62.40** | **91.51** | **63.22** | **227.40** | **62.73** | **2.38** | **58.71** | **104.63** | **61.05** | **80.31** | **61.96** | **184.94** | **61.45** |
| King/Mokaning | 344.47 | 62.59 | 47.14 | 61.18 | 391.61 | 62.42 | 37.96 | 59.72 | 257.17 | 62.63 | 9.39 | 62.85 | 266.56 | 62.64 |
| **Total 2017** | **480.36** | **62.54** | **138.65** | **62.53** | **619.01** | **62.53** | **40.35** | **59.66** | **361.80** | **62.18** | **89.70** | **62.06** | **451.50** | **62.15** |
| Total 2016 | 394.78 | 64.30 | 176.36 | 64.28 | 571.14 | 64.30 | 13.40 | 62.73 | 342.96 | 64.35 | 83.05 | 64.55 | 426.01 | 64.39 |

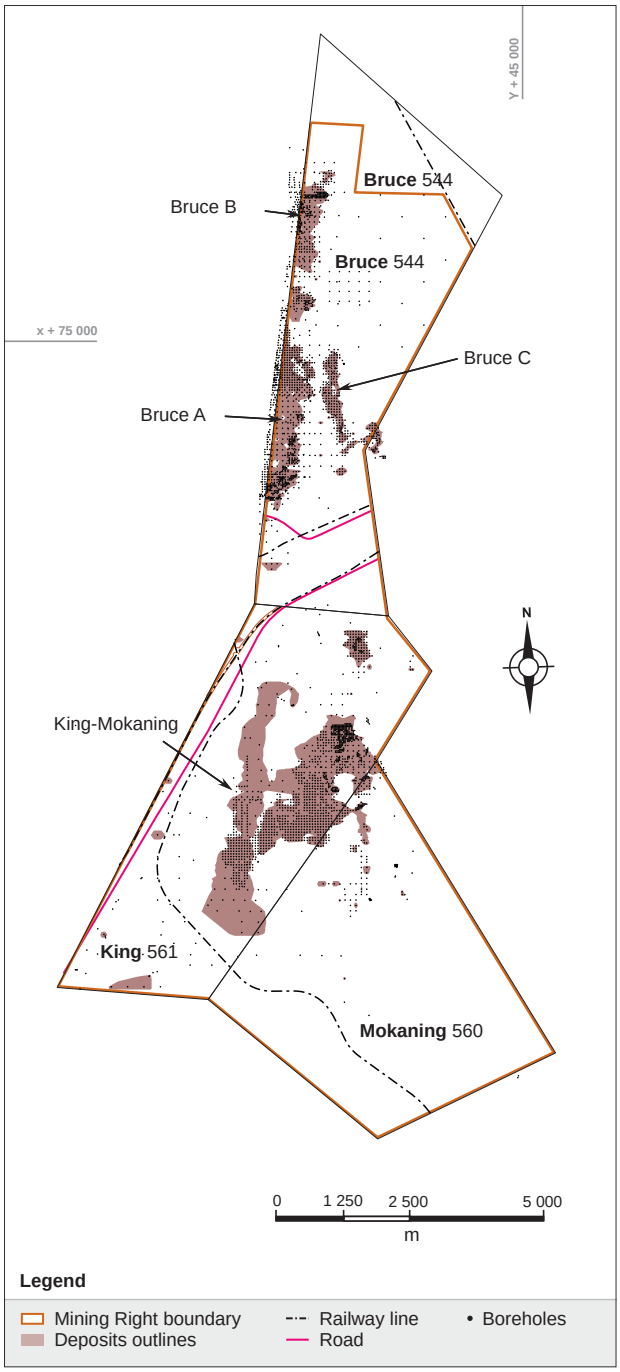
*The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.*
*Totals are rounded off.*
***Key assumptions for Mineral Resources:***
*Grade cut-off: 55% Fe*
***Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:***
*Mining loss factor: 2%*
*Mining dilution: 7%*
*Wash and screen recovery: 87%*
*Jig recovery: 74%*
*Grade cut-off: 55% Fe*
*Price used for Iron Ore (US$/t): Based on market related long term view and customer contracts related.*
*Exchange Rate used: Market related.*
* ***Khumani Iron Mine attributable interests (ARM 50%; Assore 50%).***

## KHUMANI STOCKPILES

| * Mineral Reserves are reported on a 100% basis. | Proved Reserves | | Probable Reserves | | Total Reserves | |
|---|---|---|---|---|---|---|
| **Area** | Mt | Fe% | Mt | Fe% | Mt | Fe% |
| Bruce | | | 2.20 | 55.00 | 2.20 | 55.00 |
| King | | | 1.70 | 55.50 | 1.70 | 55.50 |
| **Total 2017 Stockpiles**** | | | **3.90** | **55.22** | **3.90** | **55.22** |
| Total 2016 Stockpiles | | | 4.45 | 60.00 | 4.45 | 60.00 |

*Totals are rounded off.*
*** Stockpiles are beneficiated to produce a saleable product.*
* ***Khumani Iron Mine attributable interests (ARM 50%; Assore 50%).***

## KHUMANI DEPOSITS MAP




## KHUMANI YEAR-ON-YEAR CHANGE

Measured and Indicated Mineral Resource tonnage for Khumani (Bruce and King Pits) increased by 8% to 619.01 million tonnes due to application of a lower cut-off of 55% Fe after accounting for the mining depletion. The grade consequently reduced by 3% to 62.53% Fe. Mineral Reserves also increased (after depletion) by 6% to 451.50 million tonnes due to the lower cut-off grade applied as well as larger pit designs for Bruce A and Bruce B.

## HISTORICAL PRODUCTION AT KHUMANI MINE

| | ROM | Saleable |
|---|---|---|
| **Financial year** | Mt | Mt |
| 2012/2013 | 19.33 | 13.17 |
| 2013/2014 | 19.12 | 12.93 |
| 2014/2015 | 19.06 | 12.65 |
| 2015/2016 | 21.38 | 13.62 |
| 2016/2017 | 20.35 | 14.56 |


# ARM PLATINUM

## NKOMATI NICKEL-COPPER-COBALT-PGM-CHROMITE MINE

ARM's attributable beneficial interest at Nkomati Mine is 50%. The other 50% is held by Norilsk Nickel Africa (Pty) Ltd.

### Locality

Nkomati Nickel Mine is located approximately 300 kilometres east of Johannesburg in the Mpumalanga Province of South Africa. Situated at latitude 25º40'S and longitude 30º30'E, the mine is accessed via the national N4 highway between Johannesburg and Machadodorp, the R341 provincial road and the R351 tarred road.

R&R Refer to page 1 for a locality map showing the Nkomati Nickel Mine.

### History

Nickel, copper, cobalt, PGM and chromite mineralisation is hosted by the Uitkomst Complex, a layered mafic-ultramafic, Bushveld satellite intrusion. The Uitkomst Complex outcrops on the farms Slaaihoek 540JT and Nkomati 770JT. In 1929, the Mineral Rights on Slaaihoek were purchased by ETC, an Anglovaal subsidiary, to mine gold at the old Mamre and Slaaihoek mines. In the early 1970s, an Anglo American/INCO joint venture began exploring Uitkomst for nickel. In 1990, Anglo American (AAC) completed a feasibility study on an open-pit operation exploiting the large disseminated sulphide resource on Uitkomst, with negative results.

Exploration on Slaaihoek by Anglovaal began in 1989, and in 1991 the massive sulphide body (MSB) was discovered by surface drilling. In 1995, the Nkomati JV between Anglovaal and AAC was formed and in January 1997, underground production started on the MSB. In 2004, Anglovaal acquired AAC's interest and in 2005, following the merger of Anglovaal and ARM, a 50:50 JV was formed between ARM and LionOre, then a global nickel producer and owner of the Activox technology. In February 2006, Nkomati approved the Phase 1 expansion project to exploit the Main Mineralised Zone (MMZ), one of the disseminated sulphide ore bodies, by underground and open-pit mining at a rate of 100 000 tonnes per month of ore to maintain annual nickel production at approximately 5 000 tonnes in concentrate after output from the MSB started declining. The project was completed in 2007 and in the same year, Norilsk Nickel acquired LionOre, together with its 50% share in Nkomati. The MSB ore body is now completely mined out.

The Phase 2a expansion project, increasing MMZ ore production to 375 000 tonnes per month with the construction of a new plant, was commissioned during 2010. The Phase 2b expansion, involving the upgrading of the 100 000 tonnes per month MMZ plant to a 250 000 tonnes per month Chromititic Peridotite Mineralised Zone (PCMZ) plant was completed during the 2010/2011 financial year. The PCMZ, which is being mined only in the open pit, is a disseminated chromite-rich sulphide body within the Chromititic Peridotite (PCR) Unit (overlying the MMZ), which has to be treated separately to liberate the chromite fines.

Nkomati has also been producing lumpy chromite, chips and fines from the Oxidised Massive Chromitite since 2006, a layer which overlies the PCMZ ore body. A chrome washing plant to treat the fines stockpile was commissioned in 2008. In addition, the Oxidised PCR, which is the highly weathered PCR Unit immediately below the Oxidised Massive Chromitite, is being stockpiled for future processing for its chromite content.

## Competence

The following Competent Persons were involved in the estimation of Mineral Resources and Mineral Reserves for the Nkomati Mine. They are employed by Nkomati Mine.

| Competent Person | Professional organisation | Membership Number | Qualifications | Relevant Experience |
|---|---|---|---|---|
| N Strydom (Mineral Resources) | SACNASP | 400148/04 | NHD (Economic Geology), MBA | 18 years |
| T Mogano (Mineral Reserves) | SAIMM | 708776 | Certificates in Advanced Mine Survey and Advanced Mine Valuation | 6 years |

## Mining authorisation

| Legal Entitlement | Minerals covered by Mining Right | Comment | Period of Mining Right (years) | Known Impediments on legal entitlement |
|---|---|---|---|---|
| Mining Rights<br>MP 146 MR<br>MP 147 MR | Nickel, copper, cobalt, platinum, palladium, rhodium, iridium, ruthenium, osmium, gold, silver and other contained minerals and metals. | None | 25 years<br>6 June 2012 to 5 June 2037 | None |

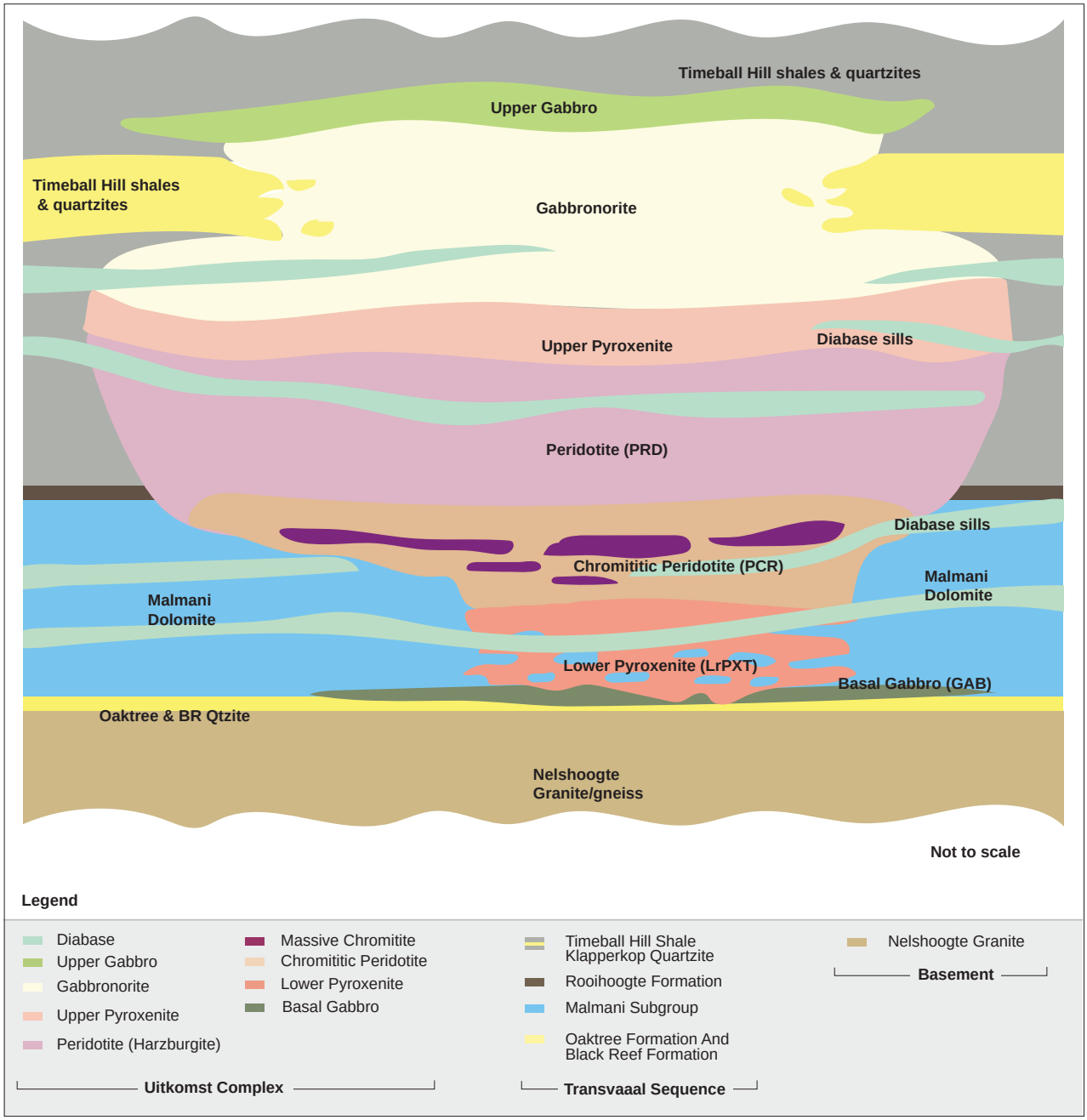
## Geology

Sulphide and chromite mineralisation occurs within the Uitkomst Complex, a Bushveld-age, layered, mafic-ultramafic intrusion, which concordantly intrudes dolomite/chert of the Malmani Subgroup and shales/quartzites of the Timeball Hill Formation. The Uitkomst Complex, which lies unconformably on an Archaean basement, is a north-west/south-east tubular shaped body which outcrops in the Slaaihoek Valley for approximately 9 kilometres before dipping at 4º below an escarpment where it has been drilled down-dip for another 4 kilometres and is still open-ended to the north-west.

From the base to top, the stratigraphy of the Uitkomst Complex comprises the Basal Gabbro Unit (up to 15 metres thick), the Lower Pyroxenite Unit (average 35 metres), the Chromititic Peridotite Unit (30 to 60 metres), the Massive Chromitite Unit (up to 10 metres), the Peridotite Unit (330 metres), the Upper Pyroxenite Unit (65 metres), the Gabbronorite Unit (250 metres), and the Upper Gabbro Unit (50 metres). The complex and surrounding sediments are intruded by numerous diabase sills up to 30 metres in thickness.

## ARM PLATINUM continued

### IDEALISED GEOLOGICAL SECTION OF UITKOMST COMPLEX



Apart from the now mined out Massive Sulphide Body (MSB), situated at and below the base of the Uitkomst Complex, there are three main economic sulphide mineralised zones;

- The Basal Mineralised Zone (BMZ) within the Basal Gabbro.
- The Main Mineralised Zone (MMZ) occurring within the Lower Pyroxenite unit.
- The Chromititic Peridotite Mineralised zone (PCMZ) which occurs with the Chromititic Peridotite (PCR).

In addition, the Peridotite Unit contains the Peridotite Mineralised Zone (PRDMZ) which is a low grade disseminated sulphide mineralisation zone not yet included in the mine's resource base. The current mined chromite is contained within the Massive Chromitite Unit (MCHR) in the open-pit area. The dominant sulphide minerals are pyrrhotite, pentlandite and chalcopyrite. Cobalt is mostly in solid solution in the pentlandite, and the platinum group metals (PGM) occur as separate minerals, with merenskyite being dominant.

## Exploration Activities

No exploration programme took place.

## Mining Methods and Infrastructure

Mining operations comprise open-pit mining operation which feeds two concentrators (MMZ and PCMZ) producing concentrate containing PGMs, nickel, copper and cobalt. Previously, MMZ was also mined by underground mechanised mining methods but this is now on care and maintenance. Final products are transported to various third parties for toll smelting and refining. Chrome products from oxidised massive chromitite and the PCMZ, produced from the chrome washing plant and the PCMZ plant, are sold to local and export markets.

## Mineral Resources

There have been numerous diamond, percussion and reverse circulation (RC) drilling campaigns since 1972. Consequently, various sampling and assaying protocols as well as varying standards of QA/QC have been used. Core sizes are mainly NQ and TNW. Before 1990 (Anglo American boreholes), half core samples over widths ranging from 1 metre to 5 metres were taken. Samples were assayed at the Anglo American Research Laboratory (AARL) for total nickel, copper and cobalt using Atomic Absorption (AA) and for 'sulphide' nickel using a peroxide leach/AA finish. Composite samples were assayed for platinum and palladium by Pb-collection fire assay/ICP, S by combustion, and a range of major elements by fusion and density using the Archimedes bath method. Between 1990 and 1997 (Anglovaal boreholes), assays were carried out at the Anglovaal Research Laboratory (AVRL), with internal standard checks. Nickel analyses were also carried out by the partial digestion methods. Comparisons between AARL and AVRL were undertaken to ensure that the data was compatible.

In 2003, a 50 metre-spaced drilling programme was carried out in the shallow open-pit area. Samples from this drilling were analysed at AVRL for nickel, copper and cobalt using an aqua regia partial extraction/AA finish. Platinum, palladium, rhodium and gold were analysed by Pb collection fire-assay/AA finish. Analyses also included $Cr_2O_3$, MgO, FeO and S. Density was also determined by gas pycnometer. Duplicates and internal standards were used and a suite of referee samples were analysed at the Genalysis Laboratory in Perth. Comparisons indicated good correlations between laboratories. In 2005, it was decided to resample many of the Anglo American drill holes to improve the sample density for PGEs in the open-pit area. Drill core was resampled (quarter core) at 1 metre intervals. Assays were carried out by the SGS Laboratory in Johannesburg for Pt, Pd and Au by Pb collection fire-assay/AA finish and for Ni, Cu and Co by aqua regia leach/AA finish. Blanks, duplicates and standards were included for quality control.

In 2007/2008, a 50 metre in-fill diamond drilling programme (116 holes – 18 000 metres) was completed in the shallower part of Pit 3. In the Pit 2 area, another 44 holes (3 450 metres) were added to the database. Half-core samples from the Pit 3 drilling were analysed at Genalysis Laboratory Services in Perth for Ni, Cu and Co by aqua regia partial digestion/ICP finish; for Pt, Pd and Au by Pb collection fire assay/ICP finish; high chrome samples for $Cr_2O_3$ by fusion/ICP and density by gas pycnometer. AMIS standards, duplicates and blank samples were used for internal QA/QC. Half-core samples from the Pit 2 drilling were analysed at Nkomati's mine laboratory for Ni, Cu and Co by aqua regia partial digestion/AA finish.

