MERAFE
RESOURCES



APPENDIX 1

MINERAL RESOURCES AND MINERAL RESERVES REPORT

31 DECEMBER 2018

P-J GRÄBE/JANUARY 2019

MINERAL RESOURCE AND MINERAL RESERVE STATEMENT

INTRODUCTION

The purpose of this report is to document the Mineral Resources and Mineral Reserves of Merafe Resources (Merafe) in accordance with the requirements of the SAMREC Code (The South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves (2016). All Merafe's operations are part of a pooling and sharing venture (PSV) with Glencore Operations South Africa (Pty) Ltd (hereafter called the Venture). Merafe has a 20.5% participation interest in the Mineral Resources and Mineral Reserves of the Venture. The estimates in this document are as at the 31st December 2018. The mined-out limits have been kept as at the end of June 2018. To arrive at a Mineral Resource and Mineral Reserve estimate for 31st December 2018, the budgeted production for July 2017 to December 2018 has been deducted from the total estimates. The Mineral Resource and Mineral Reserve information in the tables on the following pages is based on information compiled by Competent Persons (as defined by the SAMREC Code). The reference in the side column refers to the applicable requirement for the JSE listing rules, Section 12 (Mineral Companies).

12.11 (i) (2)

STATEMENT BY COMPETENT PERSON

The Mineral Resource and Mineral Reserve statement has been reviewed and the relevant data extracted and compiled by Pieter-Jan Gräbe (PJG). PJG is the Lead Competent Person, registered with the South African Council for Natural Scientific Professions (SACNASP, Private Bag X450, Silverton, 0127), Reg. No. - 400177/87 and holds a BSc. Hons. degree in Geology as well as a NHD in Metalliferous Mining. PJG is a geologist with 33 years' experience in mineral exploration and mining geology, directly linked to the mining industry and currently a full time employee of Glencore Operations South-Africa. PJG consents to the inclusion in this report of the matters based on this information in the form and context in which it appears.

12.11 (i) (5)

12.11 (i) (6)

Pieter-Jan Gräbe
Glencore Operations South Africa (Pty) Ltd
PO Box 2131
Rustenburg, 0300
NW, RSA
Tel: (014) 590 2416

DEFINITIONS

The following definitions (as per the SAMREC Code 2016), have been applied in estimation and categorization of the Mineral Resources and Mineral Reserves disclosed within this document.

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.

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.

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.

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.

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 **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.

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.

BRIEF DESCRIPTION OF EXPLORATION ACTIVITIES

The Venture's exploration activities aim to increase geological knowledge and confidence in its Mineral Resource base and to comply with legislative requirements. Exploration is done on two fronts; exploration drilling ahead of operations in current mining areas to support the mining activities, whilst project areas are explored to define and quantify new resources. *12.11 (iii) (1)*

Exploration is carried out on an annual basis, primarily through the drilling of vertical exploration drillholes. Geophysical surveys (mainly airborne magnetic surveys) have been conducted on all major operating mines and projects. The bulk of the exploration drillholes are drilled, as far as possible, on a pre-determined grid whilst further drillholes are drilled to target geological anomalies and to provide geological and geotechnical information to support effective mine planning.

A total of R13.302m was spent on drilling 15 357m of surface exploration drillholes for the Venture's operations and projects in FY2018. The exploration drilling is outsourced to a third party.