The underground MMZ and PCMZ Mineral Resources are based on surface and underground diamond drilling as well as RC holes. Underground holes are spaced 10 to 20 metres apart and the drill core is sampled at 1 metre intervals. The Nkomati Mine laboratory analyses samples for Ni, Cu and Co using aqua regia leach/ICP finish, while the PGE assays are carried out by SGS and Mintek Laboratories in Johannesburg. Both laboratories use blanks, standards and check assays for quality control.

Geological wireframe models are generated from the entire borehole database (boreholes and RC holes) in Datamine Studio 3. All data is used for the variography. Grade estimation is by Ordinary Kriging. In addition to the estimation of Ni, 3PGMs+Au, Co and Cu, density is also estimated for each model cell. Block sizes for the resource model are at 50 x 50 x 2.5 metres for poorly informed areas, 25 x 25 x 2.5 metres for moderately informed areas and 12.5 x 12.5 x 2.5 metres for well-informed areas. Grade cut-offs used for the Mineral Resources are 0.16% Ni for MMZ and PCMZ (open-pit) and 0.30% Ni for MMZ and PCMZ (underground).

The open-pit and underground resources are based on the 2016 resource model which was created on-mine and internally reviewed.

A three-dimensional approach to the Mineral Resource classification is applied. It allows for the classification of each block model cell based on a combination of model cell geostatistical parameters and geological confidence. The geostatistical parameters considered are search volume, Kriging variance, Kriging efficiency and regression slope.

## Mineral Reserves

Mineral Reserves for the Nkomati open-pit area were derived from application of modifying factors to the Measured and Indicated Resources. The factors included mining method and design, mining recovery factors, mining dilution, plant recovery factors and mine optimisation at specific metal prices. Details of some of these parameters are provided as footnotes below the Mineral Resources and Mineral Reserves tables. The open-pit optimisation also considered the following parameters: mining cost, processing cost, services and supplementary cost, geotechnical slope parameters and environmental aspects. Underground Mineral Reserves were produced by applying the following modifying factors: mining method and design, mining extraction factors and mining dilution.

ARM PLATINUM continued

## NKOMATI MINE: MINERAL RESOURCES (NI, PGEs, Cu, Co, $Cr_2O_3$)

| * Mineral Resources are reported on a 100% basis. | Measured Resources | | | | | | Indicated Resources | | | | | | Measured and Indicated Resources | | | | | | Inferred Resources | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mt | Ni% | Cu% | Co% | 4E g/t | $Cr_2O_3$% | Mt | Ni% | Cu% | Co% | 4E g/t | $Cr_2O_3$% | Mt | Ni% | Cu% | Co% | 4E g/t | $Cr_2O_3$% | Mt | Ni% | Cu% | Co% | 4E g/t | $Cr_2O_3$% |
| **Underground** | | | | | | | | | | | | | | | | | | | | | | | | |
| MMZ | 10.04 | 0.57 | 0.20 | 0.03 | 1.19 | | 37.37 | 0.48 | 0.21 | 0.02 | 1.19 | | 47.41 | 0.50 | 0.21 | 0.02 | 1.19 | | 6.30 | 0.41 | 0.20 | 0.02 | 1.26 | |
| PCMZ | 1.05 | 0.37 | 0.12 | 0.02 | 0.95 | 10.11 | 12.68 | 0.38 | 0.12 | 0.02 | 0.92 | 10.77 | 13.73 | 0.38 | 0.12 | 0.02 | 0.92 | 10.72 | 40.05 | 0.40 | 0.12 | 0.02 | 0.92 | 10.52 |
| **Open-pit** | | | | | | | | | | | | | | | | | | | | | | | | |
| MMZ Pit 3 | 40.28 | 0.35 | 0.16 | 0.02 | 0.99 | | 19.81 | 0.37 | 0.16 | 0.02 | 0.99 | | 60.09 | 0.36 | 0.16 | 0.02 | 0.99 | | | | | | | |
| PCMZ Pit 3 | 34.54 | 0.22 | 0.07 | 0.01 | 0.75 | 12.02 | 26.64 | 0.21 | 0.06 | 0.01 | 0.70 | 12.66 | 61.18 | 0.22 | 0.06 | 0.01 | 0.73 | 12.30 | | | | | | |
| **Total 2017 Mineral Resources** | **85.91** | **0.32** | **0.13** | **0.02** | **0.92** | | **96.50** | **0.37** | **0.15** | **0.02** | **0.98** | | **182.41** | **0.35** | **0.14** | **0.02** | **0.95** | | **46.35** | **0.40** | **0.13** | **0.02** | **0.97** | |
| Total 2016 Mineral Resources | 90.70 | 0.33 | 0.13 | 0.02 | 0.92 | | 96.52 | 0.37 | 0.15 | 0.02 | 0.98 | | 187.22 | 0.35 | 0.14 | 0.02 | 0.95 | | 46.35 | 0.40 | 0.13 | 0.02 | 0.97 | |

***4E** = platinum + palladium + rhodium + gold.*
*The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.*
*Totals are rounded off.*
***Key assumptions for Mineral Resources:***
*Grade cut-off: Underground: 0.30% Ni MMZ and 0.30% Ni PCMZ. Open-pit: 0.16% Ni MMZ and 0.16% Ni PCMZ.*
** **Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).***

## NKOMATI MINE: CHROMITE MINERAL RESOURCES

| * Mineral Resources are reported on a 100% basis. | Measured Resources | | Indicated Resources | | Measured and Indicated Resources | | Inferred Resources | |
|---|---|---|---|---|---|---|---|---|
| | Mt | $Cr_2O_3$% | Mt | $Cr_2O_3$% | Mt | $Cr_2O_3$% | Mt | $Cr_2O_3$% |
| **Oxidised Massive Chromitite Pit 3 2017** | **0.13** | **25.40** | | | **0.13** | **25.40** | | |
| Oxidised Massive Chromitite Pit 3 2016 | 0.18 | 25.97 | | | 0.18 | 25.97 | | |
| **Un-oxidised (fresh) Massive Chromitite Pit 3 2017** | **6.16** | **28.98** | | | **6.16** | **28.98** | | |
| Un-oxidised (fresh) Massive Chromitite Pit 3 2016 | 6.48 | 28.88 | | | 6.48 | 28.88 | | |

*The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.*
*Totals are rounded off.*

***Key assumptions for Mineral Resources:***
*Grade cut-off: 20% ($Cr_2O_3$)*
** **Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).***

## NKOMATI MINE: MINERAL RESERVES

| * Mineral Reserves are reported on a 100% basis. | Proved Reserves | | | | | | Probable Reserves | | | | | | Total Reserves | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mt | Ni% | Cu% | Co% | 4E g/t | $Cr_2O_3$% | Mt | Ni% | Cu% | Co% | 4E g/t | $Cr_2O_3$% | Mt | Ni% | Cu% | Co% | 4E g/t | $Cr_2O_3$% |
| **Underground Mine** | | | | | | | | | | | | | | | | | | |
| MMZ | 0.32 | 0.43 | 0.16 | 0.02 | 1.05 | | 10.91 | 0.47 | 0.21 | 0.02 | 1.12 | | 11.22 | 0.47 | 0.21 | 0.02 | 1.12 | |
| **Open-pit** | | | | | | | | | | | | | | | | | | |
| MMZ Pit 3 | 29.38 | 0.37 | 0.15 | 0.02 | 1.00 | | 6.01 | 0.36 | 0.15 | 0.02 | 0.95 | | 35.39 | 0.37 | 0.15 | 0.02 | 0.99 | |
| PCMZ Pit 3 | 28.52 | 0.22 | 0.07 | 0.01 | 0.74 | 13.87 | 13.50 | 0.21 | 0.06 | 0.01 | 0.70 | 13.56 | 42.02 | 0.22 | 0.07 | 0.01 | 0.73 | 13.77 |
| **Total Mineral Reserves 2017** | **58.22** | **0.30** | **0.11** | **0.02** | **0.87** | | **30.42** | **0.33** | **0.13** | **0.02** | **0.90** | | **88.63** | **0.31** | **0.12** | **0.02** | **0.88** | |
| Total Mineral Reserves 2016 | 62.93 | 0.30 | 0.11 | 0.02 | 0.88 | | 31.63 | 0.33 | 0.13 | 0.02 | 0.89 | | 94.56 | 0.31 | 0.12 | 0.02 | 0.89 | |

***4E** = platinum + palladium + rhodium + gold*
*Totals are rounded off.*
***Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:***
*Mining Extraction Factor: Underground: 68%. Open-pit: 100%*
*Average Plant Recovery: 70%*
*Price ranges (US$): **Ni:** 10 124 – 12 017/t; **Cu:** 5 413 – 5 479/t; **Co:** 12.62 – 12.75/lb; **Pt:** 988 – 1 121/oz; **Pd:** 719 – 813/oz; **Au:** 1 207 – 1 221/oz*
*Exchange Rate (R/US$): 13.16 – 13.81*
*Grade cut-off: **Underground:** 0.35% Ni MMZ. **Open-pit:** 0.16% Ni MMZ and 0.16% Ni PCMZ.*
** **Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).***

## NKOMATI MINE: MMZ STOCKPILE MINERAL RESERVES

| * Mineral Reserves are reported on a 100% basis. | Proved Reserves | | | | | | Probable Reserves | | | | | | Total Reserves | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mt | Ni% | Cu% | Co% | 4E g/t | $Cr_2O_3$% | Mt | Ni% | Cu% | Co% | 4E g/t | $Cr_2O_3$% | Mt | Ni% | Cu% | Co% | 4E g/t | $Cr_2O_3$% |
| **MMZ Stockpiles 2017** | **0.32** | **0.44** | **0.21** | **0.03** | **1.27** | | | | | | | | **0.32** | **0.44** | **0.21** | **0.03** | **1.27** | |
| MMZ Stockpiles 2016 | 0.08 | 0.30 | 0.15 | 0.02 | 1.01 | | | | | | | | 0.08 | 0.30 | 0.15 | 0.02 | 1.01 | |

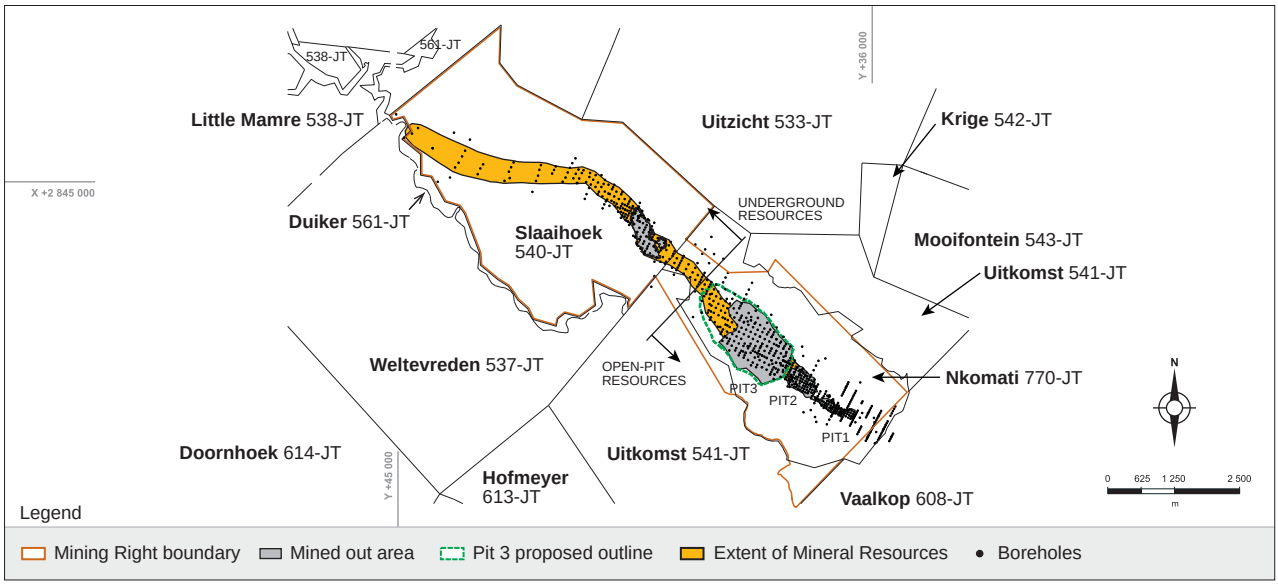
*4E = platinum + palladium + rhodium + gold*
*Totals are rounded off.*
*Grade cut-off: 0.16% Ni.*
** Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).*

## NKOMATI MINE: PCMZ STOCKPILE MINERAL RESERVES

| * Mineral Reserves are reported on a 100% basis. | Proved Reserves | | | | | | Probable Reserves | | | | | | Total Reserves | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mt | Ni% | Cu% | Co% | 4E g/t | $Cr_2O_3$% | Mt | Ni% | Cu% | Co% | 4E g/t | $Cr_2O_3$% | Mt | Ni% | Cu% | Co% | 4E g/t | $Cr_2O_3$% |
| **PCMZ Stockpiles 2017** | **0.88** | **0.18** | **0.06** | **0.01** | **0.67** | **13.94** | | | | | | | **0.88** | **0.18** | **0.06** | **0.01** | **0.67** | **13.94** |
| PCMZ Stockpiles 2016 | 2.92 | 0.20 | 0.06 | 0.01 | 0.72 | 13.89 | | | | | | | 2.92 | 0.20 | 0.06 | 0.01 | 0.72 | 13.89 |

*4E = platinum + palladium + rhodium + gold*
*Totals are rounded off.*
*Grade cut-off: 0.16% Ni.*
** Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).*

## NKOMATI MINE MINERAL RESOURCES MAP



ARM PLATINUM continued

## NKOMATI MINE: CHROMITE MINERAL RESERVES

| * Mineral Reserves are reported on a 100% basis. | Proved Reserves | | Probable Reserves | | Total Reserves | |
|---|---|---|---|---|---|---|
| | Mt | $Cr_2O_3$% | Mt | $Cr_2O_3$% | Mt | $Cr_2O_3$% |
| **Oxidised Massive Chromitite Pit 3 2017** | **0.06** | **25.60** | **0.06** | **21.61** | **0.12** | **23.61** |
| Oxidised Massive Chromitite Pit 3 2016 | 0.10 | 23.79 | 0.04 | 21.67 | 0.14 | 23.18 |
| **Un-oxidised (Fresh) Massive Chromitite Pit 3 2017** | **0.76** | **17.48** | **0.56** | **19.79** | **1.32** | **18.46** |
| Un-oxidised (Fresh) Massive Chromitite Pit 3 2016 | 0.94 | 17.72 | 0.47 | 19.45 | 1.41 | 18.30 |

*Totals are rounded off.*
***Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:***
*Price ranges (US$/t):* ***Cr Concentrate****: 143 – 174*
*Exchange Rate (R/US$): 13.16 – 13.81*
*** Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).***

## NKOMATI MINE: CHROMITE STOCKPILE MINERAL RESERVES

| * Mineral Reserves are reported on a 100% basis. | Proved Reserves | | Probable Reserves | | Total Reserves | |
|---|---|---|---|---|---|---|
| | Mt | $Cr_2O_3$% | Mt | $Cr_2O_3$% | Mt | $Cr_2O_3$% |
| PCR Stockpile | 2.29 | 19.20 | | | 2.29 | 19.20 |
| Fresh – massive chrome | 0.04 | 22.00 | | | 0.04 | 22.00 |
| **Total Stockpiles Reserves 2017** | **2.33** | **19.25** | | | **2.33** | **19.25** |
| Total Stockpiles Reserves 2016 | 2.53 | 19.83 | | | 2.53 | 19.83 |

*Totals are rounded off.*
*** Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).***

### YEAR-ON-YEAR CHANGE

The Measured and Indicated Mineral Resources (MMZ and PCMZ) decreased by 3% to 182.41 million tonnes at 0.35% Ni mainly due to mining depletion.

Mineral Reserves (MMZ and PCMZ) also reduced due to mining depletion from 94.56 million tonnes at 0.31% Ni in 2016 to 88.63 million tonnes at 0.31% Ni in 2017 mainly due to mining depletion.

### HISTORICAL PRODUCTION AT NKOMATI NICKEL MINE (MMZ AND PCMZ)

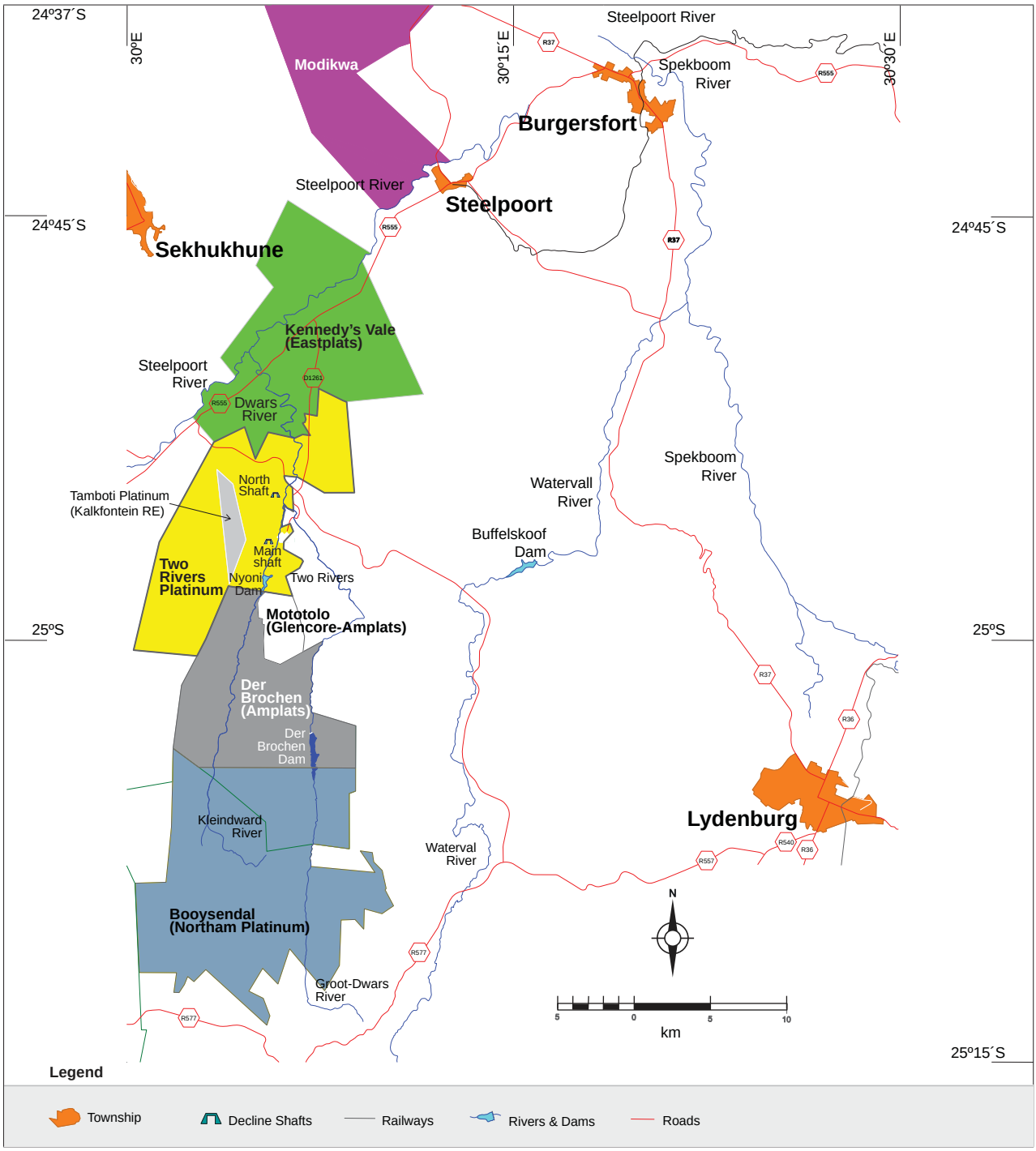
| Financial year | ROM | | Milled | |
|---|---|---|---|---|
| | Mt | Ni% | Mt | Ni% |
| 2012/2013 | 11.74 | | 7.59 | |
| 2013/2014 | 7.01 | | 7.93 | |
| 2014/2015 | 7.35 | | 8.03 | |
| 2015/2016 | 7.61 | | 8.24 | |
| 2016/2017 | 5.20 | 0.38 | 7.49 | 0.30 |

# TWO RIVERS PLATINUM MINE

ARM's attributable beneficial interest in Two Rivers Platinum Mine (TRP) operation is 51%. The other 49% is held by Impala Platinum.

## Locality

Two Rivers Platinum Mine is located on the southern sector of the Eastern Limb of the Bushveld Complex. The mine is located on the farm Dwarsrivier 372KT and extends to portions of the farms Kalkfontein 367KT and Tweefontein 360KT and the farm Buffelshoek 368KT. At longitude 30°07'E and latitude 24°59'S, the mine is approximately 30 kilometres from Steelpoort and 60 kilometres from Lydenburg, Mpumalanga Province, South Africa. Two Rivers Platinum Mine is neighboured by Mototolo Platinum Mine and Dwarsrivier, Tweefontein and Thorncliff chromite mines.



ARM PLATINUM continued

## History

Exploration, development and production history in the area dates from the early 1920s. During 1929, Lydenburg Platinum Areas Limited started mining activity, but no records are available.

Following the acquisition by Gold Fields Mining and Development Limited, exploration started again in 1987 and was mainly directed at the Merensky Reef. Assmang Limited acquired the Dwarsrivier farm in September 1998, primarily to exploit the LG6 chromitite. During 2001, Avmin acquired the PGE rights on the farm from Assmang and targeted the UG2 Reef. In June 2005, after the ARM/Anglovaal merger, and following a full feasibility study and a period of trial underground mining, the ARM/Impala Joint Venture announced the approval of a 220 000 ounce-per-year PGM mine. As a result, an underground mine was established. The plant was commissioned in July 2006. Two Rivers now incorporates portions 1 to 6 of Kalkfontein farm, Tweefontein and Buffelshoek farms after agreement was reached between ARM and Implats.

## Competence

The following Competent Persons were involved in the estimation of Mineral Resources and Mineral Reserves for the Two Rivers Mine. They are employed by ARM (S Kadzviti) and Two Rivers Mine (M Cowell).

| Competent Person | Professional Organisation | Membership Number | Qualifications | Relevant Experience |
|---|---|---|---|---|
| S Kadzviti (Mineral Resources) | SACNASP | 400164/05 | BSc (Geology and Mathematics), MSc (Exploration Geology), GDE (Mining Engineering) | 27 years |
| M Cowell (Mineral Reserves) | SACNASP | 400102/02 | BSc (Geology), BSc Hons (Geology) | 15 years |

## Mining authorisation

| Legal Entitlement | Minerals Covered by Mining Right | Comment | Period of Mining Right (years) | Known Impediments on Legal Entitlement |
|---|---|---|---|---|
| Mining Right LP 178 MR (As amended) | Platinum, palladium, rhodium, ruthenium, osmium, iridium, silver, gold and ores. | None | 25 years 20 March 2013 to 19 March 2038 | None |

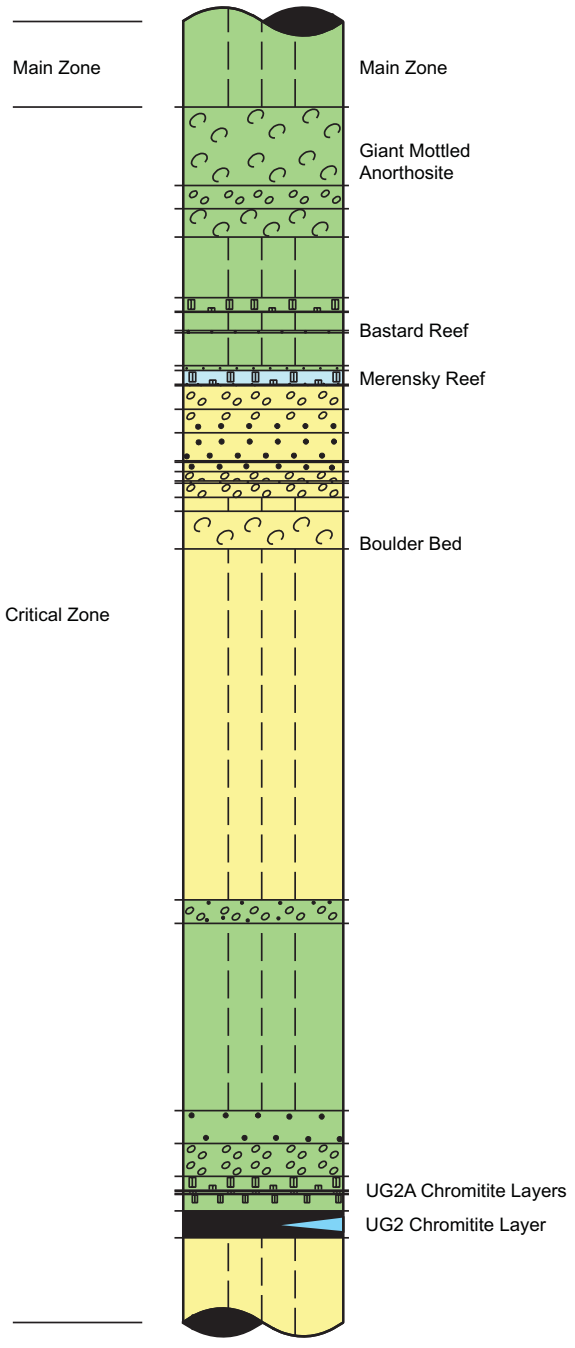
## Geology

The geological succession at Two Rivers Platinum Mine is broadly similar to other areas of the eastern limb of the Bushveld Complex. An exception is the presence of the Steelpoortpark granite in the south-western part of the project, which is unique to this area. At Two Rivers, both the Merensky and UG2 Reefs are present, but only the UG2 is currently exploited. The middling between the Merensky Reef and the UG2 Reef is approximately 140 metres to 160 metres, but reduces significantly in the northern part of the Two Rivers Platinum Mine, to about 70 metres.

The UG2 Reef outcrops in the Klein Dwarsrivier valley on the Dwarsrivier farm, with a north-south strike length of 7.5 kilometres, dipping to the west at between 7º to 10º. The elevated topography results in the UG2 occurring at a depth of approximately 935 metres towards the western boundary. The UG2 is usually bottom loaded with peak PGM values occurring in the basal 10 centimetre portion. The following reef facies have been defined for the UG2 at Two Rivers Platinum Mine:

- UG2 Normal Reef facies which is characterised by a 100 to 120 centimetre-thick chromitite overlain by up to three chromitite 'leaders' collectively termed the UG2A chromitites.
- UG2 Split Reef facies in the southern, west-central and north-eastern parts which is characterised by a chromitite seam that is separated by a layer of a fine- to medium-grained internal pyroxenite unit.
- The UG2 Multiple Split Reef facies which is represented by multiple splitting of the UG2 chromitite by internal pyroxenite. It occurs mainly in the southern section of the mine on the Dwarsrivier farm as well as the east-central section of the Buffelshoek farm.

## STRATIGRAPHIC COLUMN OF THE UPPER CRITICAL ZONE FROM THE MERENSKY HANGING-WALL THROUGH TO THE UG2 FOOTWALL AT TWO RIVERS PLATINUM MINE.




| Thickness (metres) | Lithology |
|---|---|
| >250 | Gabbronorite with anorthosite layers |
| 35 | Mottled and spotted anorthosite |
| 5 | Mottled anorthosite |
| 6 | Mottled anorthosite |
| 13 | Norite |
| 3 | Pyroxenite |
| 4 | Norite |
| 0.1 – 0.5 | Pyroxenite |
| 7 | Mottled anorthosite |
| 1 | Spotted anorthosite |
| 2 – 3 | Pyroxenite (Merensky Reef) |
| 0 – 0.3 | Pyroxenitic pegmatoid |
| 0 – 5 | Mottled anorthosite |
| 5 | Spotted and mottled anorthosite |
| 6 | Spotted anorthosite and norite |
| 0.3 | Mottled anorthosite |
| 2 | Spotted anorthosite |
| 2 | Mottled anorthosite |
| 0.5 | Spotted anorthosite |
| 3 | Mottled anorthosite |
| 3 | Norite |
| 8 | Mottled and spotted anorthosite, pyroxenite 'boulders' |
| 65 – 75 | Norite |
| 5 | Spotted and mottled anorthosite |
| 30 – 40 | Norite |
| 7 | Spotted anorthosite |
| 7 | Mottled anorthosite |
| 3 | Pyroxenite (medium grained) |
| 0.2 | Chromitite |
| 0.3 – 0.5 | Pyroxenite (medium grained) |
| 0.1 | Chromitite |
| 0-2 | Pyroxenite (fine grained) |
| 0.4 | Chromitite |
| 0.6 | Pyroxenite/norite |
| 1 – 1.2 | Chromitite (UG2 Reef) |
| 0 – 2.5 | Pegmatoid |
| >10 | Norite/pyroxenite |

ARM PLATINUM continued

The Merensky Reef consists mainly of orthopyroxene with lesser amounts of plagioclase and clinopyroxene. Thin chromitite layers, usually 1 to 4 millimetres thick, occur near the upper and lower contacts of the reef. The Merensky Reef has variable thickness but generally reduces in thickness from the Dwarsrivier farm towards Kalkfontein and Buffelshoek farms.

The regional north-northeast to south-southwest trending Kalkfontein fault, with a vertical displacement of up to 1 000 metres down-thrown to the west, defines the limits of the eastern structural domain for both the UG2 and Merensky Reefs. The ground beyond this fault remains an exploration target where both reefs are at depths in excess of 1 000 metres. Both reefs are affected by the granite intrusion in the southern portion of the Buffelshoek farm where both reefs are absent.

## Exploration Activities

A total of four surface boreholes were drilled with a total of 2 493 metres in the Buffelshoek area. Three of the boreholes intersected Merensky and UG2 reefs and sampling results are awaited. The fourth hole is still being drilled. The cost of the exploration work was R6.6 million. In 2018, drilling is planned to continue in the Buffelshoek area targeting both Merensky and UG2 reefs.

## Mining Methods and Infrastructure

The Two Rivers mining operation consists of two UG2 Decline shaft systems, the Main Decline and the North Decline, located approximately 2.5 kilometres apart on strike. Both shafts were designed for mechanised bord and pillar mining. The mine has a concentrator plant on site where initial processing is done. Concentrate is transported by road to Impala Platinum's plants for further processing.

## Mineral Resources

The Two Rivers Mine UG2 geological and grade model was updated in 2017 using the borehole data from all the farms: Dwarsrivier, Kalkfontein, Tweefontein and Buffelshoek.

TRP has a large borehole database from drilling undertaken by the mine (Dwarsrivier farm and portions 4 to 6 of Kalkfontein and Tweefontein farms), Implats (Kalkfontein portions 1 to 3 and Buffelshoek) and Kameni (Pty) Ltd (Kalkfontein Remaining Extent). The boreholes were drilled to intersect Merensky and UG2 Reefs. The boreholes have an average grid spacing of 500 metres over the whole property and 250 metre grid spacing in some areas. The borehole spacing is 100 metres on strike and 50 metres on dip in the north-eastern portion of Dwarsrivier farm.

The borehole core drilled by TRP is cut by diamond saw and the half-core sampled at 20 centimetre intervals. Samples for both Merensky and UG2 Reefs are crushed and split and submitted for assaying. All samples from recent drilling at TRP were assayed at Genalysis Laboratory Services (Pty) Ltd (Genalysis) using Ni-sulphide collection fire-assay with an ICP-MS finish to determine Pt, Pd, Rh, Ru, Ir and Au values. Base metals (Ni, Cu, Co) were assayed by aqua regia digestion/OES finish. Duplicate samples and check analyses are carried out. Densities are also determined at the laboratory by pycnometer. The earlier Gold Fields and Assmang samples were assayed by Pb-collector fire-assay with gravimetric finish. In order to combine the data, some of the original core samples were re-assayed by means of Ni-sulphide collection fire-assay and a regression equation was derived, to re-cast the original Pb-collection data as Ni-sulphide assay 'equivalents'. Samples from other drilling campaigns by Implats and Kameni utilised the Genalysis laboratory as well.

In 2017, the UG2 geological modelling was undertaken in Datamine Strat 3D. The software is suitable for stratified deposits and allows for the modelling of faults. The model produced this year shows consistency in the fault displacements. Thicknesses for the UG2 have reduced in some areas as the software is able to handle local thickening of reef better than the traditional wireframing methods used in the past. Ordinary Kriging interpolation within Datamine Studio RM was used to estimate the grade of each 50 x 50 x 1 metre block generated within the UG2 reef geological models. Variables estimated were Pt, Pd, Rh, Au, Ru, and Ir, Cu and Ni. The internal pyroxenite and the leader chromitites were also modelled and estimated. Sub-cell splitting of blocks was allowed to follow the geological boundaries accurately. Density was estimated by Kriging in the resource model. Additional models of the UG2 leaders and the footwall of the UG2 chromitite were created for use in the Mineral Reserve model as mining dilution. The Merensky Reef model was not updated in 2017, so the previous model of 2015 was utilised.

The UG2 and Merensky Mineral Resource classification is based on the consideration of both geological and geostatistical parameters. The geological continuity of the reef is assessed by considering minor and major faulting and other structural disturbances on the UG2 reef and the consistency in thickness and grade. Geostatistical parameters such as Kriging variance, Kriging efficiency, regression slope, number of samples used in estimation and search volume are also considered in the Mineral Resource classification.

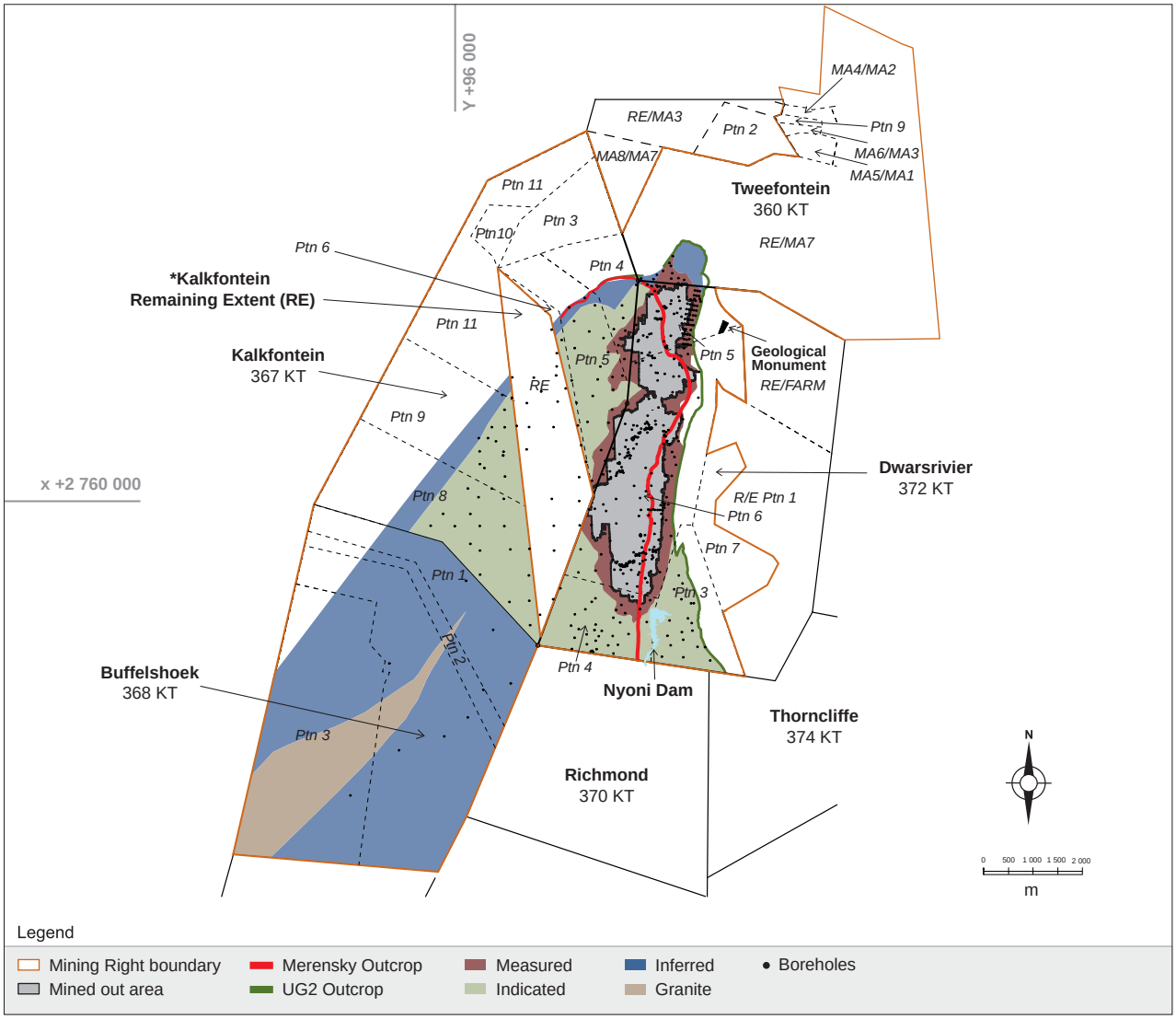
Geological losses of 22% to 30% were applied to account for potholes, faults, dykes and replacement pegmatoids.

## TWO RIVERS PLATINUM MINE: UG2 REEF MINERAL RESOURCES

| * Mineral Resources are reported on a 100% basis. | Mineral Resources | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mt | Pt g/t | Pd g/t | Rh g/t | Au g/t | 4E g/t | 6E g/t | Pt Moz | 6E Moz |
| Measured | 15.22 | 2.52 | 1.41 | 0.48 | 0.04 | 4.44 | 5.42 | 1.23 | 2.65 |
| Indicated | 62.05 | 2.36 | 1.51 | 0.44 | 0.05 | 4.36 | 5.28 | 4.70 | 10.53 |
| **Measured and Indicated 2017** | **77.27** | **2.39** | **1.49** | **0.45** | **0.04** | **4.37** | **5.31** | **5.93** | **13.18** |
| Measured and Indicated 2016 | 72.76 | 2.38 | 1.39 | 0.44 | 0.05 | 4.25 | 5.13 | 5.56 | 11.99 |
| **Inferred 2017** | **80.64** | **2.51** | **1.71** | **0.47** | **0.05** | **4.73** | **5.60** | **6.49** | **14.50** |
| Inferred 2016 | 117.83 | 2.52 | 1.82 | 0.47 | 0.06 | 4.86 | 5.75 | 9.56 | 21.77 |

***4E*** *= platinum + palladium + rhodium + gold;* ***6E*** *= platinum + palladium + rhodium + iridium + ruthenium + gold*
*The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.*
*Totals are rounded off.*
***Key assumptions for Mineral Resources:***
*Geological loss factor applied: 22% – 30%*
* ***Two Rivers Platinum Mine attributable interests (ARM 51%; Impala Platinum 49%).***

## TWO RIVERS PLATINUM MINE: UG2 REEF MINERAL RESOURCES CLASSIFICATION




* *Kalkfontein Remaining Extent (RE), currently 100% owned by ARM, was acquired as part of the Tamboti Platinum (Pty) Ltd transaction.*

R&R The Mineral Resources for this portion are reported under Tamboti Platinum on pages 40 to 43 of this report.