No feasibility studies were conducted during the reporting period on any of the ventures mines or projects. *12.11 (iii)(9)*

GEOLOGICAL SETTING

The Venture's chrome ore-bodies occur in the Bushveld Complex and its silica deposit occurs in the Magaliesberg Formation of the Transvaal Super Group (Figure 1). Both these geological occurrences are found in South Africa. Chrome ore is mined from both underground (mostly) and opencast workings, whilst silica is mined opencast only. *12.11 (iii) (2)*

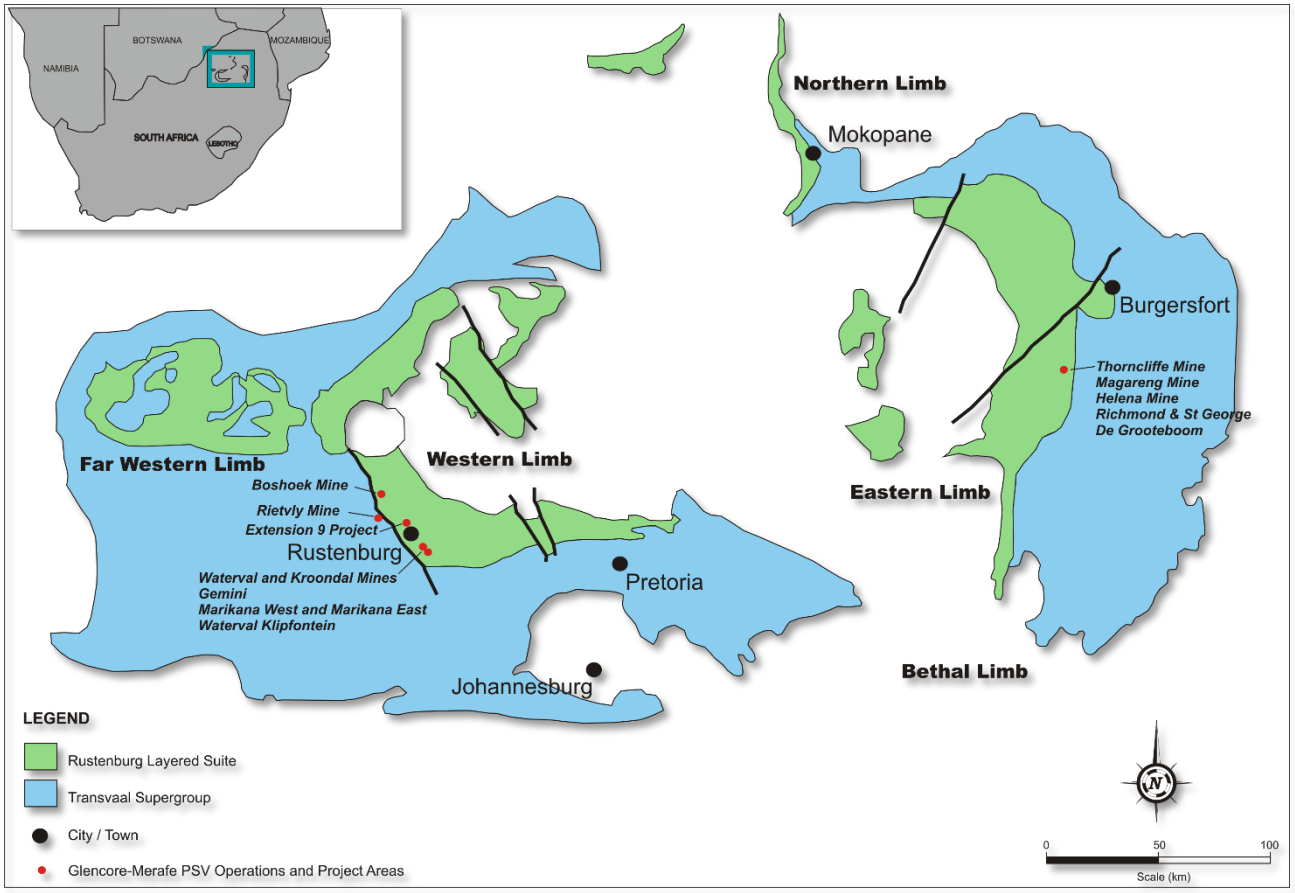


Figure 1: Location of the Venture's Operations

The Bushveld Complex

The 2 billion year old Bushveld Complex ("the Complex") is the world's largest known layered igneous intrusion and covers an area of 65 000km^2. The Complex is host to the majority of the world's PGM, chromite and vanadium resources.