ARM PLATINUM continued

## Mineral Reserves

The Mineral Resources to Mineral Reserves conversion for the UG2 was done using the Studio 5D Mine Planning software package. Conversion of the UG2 Mineral Resources was done for the Measured and Indicated Mineral Resources in Dwarsivier farm, Kalkfontein farm Portions 4 to 6 and Tweefontein. Kalkfontein 1 Indicated Mineral Resources are still to be converted to Mineral Reserves pending the approval of the incorporation of the Tamboti (Kalkfontein RE) portion into the Two Rivers Mining Right. The modifying factors used for the conversion of Mineral Resources to Mineral Reserves took into account the mining method, mining extraction factor, mining losses, mining dilution, mine call factor and commodity prices amongst other parameters. Details of these parameters are provided as footnotes on the Mineral Reserve tabulations.

### TWO RIVERS PLATINUM MINE: UG2 REEF MINERAL RESERVES

| * Mineral Reserves are reported on a 100% basis. | Mineral Reserves | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mt | Pt g/t | Pd g/t | Rh g/t | Au g/t | 4E g/t | 6E g/t | Pt Moz | 6E Moz |
| Proved | 10.72 | 1.66 | 0.96 | 0.32 | 0.03 | 2.96 | 3.64 | 0.57 | 1.25 |
| Probable | 22.53 | 1.52 | 0.93 | 0.29 | 0.03 | 2.77 | 3.39 | 1.10 | 2.46 |
| **Reserves 2017** | **33.25** | **1.57** | **0.94** | **0.30** | **0.03** | **2.83** | **3.47** | **1.68** | **3.71** |
| Reserves 2016 | 43.25 | 1.65 | 0.95 | 0.31 | 0.02 | 2.93 | 3.56 | 2.30 | 4.95 |

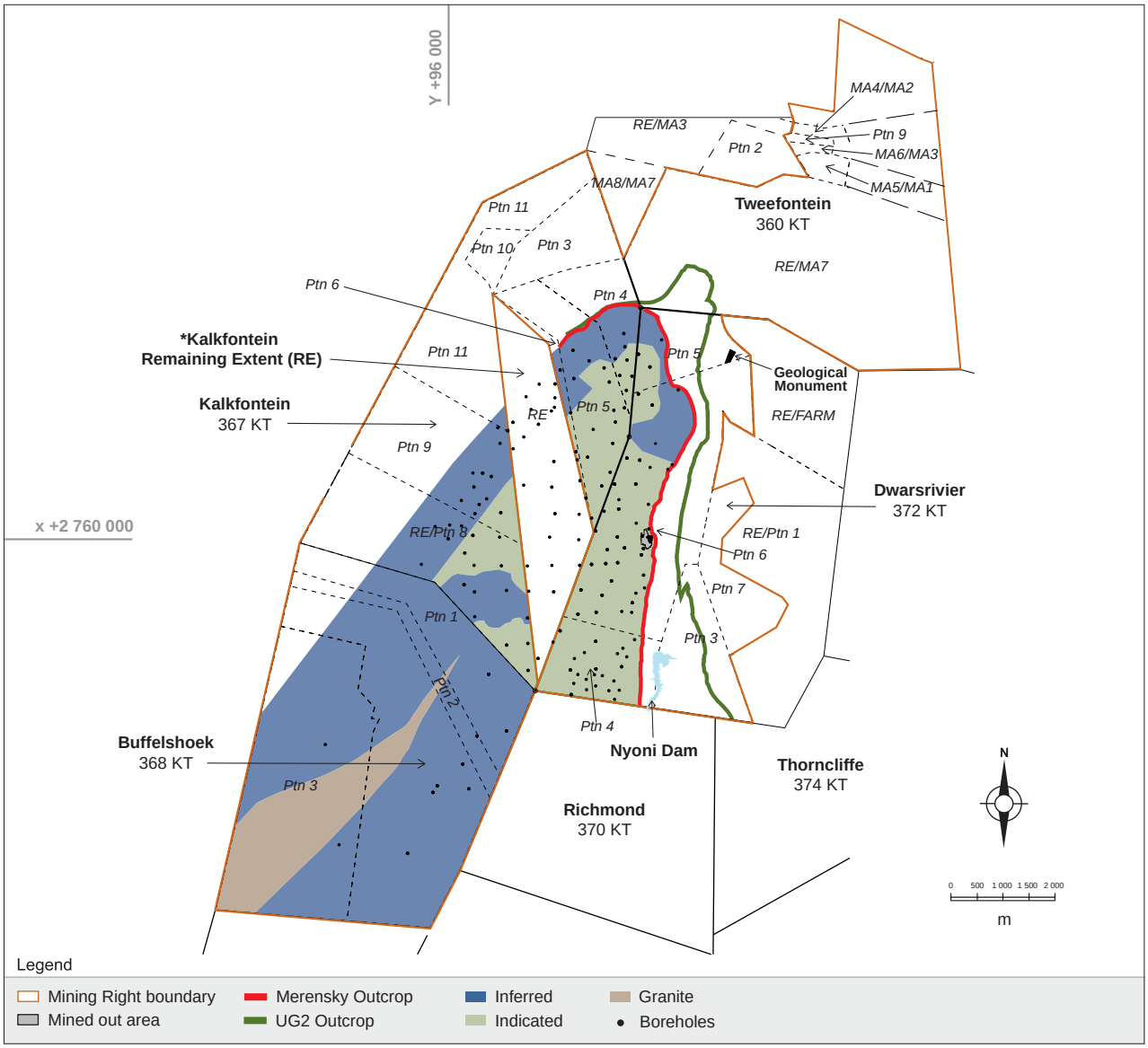
*__4E__ = platinum + palladium + rhodium + gold; __6E__ = platinum + palladium + rhodium + iridium + ruthenium + gold*
*Totals are rounded off.*
***Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:***
*Mining loss factor: 5%*
*Plant Recovery: 87% (6E)*
*Mine call factor: 97.7%*
*Mining dilution: on average 10 cm on hangingwall and 35 cm on footwall.*
*Price ranges (US$/0Z): __Pt:__ 1 207; __Pd:__ 848; __Rh:__ 880; __Ru:__ 47; __Ir:__ 513; __Au:__ 1 302*
*Exchange Rate (R/US$): 13.93*
** __Two Rivers Platinum Mine attributable interests (ARM 51%; Impala Platinum 49%).__*

### TWO RIVERS PLATINUM MINE: MERENSKY REEF MINERAL RESOURCES

| * Mineral Resources are reported on a 100% basis. | Mineral Resources | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mt | Pt g/t | Pd g/t | Rh g/t | Au g/t | 4E g/t | 6E g/t | Pt Moz | 6E Moz |
| **Indicated 2017** | **60.57** | **1.68** | **0.88** | **0.10** | **0.19** | **2.85** | **3.11** | **3.27** | **6.05** |
| Indicated 2016 | 60.57 | 1.68 | 0.88 | 0.10 | 0.19 | 2.85 | 3.11 | 3.27 | 6.05 |
| **Inferred 2017** | **99.19** | **2.09** | **1.15** | **0.13** | **0.25** | **3.61** | **3.92** | **6.67** | **12.51** |
| Inferred 2016 | 99.19 | 2.09 | 1.15 | 0.13 | 0.25 | 3.61 | 3.92 | 6.67 | 12.51 |

*__4E__ = platinum + palladium + rhodium + gold; __6E__ = platinum + palladium + rhodium + iridium + ruthenium + gold*
*The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.*
*Totals are rounded off.*
***Key assumptions for Mineral Resources:***
*Geological Loss factor applied: 30%*
** __Two Rivers Platinum Mine attributable interests (ARM 51%; Impala Platinum 49%).__*

## TWO RIVERS PLATINUM MINE: MERENSKY REEF MINERAL RESOURCES CLASSIFICATION




* *Kalkfontein Remaining Extent (RE), currently 100% owned by ARM, was acquired as part of the Tamboti Platinum (Pty) Ltd transaction.*

R&R The Mineral Resources for this portion are reported under Tamboti Platinum on pages 40 to 43 of this report.

### YEAR-ON-YEAR CHANGE

UG2 Measured and Indicated Mineral Resources at Two Rivers Platinum Mine increased from 72.76 million tonnes at 5.13 g/t (6E) to 77.27 million tonnes at 5.31 g/t (6E) mainly due to the upgrade of Inferred Mineral Resources into Indicated Mineral Resources as a result of better structural interpretation.

Merensky Mineral Resources remained the same as in 2015 as the models for 2015 were still used in the 2017 evaluation.

The UG2 Mineral Reserves materially changed from 43.25 million tonnes at 3.56 g/t (6E) to 33.25 million tonnes at 3.47 g/t (6E) in 2017. The net loss in tonnage and ounces is primarily due to the depletion during the financial year 2016/2017, undercut mining in five of the half levels at the Main Decline, a reduction in the mining height in some areas as a result of remodeling and the effect to mining by a 20 metre fault on the North Decline area.

### HISTORICAL PRODUCTION AT TWO RIVERS PLATINUM MINE

| | ROM | | Milled | |
|---|---|---|---|---|
| Financial year | Mt | Grade g/t (6E) | Mt | Grade g/t (6E) |
| 2012/2013 | 3.33 | | 3.17 | |
| 2013/2014 | 3.27 | | 3.28 | |
| 2014/2015 | 3.44 | | 3.36 | |
| 2015/2016 | 3.37 | | 3.51 | |
| 2016/2017 | 3.38 | 3.80 | 3.50 | 3.90 |

ARM PLATINUM continued

## TAMBOTI PLATINUM

ARM's interest in Tamboti Platinum is 100% following the acquisition of Tamboti Platinum (Pty) Ltd, holder of a Mining Right over the Kalkfontein Remaining Extent (RE) adjacent to Two Rivers Mine. An agreement has been reached with Implats and consent to transfer this property into the Two Rivers Mine Mining Right has been given, but execution is pending.

### Locality

Tamboti Platinum area is located in the Eastern Limb of the Bushveld Complex, contiguous to Two Rivers Mine on the Remaining Extent portion of Kalkfontein farm. Both UG2 and Merensky Reefs are present on the Kalkfontein RE.

R&R Refer to Two Rivers Platinum Mine locality map on page 33.

### History

The area has been explored for its mineral potential since the early 1900s. Most of the activity in the area was in the form of erratic exploration activities which included trenching. Recent drilling has been undertaken by Implats and Kameni (Pty) Ltd between 1987 and 2010.

### Competence

The following Competent Persons were involved in the estimation of Mineral Resources for the Tamboti Platinum area (Kalkfontein RE). They are employed by ARM (S Kadzviti) and Two Rivers Platinum Mine (J Coetzee).

| Competent Person | Professional Organisation | Membership Number | Qualifications | Relevant Experience |
|---|---|---|---|---|
| S Kadzviti (Mineral Resources) | SACNASP | 400164/05 | BSc (Geology and Mathematics), MSc (Exploration Geology), GDE (Mining Engineering) | 27 years |
| J Coetzee (Mineral Resources) | SACNASP | 114086 | BSc (Geology), BSc Hons (Geology) | 14 years |

### Mining authorisation

| Legal Entitlement | Minerals covered by Mining Right/Prospecting Right | Comment | Period of Mining Right/ Prospecting Right | Known Impediments on Legal Entitlement |
|---|---|---|---|---|
| Mining Right LP 165 MR | Platinum group metals, gold, silver, nickel, copper, chrome and cobalt. | Section 11 consent to transfer to Two Rivers Mine granted, but execution pending. Area covered is the Kalkfontein Remaining Extent. | 20 Years 9th July 2014 to 8th July 2034 | None |
| Prospecting Right LP 2125 PR | Chrome | Portions covered are 3, 4, 5, 6, 9, 10, 11 and RE 8 of Kalkfontein 367KT farm. | Application for the renewal of the Prospecting Right has been done. | None |

## Geology

The Kalkfontein RE is underlain by both UG2 and Merensky Reefs. The general dip of reefs is to the west at 7 to 10°. Within 500 metres of the Kalkfontein fault, the reef is faulted with vertical up-throw displacements in excess of 20 metres to the west. The reefs are vertically displaced and down-thrown by up to 1 000 metres to the west of the Kalkfontein fault. This western portion has been identified as an exploration target in which only four boreholes have intersected UG2 and Merensky Reefs.

The following reef facies, similar to those at Two Rivers Mine, have been defined for the UG2 in the Kalkfontein RE:

- UG2 Normal Reef facies, which is characterised by a 100 to 120 centimetre-thick chromitite overlain by up to three chromitite 'leaders' collectively termed the UG2A chromitites.
- UG2 Split Reef facies is characterised by a chromitite seam that is separated by a layer of a fine- to medium-grained internal pyroxenite unit.
- The UG2 Multiple Split Reef facies is represented by multiple splitting of the UG2 chromitite separated by internal pyroxenite.
- The UG2 is usually bottom loaded with peak PGM values occurring in the basal 10 centimetre portion.

The Merensky Reef consists mainly of orthopyroxene with lesser amounts of plagioclase and clinopyroxene. Thin chromitite layers, usually 1 to 4 millimetres thick, occur near the upper and lower contacts of the reef. The regional north-northeast to south-southwest trending Kalkfontein fault, with a vertical displacement of up to 1 000 metres down-throw to the west, defines the limits of the eastern structural domain for both the UG2 and Merensky Reefs.

R&R Refer to Two Rivers Platinum mine stratigraphic column on page 35.

## Mineral Resources

The Kalkfontein Remaining Extent UG2 geological and grade model was updated in 2017, together with the models for the adjacent areas of Kalkfontein and Dwarsrivier.

Borehole data provided by Impala and Kameni for the Kalkfontein RE portion, together with the data from adjacent farms, was used in the estimation of the Kalkfontein RE. These boreholes were drilled to intersect Merensky and UG2 Reefs. The boreholes have an average grid spacing of 500 metres over the whole property and 250 metre grid spacing in some areas.

All samples from historical and recent drilling at Kalkfontein RE were mostly assayed at Genalysis Laboratory Services (Pty) Ltd (Genalysis) using Ni sulphide collection fire-assay. Some samples in earlier drilling phases were assayed at the Impala Laboratory in Springs, South Africa.

Geological modelling for the UG2 was undertaken in Datamine Strat 3D. Ordinary Kriging interpolation within Datamine Studio 3 was used to estimate the grade of each 50 x 50 x 1 metre block generated within the UG2 geological models. Variables estimated were Pt, Pd, Rh, Au, Ru, and Ir, Cu and Ni. The internal pyroxenite and the leader chromitites were also modelled and estimation undertaken. Sub-cell splitting of blocks was allowed to follow the geological boundaries accurately. Density was estimated by Kriging in the resource model. Additional models of the UG2 leaders and the footwall of the UG2 chromitite were created. The Merensky Reef resource model was not updated in 2017.

The UG2 and Merensky Mineral Resource classification is based on the consideration of both geological and geostatistical parameters. The geological continuity of the reef is assessed by considering minor and major faulting and other structural disturbances on the UG2 reef and the consistency in thickness and grade. Geostatistical parameters such as Kriging variance, Kriging efficiency, regression slope, number of samples used in estimation and search volume are also considered in the Mineral Resource classification.

Geological losses of 22% to 30% were applied to account for potholes, faults, dykes and replacement pegmatoids.

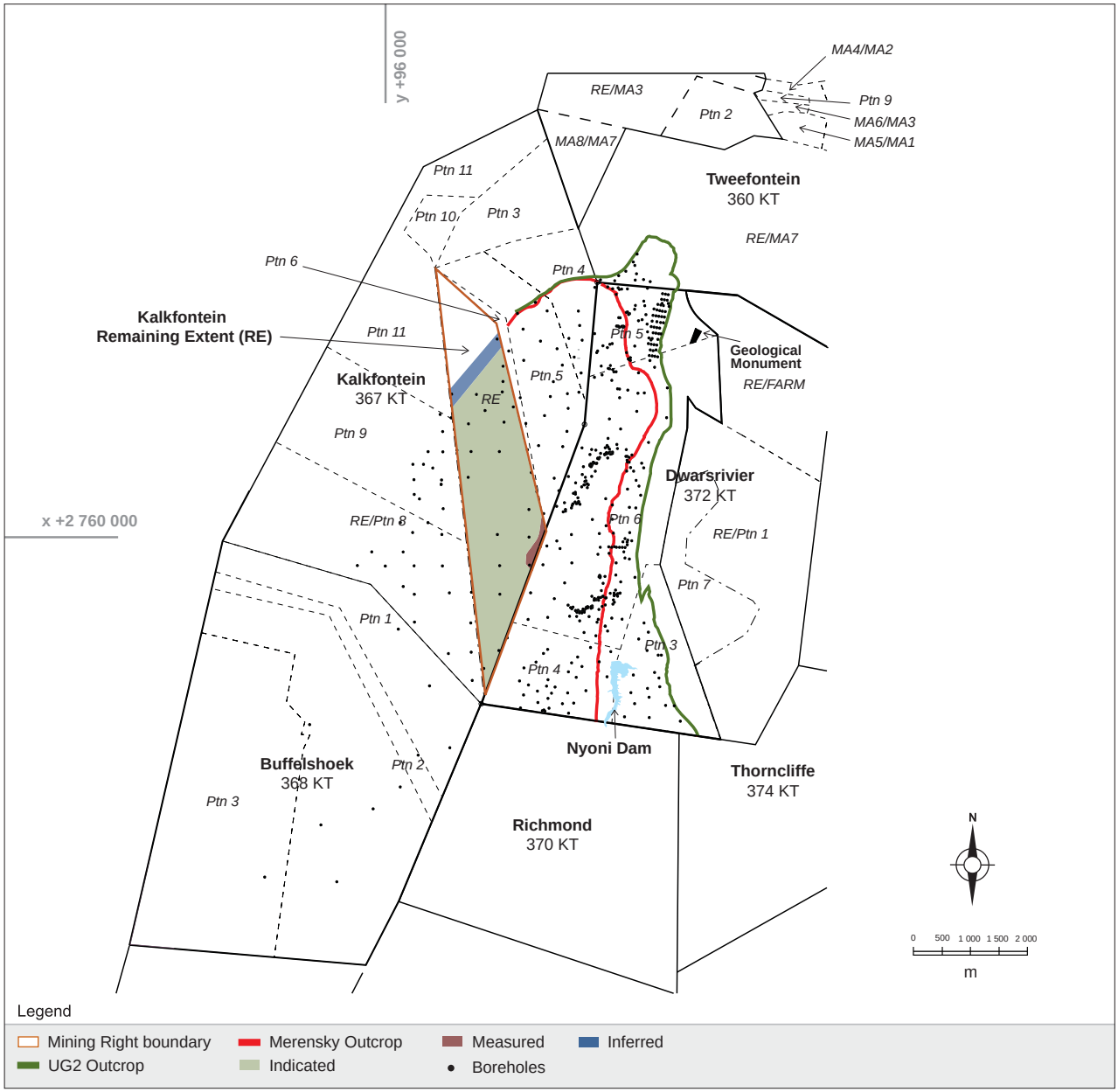
### TAMBOTI PLATINUM (KALKFONTEIN RE): UG2 REEF MINERAL RESOURCES

| * Mineral Resources are reported on a 100% basis. | Mineral Resources | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mt | Pt g/t | Pd g/t | Rh g/t | Au g/t | 4E g/t | 6E g/t | Pt Moz | 6E Moz |
| Measured | 0.38 | 2.60 | 1.80 | 0.49 | 0.05 | 4.94 | 5.99 | 0.03 | 0.07 |
| Indicated | 18.34 | 2.72 | 1.67 | 0.49 | 0.05 | 4.93 | 6.00 | 1.60 | 3.54 |
| **Measured and Indicated 2017** | **18.72** | **2.71** | **1.67** | **0.49** | **0.05** | **4.93** | **6.00** | **1.63** | **3.61** |
| Measured and Indicated 2016 | 15.20 | 2.84 | 1.74 | 0.51 | 0.05 | 5.14 | 6.19 | 1.39 | 3.02 |
| **Inferred 2017** | **0.77** | **3.09** | **1.81** | **0.58** | **0.05** | **5.53** | **6.70** | **0.08** | **0.17** |
| Inferred 2016 | 5.18 | 3.05 | 1.83 | 0.56 | 0.06 | 5.50 | 6.69 | 0.51 | 1.11 |

***4E** = platinum + palladium + rhodium + gold; **6E** = platinum + palladium + rhodium + iridium + ruthenium + gold*
*Totals are rounded off.*
***Key assumptions for Mineral Resources:***
*Geological loss factor applied: 22% – 30%*
** **Tamboti Platinum attributable interest (ARM 100%).***

ARM PLATINUM continued

## TAMBOTI PLATINUM (KALKFONTEIN RE): UG2 REEF MINERAL RESOURCES CLASSIFICATION

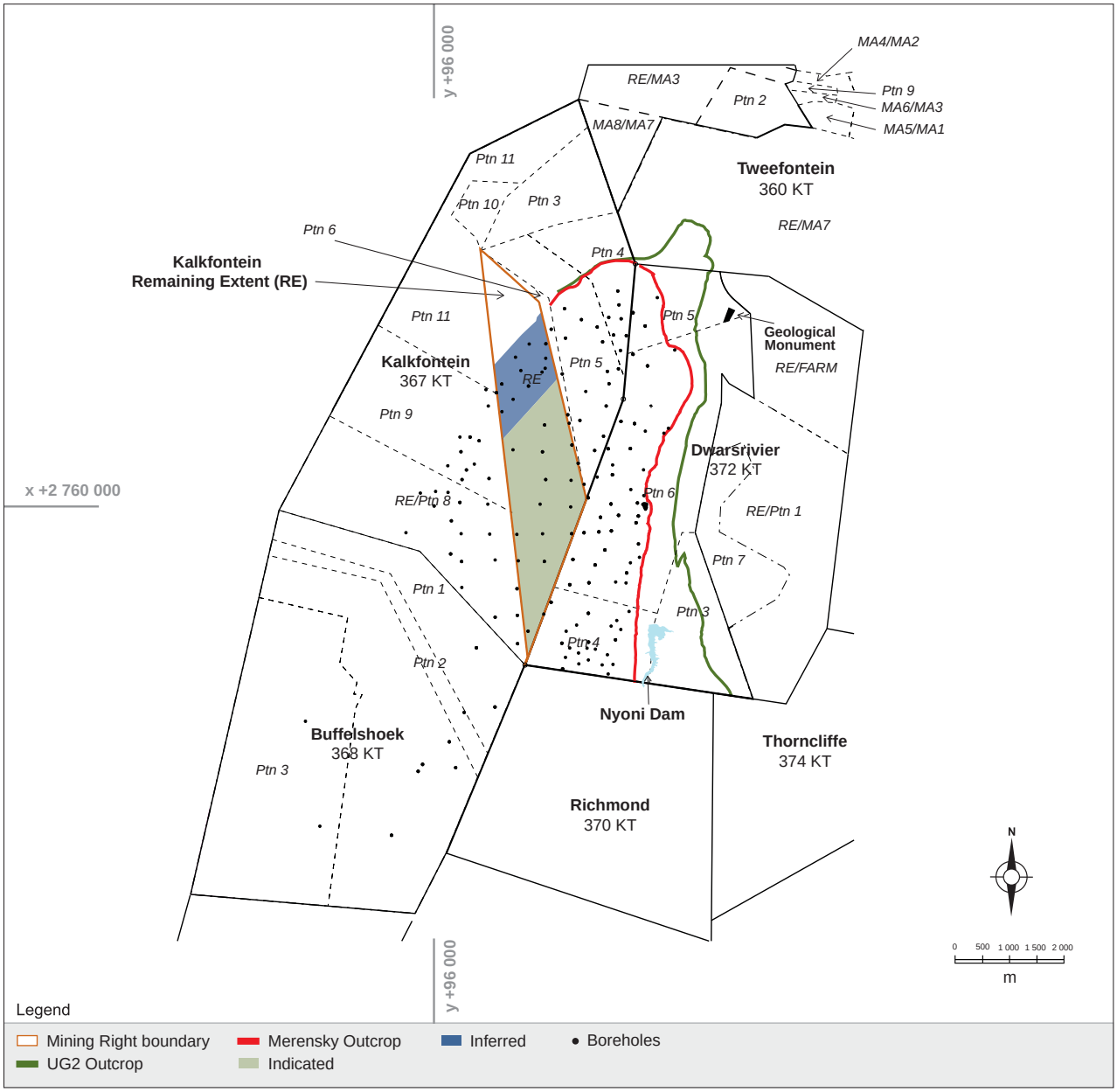



## TAMBOTI PLATINUM (KALKFONTEIN RE): MERENSKY REEF MINERAL RESOURCES

| * Mineral Resources are reported on a 100% basis. | Mineral Resources | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mt | Pt g/t | Pd g/t | Rh g/t | Au g/t | 4E g/t | 6E g/t | Pt Moz | 6E Moz |
| **Indicated 2017** | **14.39** | **2.37** | **1.20** | **0.13** | **0.28** | **3.98** | **4.31** | **1.10** | **1.99** |
| Indicated 2016 | 14.39 | 2.37 | 1.20 | 0.13 | 0.28 | 3.98 | 4.31 | 1.10 | 1.99 |
| **Inferred 2017** | **5.50** | **1.94** | **0.91** | **0.11** | **0.22** | **3.18** | **3.44** | **0.34** | **0.61** |
| Inferred 2016 | 5.50 | 1.94 | 0.91 | 0.11 | 0.22 | 3.18 | 3.44 | 0.34 | 0.61 |

*4E = platinum + palladium + rhodium + gold; 6E =platinum + palladium + rhodium + iridium + ruthenium + gold*
*Totals are rounded off.*
***Key assumptions for Mineral Resources:***
*Geological Loss factor applied: 30%*
* ***Tamboti Platinum attributable interest (ARM 100%).***

## TAMBOTI PLATINUM (KALKFONTEIN RE): MERENSKY REEF MINERAL RESOURCES CLASSIFICATION




### YEAR-ON-YEAR CHANGE

The UG2 Measured and Indicated Mineral Resources for Tamboti Platinum increased from 15.20 milion tonnes at a grade of 6.19 g/t (6E) to 18.72 million tonnes at a grade of 6.00 g/t (6E) due to the upgrade of a portion of the Inferred Resources.

The Merensky Mineral Resources remained as reported in 2016 as there was no update for the Merensky geological and grade model.

ARM PLATINUM continued

## MODIKWA PLATINUM MINE

ARM's attributable beneficial interest in Modikwa's operations is 41.5%; 8.5% is held by the Modikwa Communities and 50% is held by Rustenburg Platinum mines.

### Locality

Modikwa Platinum Mine is situated approximately 15 kilometres north of Burgersfort and 15 kilometres north-west of Steelpoort, along the border between the Mpumalanga and Limpopo Provinces in South Africa. Located at longitude 30º10'E and latitude 24º40'S, the site is accessed via the R37 road between Polokwane and Burgersfort. The topography of the area is defined by a low-lying broad valley which strikes due north-south and is underlain by rock units of the upper critical zone of the Bushveld Complex.

R&R Refer to page 1.

### History

Exploration in the area started in the mid-1920s with the discovery of the Merensky Reef. During the late 1980s, further drilling was undertaken on the UG2 and Merensky Reefs. In the late 1990s, a feasibility study was completed for the exploitation of the UG2. During 2001, a 50:50 JV agreement was signed between Rustenburg Platinum Mines and ARM Mining Consortium Limited. ARM's effective stake in Modikwa is 41.5%, through its 83% ownership of ARM Mining Consortium. The other 8.5% is held by the Mampudima and Matimatjatji community companies through their 17% shareholding in the ARM Mining Consortium.

### Competence

The following Competent Persons were involved in the estimation of Mineral Resources and Mineral Reserves for the Modikwa Mine. They are employed by Anglo American (I Colquhoun) and Modikwa Mine (J de Kock).

| Competent Person | Professional organisation | Membership Number | Qualifications | Relevant Experience |
|---|---|---|---|---|
| I Colquhoun (Mineral Resources) | SACNASP | 400097/00 | BSc (Geology), BSc Hons (Mineral Economics) | 34 years |
| J de Kock (Mineral Reserves) | SAIMM | 705068 | Government Survey Certificate of competency | 32 years |

### Mining authorisation

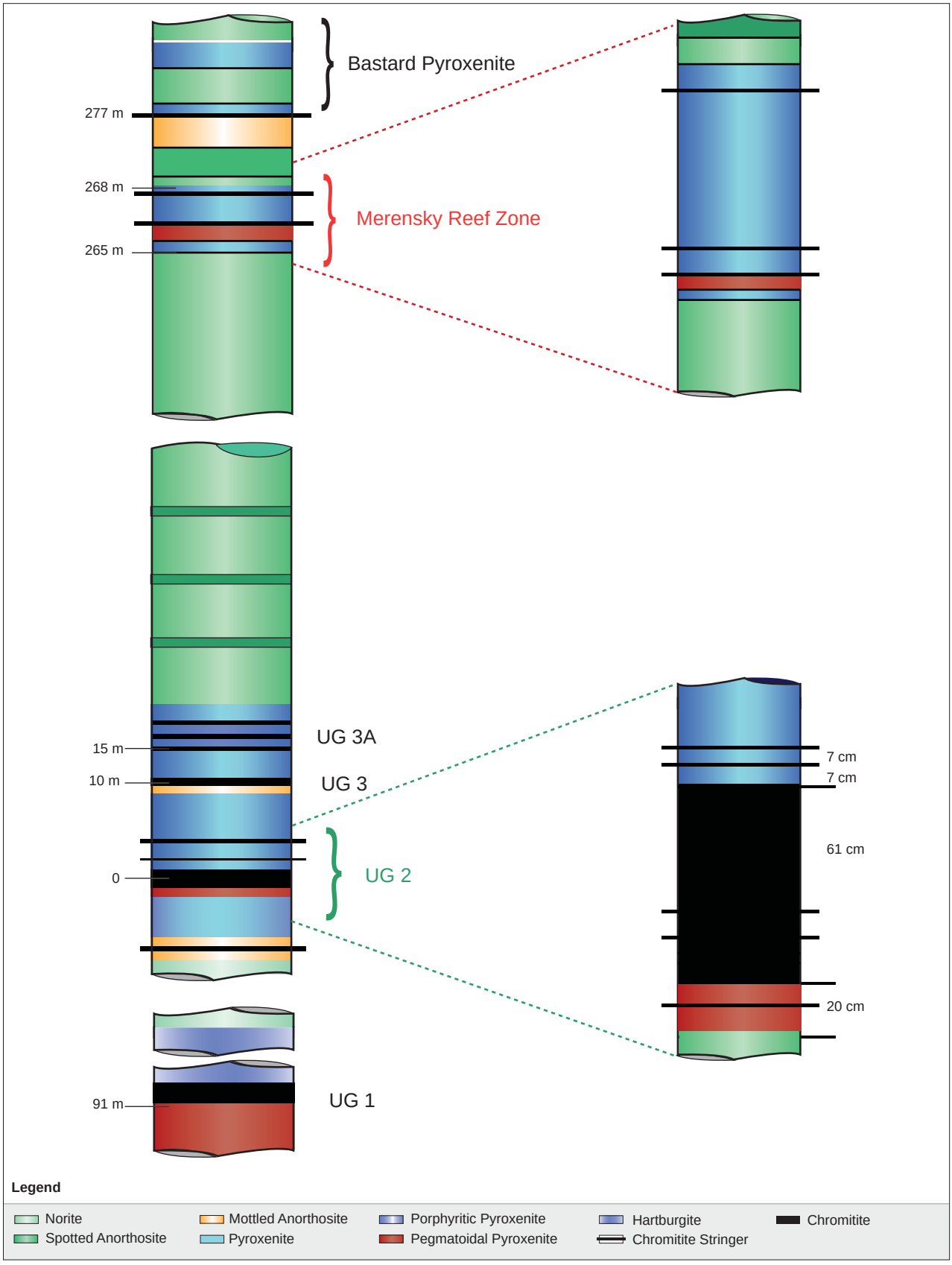
| Legal Entitlement | Minerals covered by Mining Right | Comment | Period of Mining Right (years) | Known Impediments on Legal Entitlement |
|---|---|---|---|---|
| Mining Right LP 129 MR (as amended) | Platinum group metals together with metals and minerals found in association therewith. | The acquisition in respect of a portion of the farm Doornbosch 294 KT is complete. | 30 years 13 November 2013 to 12 November 2043 | None |

### Geology

The Bushveld layered sequence around Modikwa strikes north-northwest to south-southeast and dips to the southwest at 10º to 12º, with local variations in the dip resulting in gradients of nearly 20º. There are several instances where some gentle 'rolling' of the reef horizons have been recorded, and normally steeper dips are noted nearer outcrop (as opposed to at depth). The outcrop positions of the Merensky Reef and the UG2 normally occur within the areas of low relief, and much of the outcrop is masked by extensive development of black turf, as well as, in places, transported sediments. On the farms Maandagshoek 254 KT, Onverwacht 292 KT and Winterveld 293 KT however, the UG2 (and occasionally the Merensky Reef) outcrops in a series of elongate hills. Although frequently covered with scree material, much of this outcrop has been marked by a series of trenches and pits, many of which date from the early pioneer prospecting.

Both the UG2 and Merensky Reefs are present at Modikwa. The UG2 occurs as a chromitite layer with an average thickness of approximately 60 centimetres. Three leader chromitites occur above the main seam. Gentle undulations of the UG2 with amplitudes of less than 2 metres are developed across the mine area. Potholes are randomly distributed within the North Shaft area but are less abundant in the South Shaft area. The Onverwacht Hill area in the southern portion of the mine is characterised by the presence of several large ultramafic pegmatoid intrusions that disrupt, and locally replace, the UG2.

## GENERALISED GEOLOGICAL SUCCESSION AT MODIKWA MINE




*All widths are true widths

ARM PLATINUM continued

## Exploration Activities

No exploration drilling programme took place.

## Mining Methods and Infrastructure

Mining consists of mechanised development and conventional stoping. Run-of-mine tonnage is processed at the Modikwa concentrator and the PGE-rich concentrate is transported to Anglo Platinum's Polokwane smelter and refining facilities.

## Mineral Resources

The Mineral Resource modelling and estimation for Modikwa Mine is done by the Anglo American Platinum Resource modelling team. The Mineral Resource classification is based on data constraints, information risk assessments, geological, geostatistical considerations and review by the Competent Person's Team. The UG2 and Merensky Reef Mineral Resource is based on surface diamond drillholes (mother boreholes and deflections) and underground sample sections. The logs and assay values are kept in separate electronic databases and are combined for estimation purposes after rigorous data validation. Samples are submitted to Anglo Research Laboratories (AR) and Mintek Laboratories (primary laboratories) and to Genalysis (check laboratory) for analysis. The UG2 Resource cut is divided into three units comprising the UG2 Reef and dilution cuts in the hanging wall and footwall to make up the mining cut. Estimation of the three sub-units in the mining cut is carried out separately and independently. Two-dimensional block models with block sizes of 125 x 125 metres, 250 x 250 metres and 500 x 500 metres, depending on the drill hole/sample section spacing, are created. The Pt, Pd, Rh, Au, Cu and Ni grades, width and density are interpolated using Ordinary Kriging. Resources are reported after deduction of geological losses. The geological losses account for losses due to pegmatoidal intrusions, faults, dykes and potholes.

## Mineral Reserves

Part of the Measured and Indicated Mineral Resources are converted to Mineral Reserves by applying appropriate mining, metallurgical and economic factors, i.e. 'modifying factors', details of which are below the Mineral Reserves table.

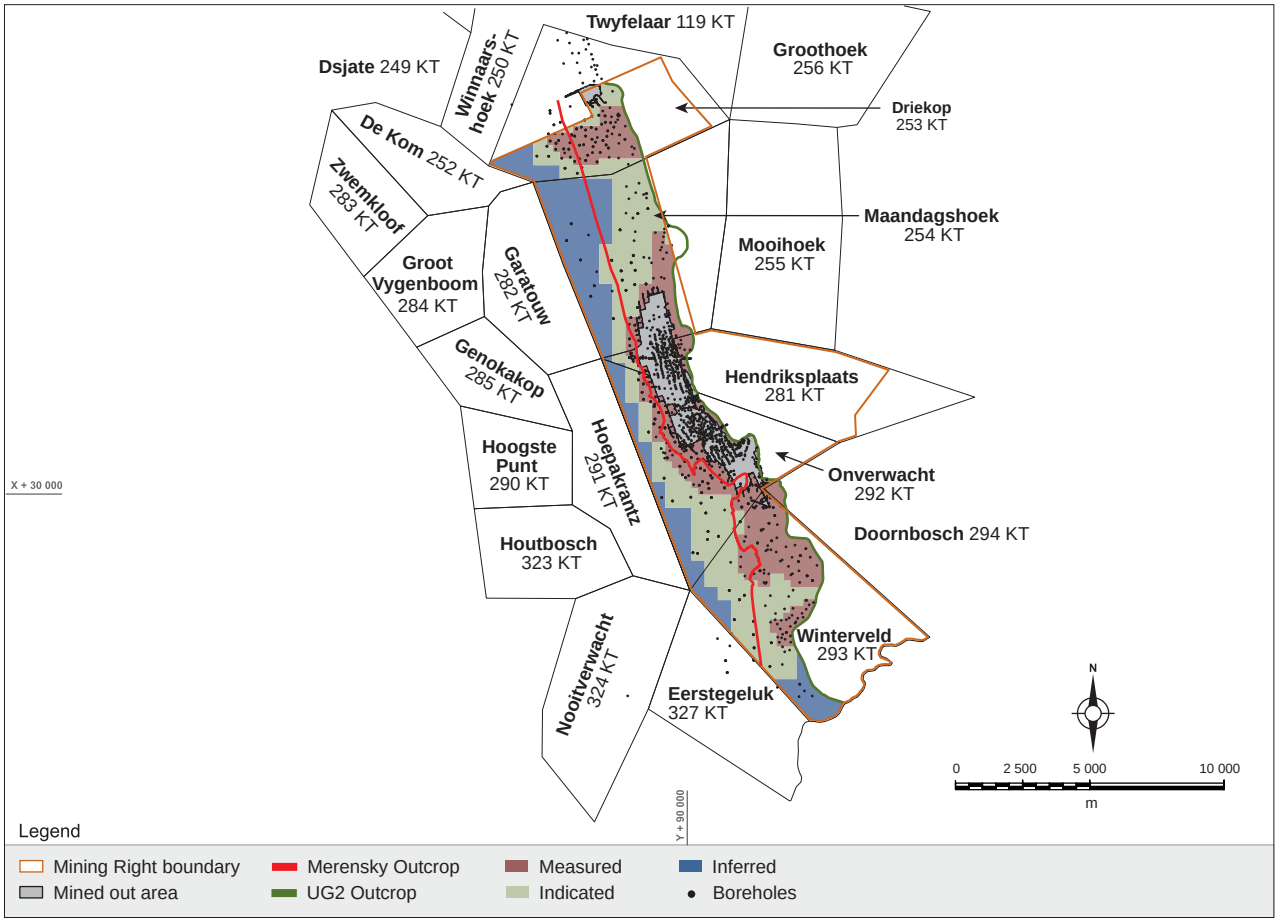
A minimum mining cut of 102 centimetres is used to determine the amount of footwall waste that is included in the mining cut. Where the hanging wall and the main seam thickness are greater than 102 centimetres, an additional 5 centimetres of footwall waste is included. The basal contact of the UG2 layer is typically high-grade and it is important that this contact is not left in the footwall during mining. The UG2 is accessed via two primary declines from the surface.