The Complex is divided into five compartments; the western limb, the eastern limb, the northern limb, the far western limb and the Bethal limb (Figure 1). Merafe has operations on the Eastern - and Western Limbs of the complex. The Bushveld Complex is divided vertically into four suites of rocks; the Rooiberg Group, the Rustenburg Layered Suite, the Rashoop Granophyre Suite and the Lebowa Granite Suite. The mafic Rustenburg Layered Suite hosts the chromite deposits of the complex in the highly continuous chromitite layers of the Critical Zone. The complex reaches a vertical thickness of up to 9 000m. The Critical Zone contains 14 individually recognisable chromitite layers with varying thicknesses and grades. The primary chromitite layers targeted for chromite extraction are the LG6A and LG6 Chromitite Layers, usually mined as a package, and the MG1 Chromitite Layer. The LG6 Package consists of the lower LG6 Chromitite Layer, which is separated from the LG6A Chromitite

Layer by a pyroxenite (waste) middling. The MG1 Chromitite Layer consists of a single chromitite layer, with occasional discontinuous internal waste partings.

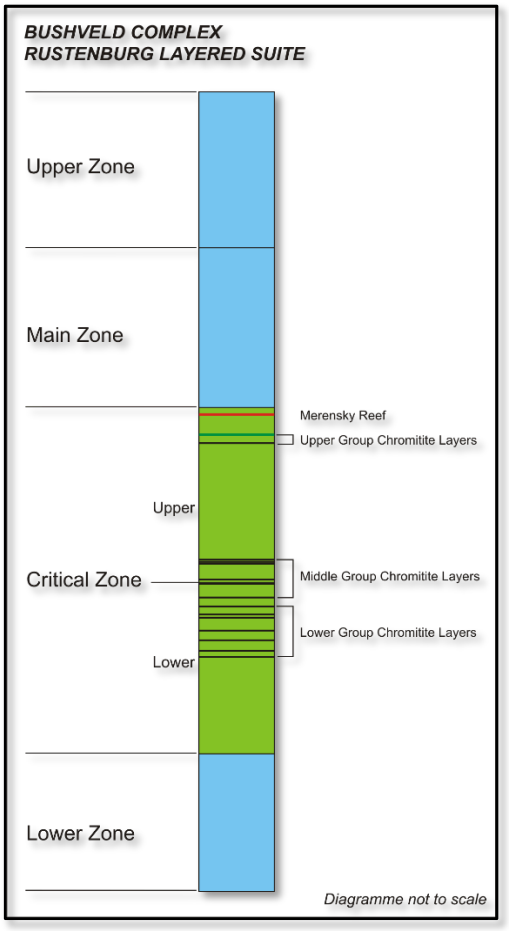


Figure 2: Schematic stratigraphy of the Rustenburg Layered Suite with special reference to the chromitite layers.

Magaliesberg Formation

The Magaliesberg Formation is made up of a package of individual layers of shale, quartzite and hornfels, which form a sub-formation of the Pretoria Group of the Transvaal Supergroup. The quartzite layers of the formation were formed by the deposition of sandstone sediments into the Transvaal Basin around 2.2 billion years ago. The Magaliesberg Formation is a massive sequence of quartzite and minor hornfels lithologies reaching a few hundred meters in thickness. The predominantly quartzite rocks form a prominent topographical ridge (mountain range) around the rim of the Bushveld Complex.

The Rietvly deposit is situated just to the west of Rustenburg town. The ore-body strikes north-south and dip towards the east at dip angles varying between 32^0 and 62^0. Jointing throughout the formation is prominent. The quartzite is very pure, with an average SiO_2 content of over 90%. There are no indications on surface of major geological disturbances. The Rustenburg Fault is developed to the southeast of the mine (just off the mine property).