### ^MODIKWA PLATINUM MINE: UG2 MINERAL RESOURCES AND MINERAL RESERVES

| * Mineral Resources and Mineral Reserves are reported on a 100% basis. | Mineral Resources | | | | Mineral Reserves | | |
|---|---|---|---|---|---|---|---|
| | Mt | 4E g/t | 4E Moz | | Mt | 4E g/t | 4E Moz |
| Measured | 87.30 | 5.95 | 16.70 | Proved | 12.34 | 4.95 | 1.96 |
| Indicated | 102.20 | 5.92 | 19.45 | Probable | 29.88 | 4.76 | 4.58 |
| **^Total Measured and Indicated 2017** | **189.50** | **5.93** | **36.15** | **Total Reserves 2017** | **42.21** | **4.82** | **6.54** |
| **Total Measured and Indicated 2016 | 139.60 | 5.92 | 26.59 | Total Reserves 2016 | 44.73 | 4.75 | 6.83 |
| **Inferred 2017** | **76.50** | **6.21** | **15.27** | | | | |
| Inferred 2017 | 77.70 | 6.21 | 15.51 | | | | |

***4E*** *= platinum + palladium + rhodium + gold*
*^ The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.*
*** In 2016 the Measured and Indicated Mineral Resources for Modikwa Mine were reported exclusive of those modified to produce Mineral Reserves.*
*Totals are rounded off.*
***Key assumptions for Mineral Resources:***
*Geological Loss factor applied: 11.38% – 38.57% (average of 17.93% over lease area)*
*Grade and thickness cut-off: 3.66 g/t (4E) and 1.02 metres*
***Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:***
*"Unknown" Geological Loss factor applied: 4% – 9%*
*Mining loss factor: 1.2%*
*Mining dilution: 19%*
*Plant Recovery: 87% (4E)*
*Mine call factor: 95%*
*Price ranges (US$/oz)**: Pt:** 1 090 – 1 095; **Pd:** 710 – 715; **Rh:** 1 015 – 1 020; **Ru:** 30 – 35; **Ir:** 495 – 510; **Au:** 1 180 – 1 190*
*Exchange Rate (R/US$): 13.00 – 13.50*
*Reserve cut-off grade: 3.66 g/t (4E)*
*** Modikwa Platinum Mine attributable interests (ARM 41.5%; Modikwa Communities 8.5%, Anglo American Platinum 50%).***

## MODIKWA PLATINUM MINE UG2 MINERAL RESOURCES CLASSIFICATION



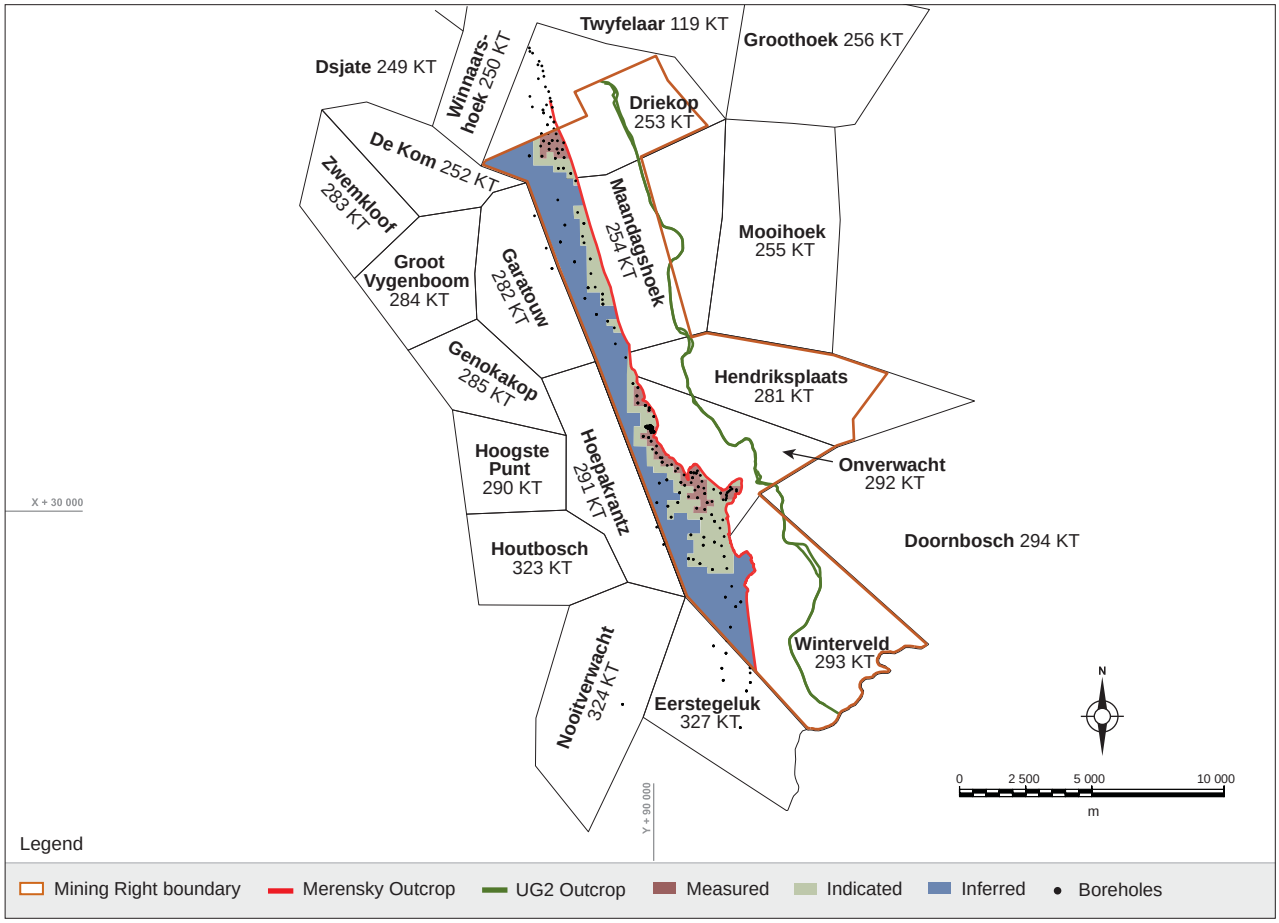

## MODIKWA PLATINUM MINE: MERENSKY REEF MINERAL RESOURCES

| * Mineral Resources and Mineral Reserves are reported on a 100% basis. | Mineral Resources | | |
|---|---|---|---|
| | Mt | 4E g/t | 4E Moz |
| Measured | 18.54 | 2.93 | 1.75 |
| Indicated | 55.73 | 2.72 | 4.88 |
| **Total Measured and Indicated 2017** | **74.27** | **2.78** | **6.63** |
| Total Measured and Indicated 2016 | 74.30 | 2.77 | 6.62 |
| **Inferred 2017** | **138.59** | **2.65** | **11.83** |
| Inferred 2016 | 139.85 | 2.65 | 11.92 |

***4E*** *= platinum + palladium + rhodium + gold*
*Totals are rounded off.*
***Key assumptions for Mineral Resources:***
*Geological Loss factor applied: 11.38% to 38.57 (average of 17.93% over lease area)*
*Grade and thickness cut-off: 1.51 g/t (4E) and 1.02 metres*
* ***Modikwa Platinum Mine attributable interests (ARM 41.5%; Modikwa Communities 8.5%, Rustenburg Platinum Mines 50%).***

ARM PLATINUM continued

## MODIKWA PLATINUM MINE MERENSKY MINERAL RESOURCES CLASSIFICATION




### YEAR-ON-YEAR CHANGE

The reporting of the UG2 Measured and Indicated Mineral Resources is now being done inclusive of that portion converted to the Mineral Reserves. The change has resulted in reporting a total of 189.50 million tonnes at 5.93 g/t (4E), Measured and Indicated Mineral Resources compared to 139.60 million tonnes at 5.92 g/t reported in 2016. The Mineral Reserves at Modikwa decreased to 42.21 million tonnes when compared with the 2016 statement (44.73 million tonnes). This is mainly due to production, design changes and modifying factor changes.

Merensky Measured and Indicated Mineral Resources remained almost the same at 74.27 million tonnes at 2.78 g/t (4E).

### HISTORICAL PRODUCTION AT MODIKWA MINE

| | ROM | | Milled | |
|---|---|---|---|---|
| Financial year | Mt | Grade g/t (4E) | Mt | Grade g/t (4E) |
| 2012/2013 | 2.20 | | 2.33 | |
| 2013/2014 | 1.94 | | 2.11 | |
| 2014/2015 | 1.86 | | 1.86 | |
| 2015/2016 | 2.08 | | 2.05 | |
| 2016/2017 | 2.05 | 4.96 | 2.01 | 4.60 |

# KALPLATS PGM PROSPECT

ARM Platinum's attributable beneficial interest in the Kalplats PGM Prospect is 46%. Stella Platinum holds 44% and Anglo American Prospecting Services 10%.

The Prospecting Right has lapsed for the Kalplats Extended Prospect.

## Locality

The Kalplats Platinum Prospects are situated 330 kilometres west of Johannesburg and approximately 90 kilometres south-west of Mahikeng in the North West Province of South Africa. Situated at latitude 26º30'S and longitude 24º50'E, the project areas are accessed from Stella on the N14 national road linking Mahikeng and Vryburg.

## History

Anglo American discovered the Kalplats platinum deposits in the early 1990s and Harmony Gold Mining Company Limited acquired the prospect from Anglo in 1999. Subsequently, ARM acquired the prospect as part of the merger of the Anglovaal, ARM and Harmony assets in 2004. Pre-2004, exploration comprised a combination of rotary air blast (RAB), reverse circulation (RC) and diamond drilling. Anglo drilled a total of 6 000 metres in 133 holes, while Harmony drilled a total of 35 640 metres in 399 holes. Harmony commissioned a feasibility study in 2003 and excavated a 500 tonne bulk sample for metallurgical test work. The study assessed the viability of both an open-pit and underground mining operation. The feasibility study was completed early in 2004.

In 2005, ARM Platinum entered into two joint venture agreements with Platinum Australia (PLA), one of which was over the 'Kalplats PGM Prospect', which provided for PLA to earn up to 49% by completing a bankable level feasibility study and making the Panton metallurgical process available at no cost.

PLA commenced drilling in 2006 with a combination of diamond and RC drilling focusing on extending the resources on the Vela, Scorpio, Sirius, Mira, Serpens North, Serpens South and Crux deposits. PLA completed 683 drill holes for a total of 92 529 metres. Late in 2009, PLA completed a pre-feasibility study on a 1.5 million tonne of ore per year open-pit mining operation and in 2012, PLA completed a Definitive Feasibility Study. Stella Platinum acquired PLA's interest in Kalplats in 2015.

## Competence

Geological modelling and resource estimation was done by Coffey Mining consultants.

## Prospecting Rights

| Prospect | Legal Entitlement | Minerals covered by Prospecting Right | Comment | Period of Prospect Right (years) | Known Impediments on Legal Entitlement |
|---|---|---|---|---|---|
| Kalplats PGM Prospect | Prospecting Right NW 492 PR | Platinum, gold ore, silver ore, precious stones, palladium, nickel ore, copper ore, cobalt and chrome ore. | ARM Platinum has applied for a Retention Permit over the Kalplats Prospect area. | Application for Retention Permit has been done. | None |
| Kalplats Extended Prospect Area | Prospecting Right DME 1056 | Platinum group metals, copper ore, cobalt, chrome ore, nickel ore, gold ore, silver ore, iron ore and vanadium. | The Prospecting Right has lapsed. | | None |

## Geology

PGE mineralisation is hosted mainly by magnetite-rich gabbros within the Stella Layered Intrusion (SLI), a 3.0 billion year old layered complex intruded into the Kraaipan Greenstone Belt. Mineralisation is contained in eight separate, subvertically dipping zones known as Crater, Orion, Vela, Sirius, Mira, Serpens North and Serpens South and Crux, each with strike lengths of between approximately 500 and 1 000 metres and widths of between 15 and 45 metres. In addition, drilling has outlined at least three additional deposits known as Scorpio, Tucana and Pointer.

Three main sub-parallel reef packages within each zone have been recognised. They are the Main Reef (the highest grade reef), Mid Reef and LG Reef. The area is structurally complex, and thrusting has caused duplication of reefs in some cases.

ARM PLATINUM continued

## Exploration Activities

No exploration drilling programme was undertaken.

## Mining Methods and Infrastructure

No mining is currently being undertaken at Kalplats.

## Mineral Resources

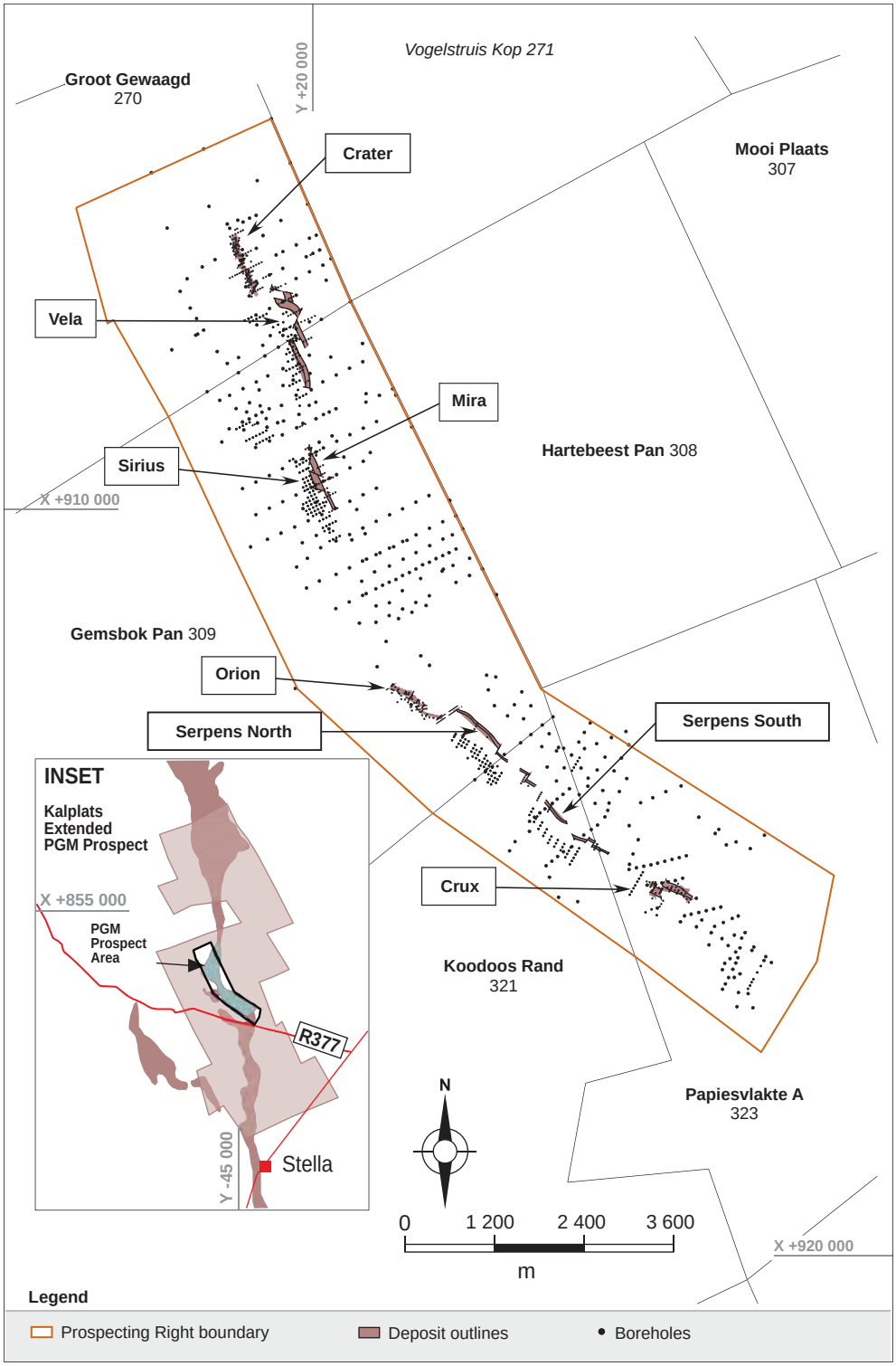
Geological modelling and resource estimation was done on all eight major deposits in the Kalplats PGM Prospect. Resources have been estimated to a depth of 200 metres below surface at a cut-off grade of 0.5 g/t 3E. Tonnages and grades are reported only for the entire thickness of a package of seven reefs, namely the UM, UUM, LM, MR, LG, MMW and Main Reef Residual layers.

### KALPLATS MINERAL RESOURCES

| * Mineral Resources are reported on a 100% basis. | Measured Resources | | Indicated Resources | | Measured and Indicated Resources | | | Inferred Resources | |
|---|---|---|---|---|---|---|---|---|---|
| | Mt | 3E g/t | Mt | 3E g/t | Mt | 3E g/t | 3E Moz | Mt | 3E g/t |
| Crater | 1.34 | 1.89 | 6.22 | 1.85 | 7.55 | 1.86 | 0.45 | 18.66 | 2.11 |
| Orion | 4.20 | 1.57 | 4.01 | 1.56 | 8.21 | 1.57 | 0.41 | 3.64 | 1.61 |
| Crux | 7.70 | 1.55 | 10.88 | 1.40 | 18.58 | 1.46 | 0.87 | 9.46 | 1.35 |
| Sirius | 0.80 | 1.52 | 5.31 | 1.49 | 6.11 | 1.49 | 0.29 | 3.38 | 1.27 |
| Mira | | | 2.71 | 1.42 | 2.71 | 1.42 | 0.12 | 3.93 | 1.44 |
| Vela | | | 21.79 | 1.36 | 21.79 | 1.36 | 0.95 | 14.87 | 1.32 |
| Serpens N | | | 4.96 | 1.41 | 4.96 | 1.41 | 0.22 | 2.74 | 1.47 |
| Serpens S | | | | | | | | 10.76 | 1.34 |
| **Total 2017** | **14.04** | **1.59** | **55.88** | **1.46** | **69.91** | **1.48** | **3.33** | **67.44** | **1.57** |
| Total 2016 | 14.04 | 1.59 | 55.88 | 1.46 | 69.91 | 1.48 | 3.33 | 67.44 | 1.57 |

***3E*** *= platinum + palladium + gold*
*Totals are rounded off.*
*Resources include UM, UUM, LM, MR, LG, MMW and the Main Reef Residual layers, which is the total mineralised width for all seven layers.*
***Key assumptions for Mineral Resources:***
*Grade cut-off: 0.5 g/t*
*** *Kalplats Platinum Prospect attributable interests (ARM 46%; Stella Platinum 44% and Anglo American Prospecting Services 10%).*

## KALPLATS PGM DEPOSITS LOCALITY MAP




### YEAR-ON-YEAR CHANGE

There were no changes to the Measured, Indicated and Inferred Mineral Resources in comparison to 2016.

# ARM COAL

## GOEDGEVONDEN COAL MINE

ARM's attributable beneficial interest in Goedgevonden's operations is 26%. The other 74% is held by Glencore Operations South Africa. The joint venture with Glencore also includes other coal operations in South Africa, Participating Coal Business (PCB), in which ARM has an economic interest of 20.2%.

### Locality

Goedgevonden Mine is situated in the Witbank Coalfield about 7 kilometres south of the town of Ogies in Mpumalanga Province in South Africa.

R&R Refer to page 1 for a locality map showing the Coal Operation.

### History

A total of 548 surface diamond boreholes were drilled during 1964 to 2004 by Duiker Mining and Xstrata SA. Anglo Coal drilled an additional 102 boreholes for the Zaaiwater area. Most boreholes were drilled down to basement to define the seam locality and basement topography. Owing to the different campaigns, the database had to be validated to produce a consistent set of data.

### Competence

The following Competent Person was involved in the reporting of Goedgevonden Coal Resources and Reserves. He is employed by Glencore.

| Competent Person | Professional organisation | Membership Number | Qualifications | Relevant Experience |
|---|---|---|---|---|
| M Smith (Mineral Resources and Mineral Reserves) | SACNASP | 400075/03 | BSc Hons (Geology), MBA | 22 years |

### Mining authorisation

| Legal Entitlement | Minerals covered by Mining Right | Comment | Period of Mining Right | Known Impediments on Legal Entitlement |
|---|---|---|---|---|
| Mining Right | Coal | New Order Mining Rights were granted and subsequently registered on 22 August 2008. | 30 years | None |

## Geology

The stratigraphy of the Witbank Coalfield consists of five seams numbered from oldest to youngest: No 1 to No 5 Seam. The seams vary in thickness from less than 0.5 metres to over 6 metres and do not exceed 300 metres in depth from surface. The coal seams dip at less than 5°. However, coal seam morphology and qualities may be locally influenced by basement topography, surface weathering and intrusion of dolerite dykes and sills. The coal qualities vary both within and between individual coal seams.

Low-quality coals, suitable for the local steam coal market, have a calorific value of between 18 to 22 MJ/kg, whereas the high-quality export steam coal has a calorific value of greater than 27 MJ/kg.

All five coal seams are developed on Goedgevonden. The No 1 Seam is of low quality, thin and only developed in paleo-low areas. The No 2 Seam is extensively developed and is of good quality and is, on average, 6 metres thick. The No 3 Seam is of good quality but, with an average thickness of only 0.3 metres, is uneconomic. The No 4 Seam, being closer to surface and although of the same thickness as the No 2 Seam, is influenced by weathering and is not as extensively developed. The No 5 Seam is of good quality, but is preserved as erosional remnants on the high ground only and thus not extensively developed over the area. No major faults, structural disturbances or intrusives were observed in the boreholes drilled to date. Opencast dragline mining operations in the area are extracting the No 2, No 4 and No 5 Seams. The open-cut mine produces both export and domestic thermal coal.

## Exploration Activities

A total of 28 boreholes at a cost of R2.99 million were drilled in the 2016/2017 financial year. The cost covered drilling and laboratory analysis. The boreholes were targeting areas ahead of current mining faces. In the 2017/2018 financial year, plans are to drill a total of 30 boreholes ahead of the current mining faces at a total cost of R3.37 million.

## Mining Methods and Infrastructure

Open-cut mining methods are utilised at Goedgevonden Mine.

## Coal Resources

Borehole data for the Mine is captured into the Geobank database. Minex provides the geological and mine planning software solution for the Mine.

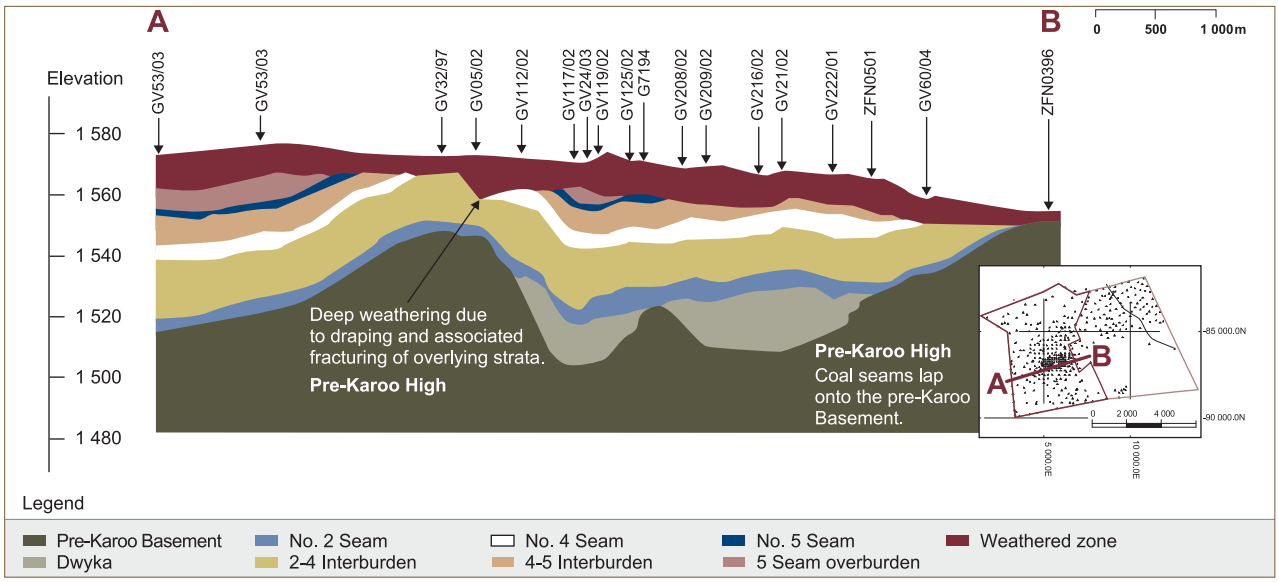
Two-dimensional resource models are generated with block sizes of 50 x 50 metres. All estimations of the individual blocks are done using inverse distance cubed with an isotropic search. Other software packages used in the evaluation are 'Washproduct' and 'Xpac'.

## Coal Reserves

Measured and Indicated Coal Resources are converted to Coal Reserves by applying the modifying factors such as mining losses, mining dilution, coal quality requirements, seam thickness cut-offs. Details of these parameters are provided in the footnotes on the Reserve tables.

The following tables show the Goedgevonden Coal Resources and Reserves obtained from Glencore, reflecting the status as at 31 December 2016. Coal Resources and Reserves of the Glencore Mines are the responsibility of the Glencore Coal Resources and Coal Reserves team.

### SECTION SHOWING GOEDGEVONDEN COAL SEAMS



ARM COAL continued

## GOEDGEVONDEN MINE: COAL RESOURCES

| * Coal Resources are reported on a 100% basis. | Coal Type and Qualities | Coal Resources | | | |
|---|---|---|---|---|---|
| | | Measured | Indicated | Measured and Indicated | Inferred |
| **Total 2017** | **Thermal Coal (Mt)**** | **540** | **13** | **553** | |
| | **CV (MJ/kg)** | **19.73** | **21.45** | **19.77** | |
| | **Ash (%)** | **32.45** | **27.88** | **32.34** | |
| | **VM (%)** | **21.78** | **22.54** | **21.80** | |
| | **S (%)** | **1.20** | **1.08** | **1.20** | |
| Total 2016 | Thermal Coal (Mt)** | 540 | 28 | 568 | |
| | CV (MJ/kg) | 19.83 | 19.20 | 19.80 | |
| | Ash (%) | 32.46 | 30.82 | 32.38 | |
| | VM (%) | 21.87 | 21.17 | 21.84 | |
| | S (%) | 1.17 | 0.83 | 1.15 | |

*Coal Resources are inclusive of those modified to produce Coal Reserves.*
*Mining method is open-cut.*
*CV – Calorific Value; VM – Volatile Matter; S – Sulphur*
*Totals are rounded off.*
***Key assumptions for Coal Resources:***
*** Coal Resources quoted on a Gross In Situ (GTIS) basis (to be reported on MTIS basis from 2018).*
*Coal Resources qualities are reported on an air dried moisture basis.*
*Geological Loss: 6%*
*Density ranges: 1.3 t/m$^3$ – 1.8 t/m$^3$*
*Seam thickness cut-off: 1 m (seams 2 and 4); 0.5 m (seams 1 and 5)*
*Qualities cut-off: Ash: 50%; VM: 20%; S: 3%*
*** Goedgevonden Coal Mine attributable interests (ARM 26%; Glencore Operations 74%).***

## GOEDGEVONDEN MINE: COAL RESERVES

| * Coal Reserves are reported on a 100% basis. | Coal Type and Qualities | Coal Reserves (ROM) | | | Coal Type and Qualities | Coal Reserves (Saleable) | | |
|---|---|---|---|---|---|---|---|---|
| | | Proved | Probable | Total Reserves | | Proved | Probable | Total Reserves |
| **Total 2017** | **Thermal Coal (Mt)** | **290** | **11** | **301** | **Thermal Coal (Mt)** | **180** | **6** | **186** |
| | **CV (MJ/kg)** | | | **19.57** | | | | |
| | **Ash (%)** | | | **31.20** | **HG Export (Mt)** | | | **84** |
| | | | | | **Export CV** | | | |
| | **VM (%)** | | | **20.71** | **(Kcal/kg)** | | | **6 000** |
| | **S (%)** | | | **1.03** | **LG Export (Mt)** | | | **102** |
| | | | | | **LG Export CV** | | | |
| | | | | | **(MJ/kg)** | | | **21.50** |
| Total 2016 | Thermal Coal (Mt) | 305 | 11 | 316 | Thermal Coal (Mt) | 200 | 6 | 206 |
| | CV (MJ/kg) | | | 19.21 | | | | |
| | Ash (%) | | | 31.20 | Export (Mt) | | | 89 |
| | | | | | *Export CV | | | |
| | VM (%) | | | 20.62 | (Kcal/kg) | | | 6 000 |
| | S (%) | | | 1.06 | Domestic (Mt) | | | 117 |
| | | | | | Domestic CV | | | |
| | | | | | (MJ/kg) | | | 21.50 |

*Saleable Coal Reserves are on a net as received moisture basis.*
*Coal Reserves qualities are reported on an air dried moisture basis.*
*Totals are rounded off.*
*Mining method is open-cut.*
*CV – Calorific Value; VM – Volatile Matter; S – Sulphur*
***Modifying factors for the conversion of Coal Resources to Coal Reserves include:***
*Mining loss factor: 6%*
*Plant Yields: **Export** – 15%; **Domestic** – 45%*
*Price used: **Short term** – based on the API4; **Long term** – Based on market related long term view and customer contracts.*
*Exchange Rate (R/US$): Market related.*
*Seam thickness cut-off: 1 m (seams 2 and 4); 0.5 m (seam 5)*
*Qualities cut-off: **Domestic:** Ash: 35%; VM: 20%; S: 1.5%. **Export:** All coal beneficiated*
*** Goedgevonden Coal Mine attributable interests (ARM 26%; Glencore Operations 74%)***

## YEAR-ON-YEAR CHANGE

Coal Resources reduced by 3% to 553 million tonnes mainly due to mining depletion.

Coal ROM Reserves decreased by 5% from 316 million tonnes to 301 million tonnes due to mining depletion as well as removal of some Coal ROM Reserves to accommodate waste dumps.

## HISTORICAL PRODUCTION AT GOEDGEVONDEN MINE

| | ROM | Saleable |
|---|---|---|
| **Financial year** | Mt | Mt |
| 2012/2013 | | 8.2 |
| 2013/2014 | | 7.3 |
| 2014/2015 | 11.9 | 8.3 |
| 2015/2016 | 9.9 | 6.5 |
| 2016/2017 | 10.8 | 6.5 |

# ARM COPPER

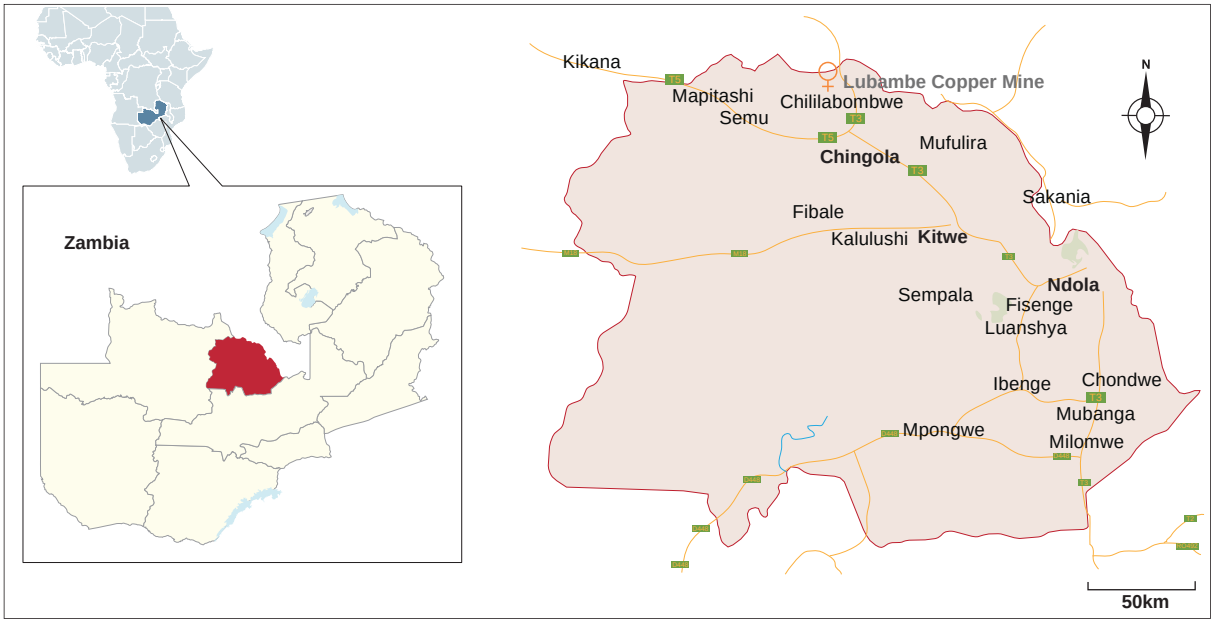
## LUBAMBE COPPER MINE

ARM's attributable beneficial interest in Lubambe Copper Mine is 40%. Vale owns 40% and ZCCM-IH 20%.

### Locality

The Lubambe Copper Mine is situated in the northern part of the Zambian Copperbelt close to the town of Chlilabombwe and adjacent to the border with the Democratic Republic of Congo (DRC). The greater Lubambe mining licence area includes the extensions of the copper mineralisation from the south and east limb of the current mine to the Konkola Basin in the south as well as the area to the east, covering the Kawiri and Kawiri North basins.

### REGIONAL MAP SHOWING LOCATION OF LUBAMBE MINE



## History

A prospective outcrop at Lubambe Mine was discovered in 1924. Since then, exploration drilling and production have been undertaken at Lubambe by companies such as Bancroft Mines Limited and ZCCM. On 27 August 2010, the Vale/ARM JV announced the development of Lubambe Copper Mine. Construction work started in September 2010. The Mine is designed to produce 2.5 million tonnes of ore per annum, resulting in 45 000 tonnes of contained copper in concentrate to be toll smelted and refined in Zambia.

## Competence

The following Competent Person was involved in the estimation of Lubambe Mine Mineral Resources and Mineral Reserves. He is employed by Lubambe Mine.

| Competent Person | Professional organisation | Membership Number | Qualifications | Relevant Experience |
|---|---|---|---|---|
| C Rose (Mineral Resources and Mineral Reserves) | SACNASP | 4000173/05 | BSc Hons (Geography), MSc (Mining Enginnering) | 26 years |

## Mining authorisation

| Legal Entitlement | Minerals covered by Mining Right | Comment | Period of Mining Right | Known Impediments on Legal Entitlement |
|---|---|---|---|---|
| Mining Licence 7061-HQ-LML | Copper, cobalt, gold, silver, selenium, tellurium and sulphur. | The revised Large Scale Mining Licence for the Lubambe Copper Project was issued in April 2011. The mining licence is bound by the Zambia/DRC border to the west, north and east and the Vedanta's Konkola Copper Mine mining licence to the south. | 25 years | None |

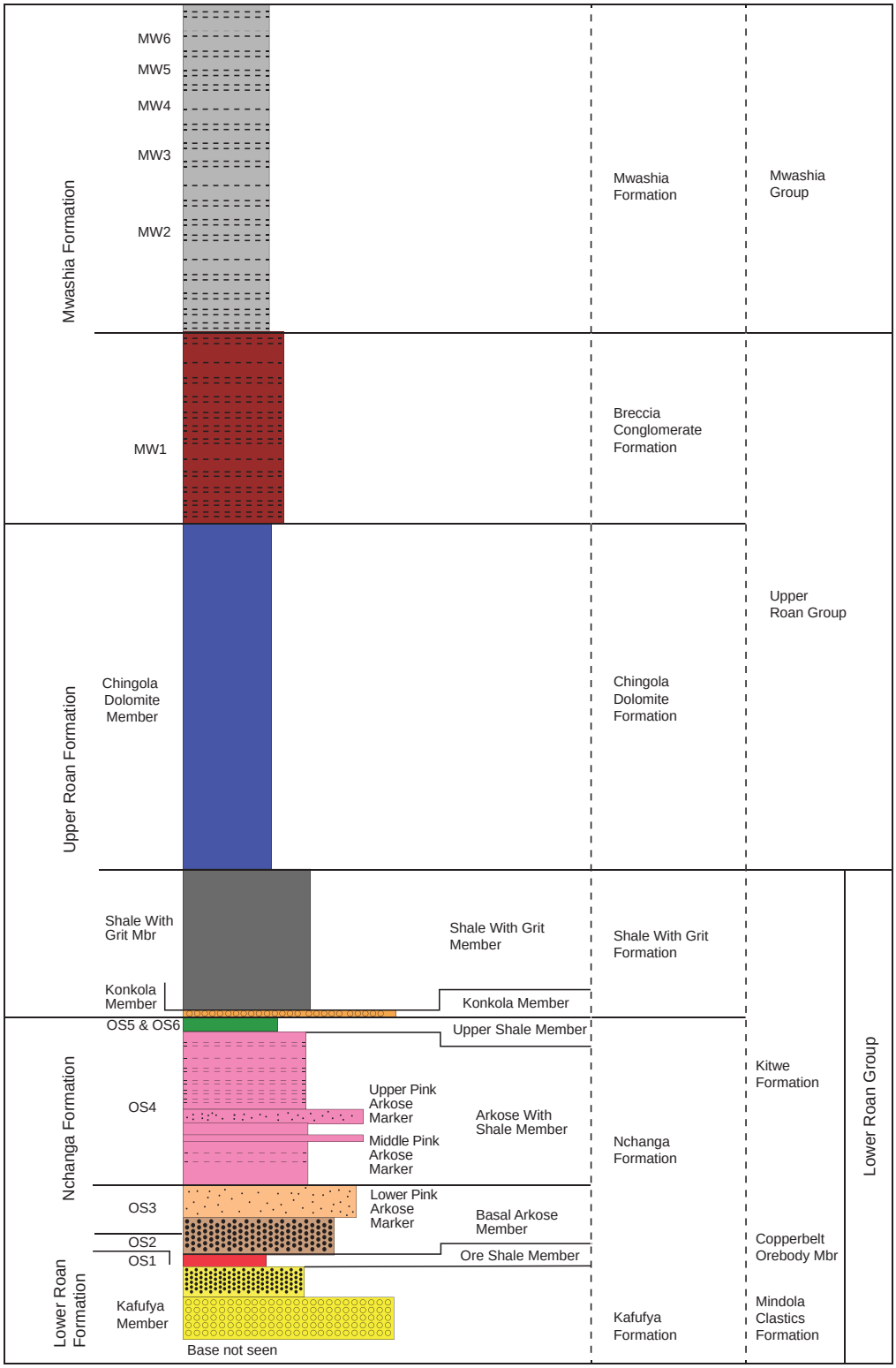
## Geology

The Lubambe copper deposit is one of approximately 30 copper/cobalt deposits occurring within the Central African Copperbelt. It is located at the north-western extremity of the Zambian portion of the Copperbelt. The deposit is hosted within sediments that accumulated in an intracratonic rift, which was subsequently closed during the Lufilian Orogeny. The deposit mineralisation is defined as the ore shale (OS) type of mineralisation. Copper mineralisation is largely hosted within the OS1 Member, whose true thickness varies from 3 to 14 metres. The lower-most 1.5 metres of the OS1 Member contains very little copper, due to leaching which preferentially occurs at the base of the OS1 where the contact between the siltstone and conglomerate/arkose represents a permeability channelway. The transition to greater than 1% total copper (TCu) is abrupt and takes place over centimetres, above a thin red iron oxide-rich marker layer, which probably acted as a redox boundary. The upper contact of the greater than 1% total copper zone (assay hanging wall) is also well-defined in the assay profile, but is not as sharp as the assay footwall contact.