TYPE OF MINING AND MINING ACTIVITIES

12.11 (iii) (3)

The Venture has chrome mining operations along the Western - and Eastern Limbs of the Bushveld Complex. The operations along the Western Limb of the Bushveld Complex comprise the Waterval - and Kroondal Mines. The LG6 Package at both Waterval and Kroondal Mine is mined underground using trackless mining methods on a Bord-and-Pillar lay-out.

Boshoek Mine is 20km north-west of Rustenburg. The MG1, LG5 and LG6 Chromitite Layers have been mined in several open pits. The opencastable ore has mostly been depleted and the mine has been put on care and maintenance.

Townlands Extension 9 is an exploration project. A Retention Permit has been applied for in Nov 2017. The DMR accepted the application and the Venture is now awaiting the granting which will mean that no exploration costs have to be expended on the project for the next 3 years.

Thorncliffe -, Magareng - and Helena Mines are situated along the southern portion of the Eastern Limb of the Bushveld Complex. The MG1 Chromitite Layer is being mined underground using trackless mining methods on a Bord-and-Pillar mining lay-out. The De Grooteboom property lies contiguous and immediately north of Thorncliffe Mine and as such form part of the Eastern Chrome Mines Complex, which are covered by one Mining Right. Thorncliffe Mine started mining in March 1997, building up to a steady state production of 113kt/m ROM (current 3 year budget). Helena Mine started producing in November 2008 and Magareng in Oct 2010. Both Magareng and Helena Mines are currently producing at a steady state of 111kt/m of ROM (current 3 year budget). Thorncliffe, Magareng and Helena Mines are situated within the same Mining Rights area but are situated on different farm properties. A Conversion application from a Prospecting Right to a Mining Right has been submitted to the DMR for an exploration project on the farms of St George and Richmond. This Mining Right will be incorporated into the Eastern Chrome Mines Mining Right. In parallel, a renewal application for the current Prospecting Right on these properties has been submitted, to ensure the right remains secured.

The Ventures silica deposit lies 15km west of Rustenburg. Rietvly Silica is an opencast mine. The quartzite is mined mainly to supply the Ventures furnaces with silica.

ORE PRODUCTION

12.11 (iii) (4)

The Venture has mined 5.628Mt ROM ore from 1st January 2018 to 31st December 2018 against a budget of 5.755Mt. The main ROM production challenges for 2018 was a sweepings contracts that was not finalized, mechanical breakdowns, geological conditions, section 54's and power outages. The sum total of these contributions amounted to -417kt. More efficient underground mining realised a gain of 290kt for the year. Saleable chrome concentrate amounted to 3.288Mt against a budget of 3.355Mt.

The estimates in this statement reflect the Mineral Resources and Mineral Reserves as at the 31st December 2018.

LEGAL ENTITLEMENT

All new order mining rights applications, mining right conversions, prospecting rights conversions and new order prospecting rights for all the main operating units, have been granted and executed by the Department of Mineral Resources. *12.11 (iii) (5)* *12.11 (iii) (10)*

Certain Section 102 and Section 11 applications under the MPRDA (Minerals and Petroleum Resources Development Act) remain in the ordinary administrative process, and the Venture has little reason to believe these will not be granted in due course.

DESCRIPTION OF THE METHOD AND ASSUMPTIONS MADE TO ESTIMATE MINERAL RESOURCES AND MINERAL RESERVES

Chrome

12.11 (iii) (7)

Raw geological data is validated through various steps and routines before finally being compiled into a final corporate network based database. The database data is statistically and geostatistically analysed to determine the inherent characteristics and variability of the data. The ore-body characteristics that are analysed are the distribution and variability of the thickness and SG's of the various chromitite layers as well as all the critical grade elements (Cr_2O_3, FeO_{total} and SiO_2). The results of the geostatistical analysis are used as input parameters for the creation of grade and thickness block models covering the entire mining or project areas. The block models form the basis from which the tonnage and grades are reported for the various Mineral Resource and Mineral Reserve blocks and categories.