Mineralisation occurs as finely disseminated sulphides along bedding planes and cleavage, in thin veinlets, and in lenticles and stringers, comprising of chalcocite, chalcopyrite, bornite, digenite, covellite, pyrite and carrollite. A large proportion of the non-sulphide copper minerals occur along fractures and veins and consist of malachite, pseudomalachite, chrysocolla, cuprite, azurite and native copper.

ARM COPPER continued

## GENERALISED GEOLOGICAL SUCCESSION OF LUBAMBE MINE



## Exploration Activities

No exploration surface drilling was conducted.

## Mining Methods and Infrastructure

Lubambe is an underground operation utilising the Longitudinal Room and Pillar mining method. The Cut and Fill mining method is being considered for mining some areas in the future.

## Mineral Resources

The 2017 Mineral Resource and Mineral Reserve declaration uses the block model developed by the Resource Geology section of the MRM Department of Lubambe Copper Mine. The grade model for the whole Lubambe Mine, was updated in March 2017 using Ordinary Kriging after undertaking an "Unfolding" process in Datamine since the deposit is folded. Ordinary Kriging represents a departure from the previous estimations, which were based on the generally accepted Zambian Copperbelt practice of inverse distance to the power of 5 (ID5). Two geological domains, East Limb and South Limb, were evaluated and classified according to the SAMREC Code into Measured, Indicated and Inferred categories using borehole sample spacing. The sample spacing used is still based on the original guidance provided by the external resource estimate conducted by AMEC in 2010. For the 2017 block model, the Selective Mining Unit (SMU) was changed to 15 x 15 x 3 metres with 3 splits (from 25 x 25 x 5 metres). The overall effect of this change has been to improve the fill of the wireframes.

The Information on which the model was based are: sampling data from both surface boreholes and shorter delineation boreholes, drilled underground, as well as mapped ore drive development. Both surface and underground diamond drill boreholes are used in grade modelling and only full ore intersections that meet the QA/QC protocols are used.

ALS Chemex in Johannesburg has been used since 2007. ALS Chemex Laboratory determines total copper content by using procedure ME-OG62, a four acid (HNO3-HClO4-HF-HCl) digestion followed by conventional ICP-AES analysis. Total copper assays include the acid soluble copper (ASCu) assay component. The ASCu content is determined by shaking the sample in 5% sulphuric acid at room temperature. The copper content is then determined by AAS. Mineral Resource classification was based on borehole spacing and geological continuity of the copper mineralisation. The reported resource is based on a cut-off of 1.5% TCu and minimum true thickness of 2 metres.

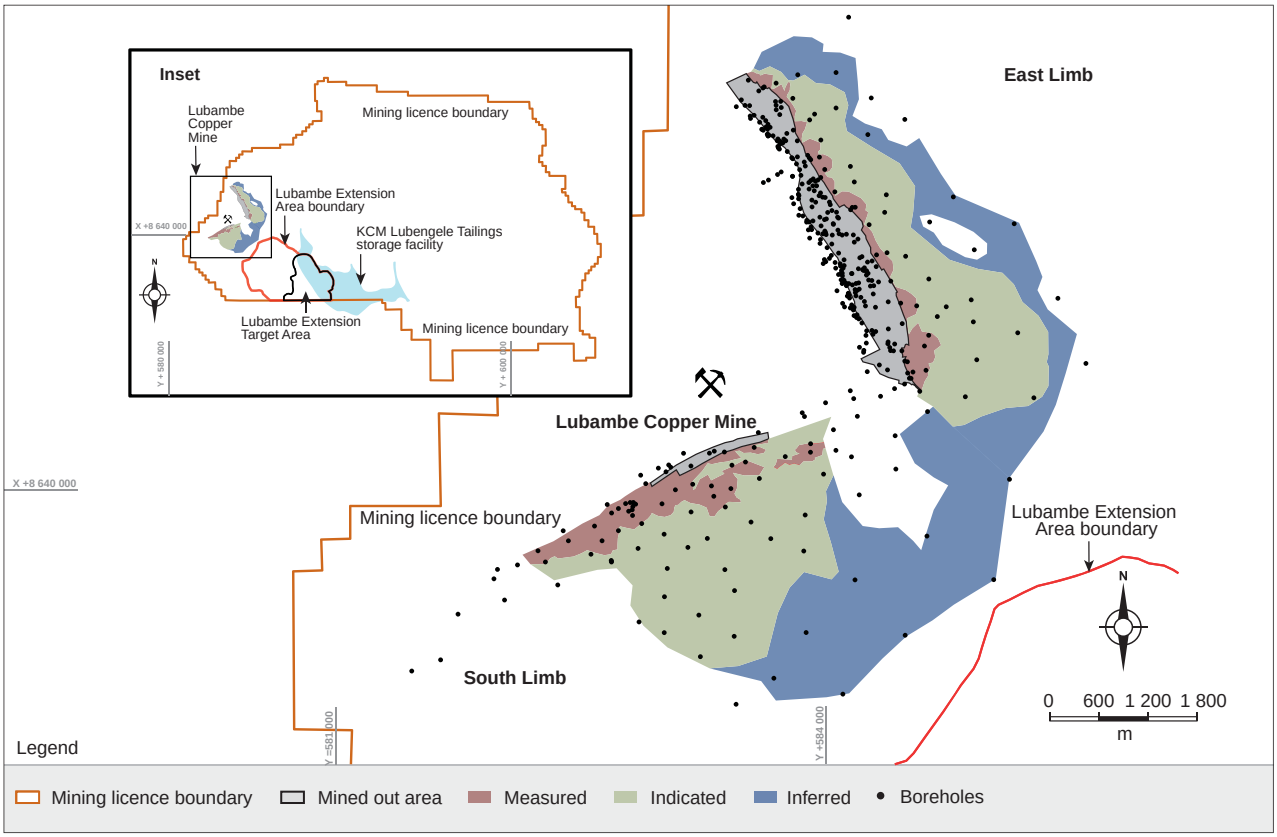
The Lubambe Extension Target area is subject to ongoing feasibility studies. The geological model for the ore body was based on a selected mineralised zone (SMZ) determined in each borehole on a 1% total copper grade over a 3 metre true thickness. Estimation into 15 x 15 metre blocks for TCu and ASCu was undertaken. The reported resource is based on a cut-off of 1.5% TCu and 4 metres true thickness.

ARM COPPER continued

## LUBAMBE MINE: COPPER MINERAL RESOURCES

| * Mineral Resources are reported on a 100% basis. | Mineral Resources | | | |
|---|---|---|---|---|
| | Mt | **TCu% | **ASCu% | Contained Cu Mt |
| **South Limb** | | | | |
| Measured | 5.7 | 2.44 | 0.72 | 0.14 |
| Indicated | 21.0 | 2.18 | 0.50 | 0.46 |
| **Measured and Indicated** | **26.7** | **2.24** | **0.55** | **0.60** |
| Inferred | 17.2 | 2.01 | 0.40 | 0.35 |
| **East Limb** | | | | |
| Measured | 3.2 | 2.62 | 0.38 | 0.08 |
| Indicated | 20.7 | 2.65 | 0.37 | 0.55 |
| **Measured and Indicated** | **23.9** | **2.65** | **0.37** | **0.63** |
| Inferred | 8.6 | 1.89 | 0.18 | 0.16 |
| **Lubambe Mine Total Resources** | | | | |
| Total Measured | 8.9 | 2.50 | 0.60 | 0.22 |
| Total Indicated | 41.7 | 2.41 | 0.44 | 1.01 |
| **Total Measured and Indicated 2017** | **50.6** | **2.43** | **0.46** | **1.23** |
| Total Measured and Indicated 2016 | 50.7 | 2.55 | 0.41 | 1.29 |
| **Total Inferred 2017** | **25.8** | **1.97** | **0.33** | **0.51** |
| Total Inferred 2016 | 22.9 | 2.22 | 0.35 | 0.51 |

*The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.*
*Totals are rounded off.*
*** TCu – Total Copper; *** ASCu – Acid Soluble Copper*
***Key assumptions for Mineral Resources:***
*Geological Loss factor applied: 5%*
*Grade and true thickness cut-off: 1.5% (TCu) and 2 metres*
*Density: 2.57 t/m³*
** **Lubambe Copper Mine attributable interests (ARM 40%; Vale 40%; ZCCM-IH 20%).***



## Mineral Reserves

The Mineral Reserves have been derived from Measured and Indicated Mineral Resources within the Life of Mine (LOM) design and classified as either Proved or Probable Mineral Reserves.

The LOM design and schedule were developed by the mine personnel and consultants. The modifying factors used for the conversion of Mineral Resources to Mineral Reserves took into consideration the mining method, mining extraction factors, mining losses, mining dilution and commodity prices amongst other parameters. Details of these parameters are provided as footnotes on the Mineral Reserve tabulations.

### LUBAMBE MINE: COPPER MINERAL RESERVES

| | Mineral Reserves | | | |
|---|---|---|---|---|
| * Mineral Reserves are reported on a 100% basis. | Mt | **TCu% | ***ASCu% | Contained Cu Mt |
| **South Limb** | | | | |
| Proved | 4.5 | 2.12 | 0.62 | 0.09 |
| Probable | 17.7 | 1.94 | 0.45 | 0.35 |
| **Proved and Probable 2017** | **22.2** | **1.98** | **0.48** | **0.43** |
| **East Limb** | | | | |
| Proved | 2.5 | 2.28 | 0.33 | 0.06 |
| Probable | 16.3 | 2.31 | 0.32 | 0.38 |
| **Proved and Probable 2017** | **18.9** | **2.31** | **0.32** | **0.44** |
| **Lubambe Mine Total Reserves** | | | | |
| Total Proved 2017 | 7.0 | 2.18 | 0.52 | 0.15 |
| Total Probable 2017 | 34.0 | 2.12 | 0.39 | 0.73 |
| **Total Reserves 2017** | **41.0** | **2.13** | **0.41** | **0.87** |
| Total Reserves 2016 | 45.4 | 2.18 | 0.32 | 1.00 |

*Totals are rounded off.*
*** TCu – Total Copper; *** ASCu – Acid Soluble Copper*
***Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:***
*Mining Loss Factor: 22% (Longitudinal Room and Pillar); 5% (Cut and Fill)*
*Mining extraction factor: 70.9%*
*Mining dilution: 14.3%*
*Plant Recovery: 83% (Average)*
*Price (US$/t):* ***Cu:*** *6 614*
*Exchange Rate (ZMW/US$): 10.0*
* ***Lubambe Copper Mine attributable interests (ARM 40%; Vale 40%; ZCCM-IH 20%).***

## LUBAMBE EXTENSION AREA: COPPER MINERAL RESOURCES

| * Mineral Resources are reported on a 100% basis. | Mineral Resources | | | |
|---|---|---|---|---|
| | Mt | **TCu% | ***ASCu% | Contained Cu Mt |
| **^Lubambe Extension Target Area** | | | | |
| **Indicated 2017** | **90.0** | **3.73** | **0.56** | **3.36** |
| Indicated 2016 | 90.0 | 3.73 | 0.56 | 3.36 |
| **Inferred 2017** | **44.0** | **4.78** | **0.29** | **2.10** |
| Inferred 2016 | 44.0 | 4.78 | 0.29 | 2.10 |
| **Lubambe Extension (Outside Target Area)** | | | | |
| **Inferred 2017** | **79.0** | **2.80** | **1.44** | **2.21** |
| Inferred 2016 | 79.0 | 2.80 | 1.44 | 2.21 |

*^ Lubambe Extension Target Area is a portion of the Lubambe Extension Area.*
*Totals are rounded off.*
*** TCu – Total Copper; ** ASCu – Acid Soluble Copper*
***Key assumptions for Mineral Resources:***
*Geological Loss factor applied: 5%*
*Grade and true thickness cut-off: 1.5% (TCu) and 4 metres*
*Density: 2.57 g/cm$^3$*
** **Lubambe Copper Mine attributable interests (ARM 40%; Vale 40%; ZCCM-IH 20%).***

### YEAR-ON-YEAR CHANGE

The Measured and Indicated Mineral Resources for Lubambe Copper Mine decreased slightly from 50.7 million tonnes at 2.55% TCu to 50.6 million tonnes at 2.43% TCu. The lower grade is mainly due to re-evaluation using Ordinary Kriging instead of Inverse Distance estimation techniques.

The Mineral Reserves decreased to 41.0 million tonnes at a grade of 2.14% TCu compared to 45.4 million tonnes at 2.18% TCu in 2016 due to mining depletion and the decrease in TCu grade which prevented some areas from making the 1.5% TCu reserve cut-off grade.

Lubambe Extension Mineral Resources remained unchanged as no additional drilling was undertaken in the area.

### HISTORICAL PRODUCTION AT LUBAMBE MINE

| Financial year | ROM | |
|---|---|---|
| | Mt | TCu% |
| 2012/2013 | 0.96 | |
| 2013/2014 | 1.56 | |
| 2014/2015 | 1.60 | |
| 2015/2016 | 1.22 | |
| 2016/2017 | 1.01 | 2.13 |

# GOLD: HARMONY

ARM owns 14.5% of Harmony's issued share capital. Harmony is separately run by its own management team. Mineral Resources and Mineral Reserves of the Harmony mines are the responsibility of the Harmony team and are published in Harmony's Annual Report.

The report can be found on **www.harmony.co.za**.

# CONTACT DETAILS

## African Rainbow Minerals Limited

Registration number: 1933/004580/06
Incorporated in the Republic of South Africa
JSE share code: ARI
ADR ticker symbol: AFRBY
ISIN: ZAE000054045

## Registered and Corporate Office

ARM House
29 Impala Road
Chislehurston
Sandton
2196

PO Box 786136, Sandton, 2146

Telephone: +27 11 779 1300
Fax: +27 11 779 1312
E-mail: ir.admin@arm.co.za
Website: **www.arm.co.za**

## Company Secretary

Alyson D'Oyley, BCom, LLB, LLM
Telephone: +27 11 779 1300
Fax: +27 11 779 1312
E-mail: alyson.doyley@arm.co.za

## Business Development

Stompie Shiels
Executive: Business Development
Telephone: +27 11 779 1476
Fax: +27 11 779 1312
E-mail: stompie.shiels@arm.co.za

## Investor Relations

Jongisa Magagula
Corporate Development and Head of Investor Relations
Telephone: +27 11 779 1507
Fax: +27 11 779 1312
E-mail: jongisa.magagula@arm.co.za

## Auditors

External auditor: Ernst & Young Inc.
Internal auditor: KPMG

## Bankers

ABSA Bank Limited
FirstRand Bank Limited
The Standard Bank of South Africa Limited
Nedbank Limited

## Sponsors

Deutsche Securities (SA) Proprietary Limited

## Transfer Secretaries

Computershare Investor Services Proprietary Limited
Rosebank Towers
15 Biermann Avenue
Rosebank, 2196

PO Box 61051, Marshalltown, 2107

Telephone: +27 11 370 5000
Fax: +27 11 688 5222
E-mail: web.queries@computershare.co.za
Website: www.computershare.co.za

## Directors

P T Motsepe (Executive Chairman)
M P Schmidt (Chief Executive Officer)
F Abbott*
M Arnold
Dr M M M Bakane-Tuoane*
T A Boardman*
A D Botha*
J A Chissano (Mozambican)*
W M Gule*
A K Maditsi*
H L Mkatshana
J P Möller*
D C Noko*
Dr R V Simelane*
J C Steenkamp**
Z B Swanepoel*
A J Wilkens

* *Independent Non-executive*
** *Non-executive*

### FORWARD LOOKING STATEMENTS

Certain statements in this report constitute forward-looking statements that are neither reported financial results nor other historical information. They include but are not limited to statements that are predictions of or indicate future earnings, savings, synergies, events, trends, plans or objectives. Such forward-looking statements may or may not take into account and may or may not be affected by known and unknown risks, uncertainties and other important factors that could cause the actual results, performance or achievements of the Company to be materially different from the future results, performance or achievements expressed or implied by such forward-looking statements. Such risks, uncertainties and other important factors include among others: economic, business and political conditions in South Africa; decreases in the market price of commodities; hazards associated with underground and surface mining; labour disruptions; changes in government regulations, particularly environmental regulations; changes in exchange rates; currency devaluations; inflation and other macro-economic factors; and the impact of the HIV & Aids epidemic in South Africa. These forward-looking statements speak only as of the date of publication of these pages. The Company undertakes no obligation to update publicly or release any revisions to these forward-looking statements to reflect events or circumstances after the date of publication of these pages or to reflect the occurrence of unanticipated events.

STUDIO 5


www.arm.co.za