The Mineral Resource categories are based on the data point density as well as the structural geology. A data point density of approximately 200m x 200m and less is used for the classification of measured Mineral Resources. For indicated Mineral Resources a density of between 200m and 400m are used. Inferred Mineral Resources is classified where the sample point density is wider than 400m x 400m. Geologically complex areas where high variability's are anticipated are downgraded to reflect the confidence in the geoscientific knowledge and certainty. The geostatistical analysis of the exploration data in all the mines and projects have indicated semi-variogramme ranges of at least 250m increasing to 2 000m. Geological structural characteristics are used in addition to support the drilling density. Geologically complex areas are drilled at denser drill spacing's. Other factors that are taken into consideration are regional geology and the proximity of other operating or work-out mines and projects. All the non-mineralised areas, and areas that may not be mined for various legislative or other reasons are excluded from the Mineral Resources, e.g. boundary pillars, crown pillars, large potholes, transgressive geological bodies, fault zones, etc.

The Mineral Reserves are estimated by applying modifying factors to convert the Indicated Mineral Resources to Probable Mineral Reserves and the Measured Mineral Resources to Proved Mineral Reserves. The following modifying factors are used; - an estimated geological loss factor (determined by losses in historically mined-out areas and projected forward), the predetermined mining extraction rate, ore losses and ore contamination from mining over break. The Mineral Reserve areas are restricted to the 5-year detailed mine plan, except in the case of Waterval, Thorncliffe and Kroondal Mine. In these cases the LOM plans form the basis for the Mineral Reserves.

The Mineral Resources and Mineral Reserves are reported per Mining Right and/or farm boundary areas and not necessarily per mine.

Silica

The silica Mineral Resources are estimated by modelling the quartzite hill that is being mined. The volume of the quartzite hill is determined from the 1340m level (amsl) to the topographical surface as at the end of June 2018. The topographical surface is reconstructed every year by clipping the mining depletion. The remaining volume is multiplied by the assayed SG for the Rietvly quartzite to

determine the in-situ tonnage.

The quartzite is exposed by the opencast mine workings as well as along the original slopes of the hill. The exploration core bore-holes, the beneficiation process, the quartzite exposed along the slopes of the hill as well as excavations from mining have been used as criteria for classifying the deposit as an Indicated Mineral Resource. The Mineral Reserves have been declared for an opencast mining period of 5 years. The 5 year mine plan has been updated during 2017.

COMPARISON OF MINERAL RESOURCE AND MINERAL RESERVE ESTIMATES WITH PREVIOUS YEAR'S ESTIMATES

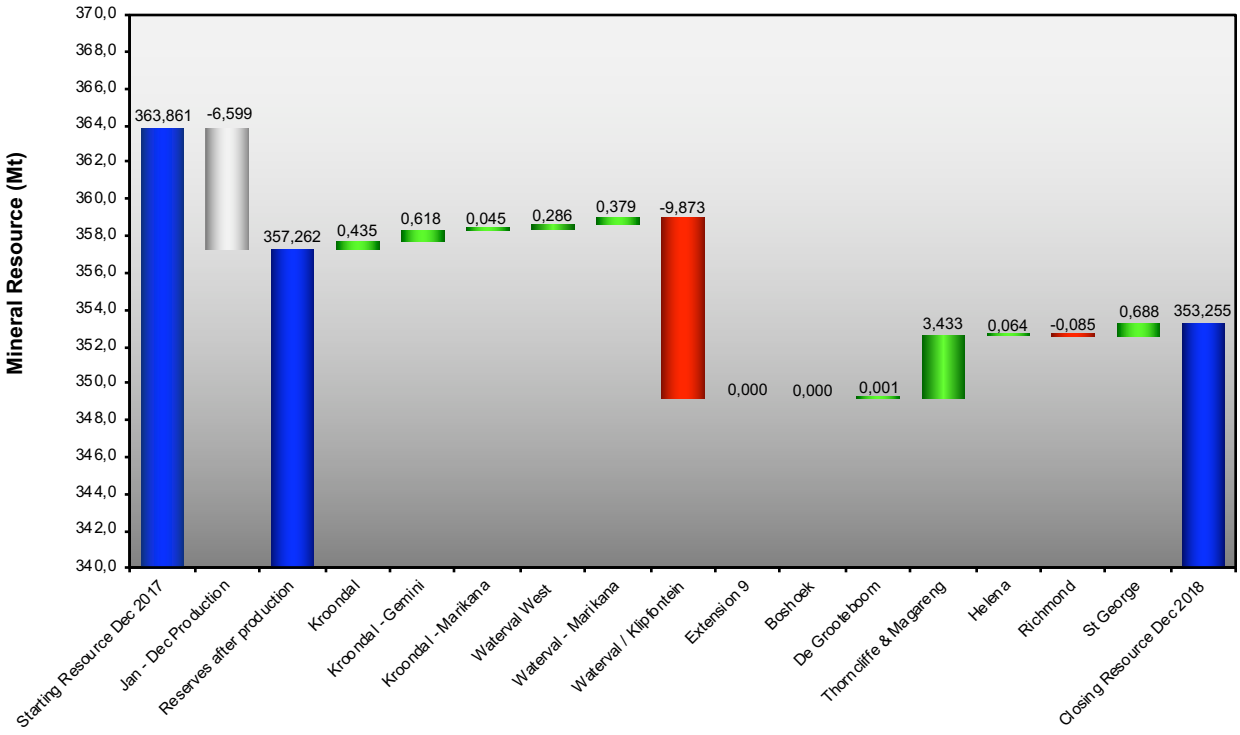
12.11 (iii) (4)

The annual Mineral Resource and Mineral Reserve estimates are compared with the previous year's statement and reconciled each year after the estimates have been finalized. Changes in the year on year tonnage and grade estimates are mainly due to mining depletion and changes in the Mineral Resource and Mineral Reserves tonnages and grades due to additional geological information. In addition, sold or un-renewed rights will also impact total resources and reserves.

Mineral Resource Reconciliation

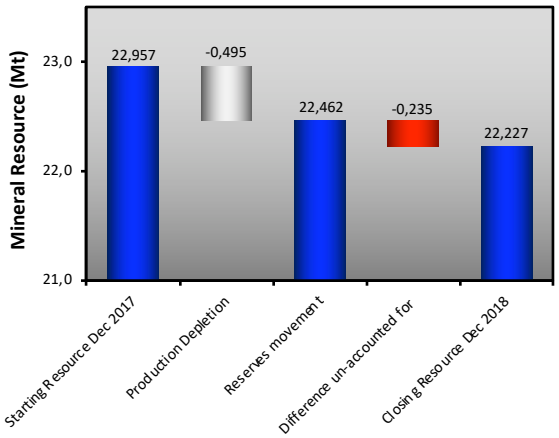
The biggest contribution to the year-on-year change in the Mineral Resource tonnages for the Venture is mainly due to the disposal of portions of the Klipfontein/Waterval and the Kroondal Gemini resource blocks in favour of Lanxess Chrome Mining (Pty) Ltd ("LCM"). The Venture will be compensated for these resources as and when LCM mine the resources. The disposed resource blocks amount to 8.098Mt.

The graphs below indicate the year-on-year net Mineral Resource movements.



An application for the extension of the prospecting rights of two properties, Richmond and St George, lying downdip of Helena and Thorncliffe farms have been logged. In addition an application has been logged to incorporate the St George and Richmond properties into the Eastern Chrome Mines Mining Right. This report includes Mineral Resources for St George and Richmond as extensions of the Thorncliffe and Helena Mineral Resources.

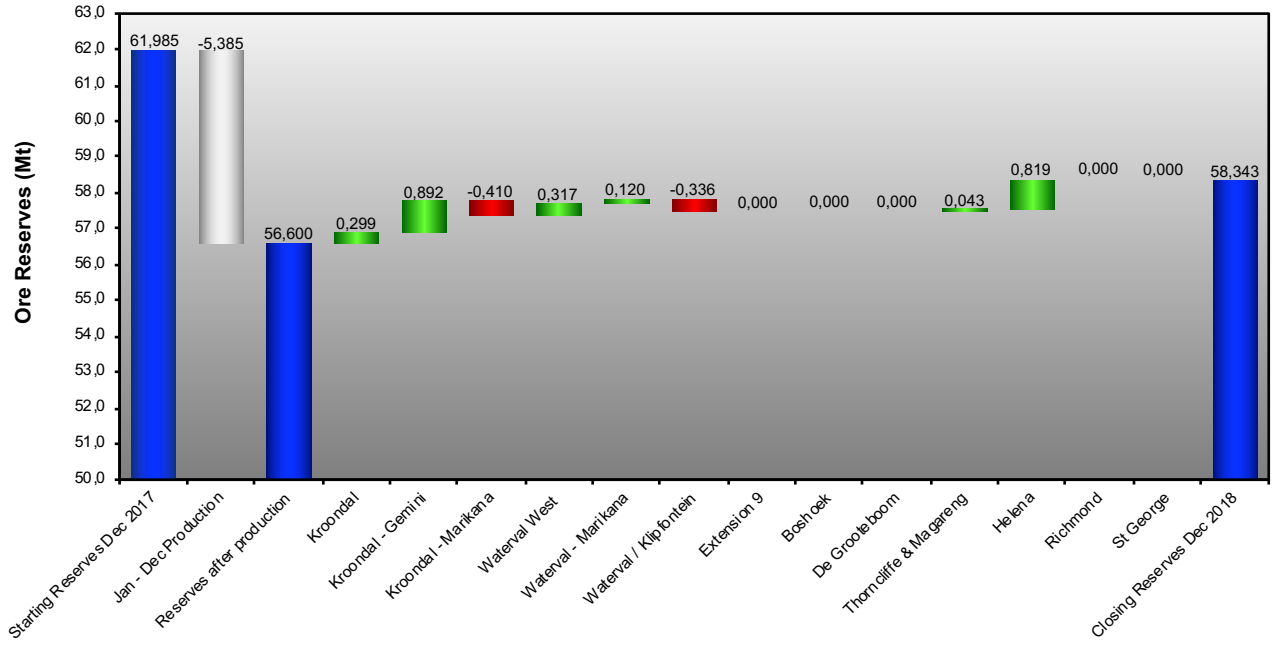
There is no material difference in the silica Mineral Resource estimate from December 2017 to December 2018 and the change is entirely attributed to mining depletion. The graph below shows the year-on-year Mineral Resource movement of Rietvly Silica.



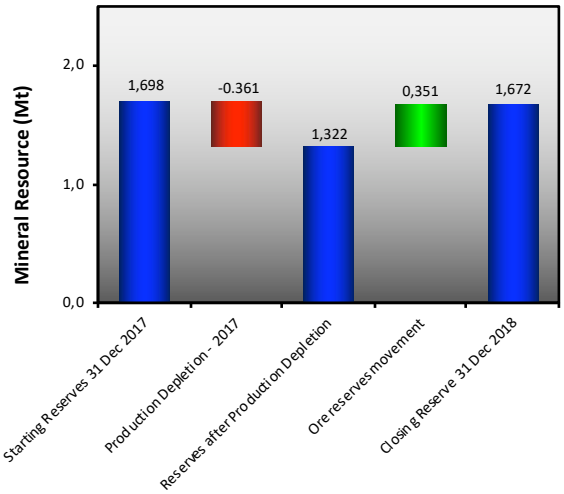
Mineral Reserve Reconciliation

The most significant changes in the year on year estimation of the Mineral Reserves recorded at the western limb operations is the mining footprint in the Kroondal - Marikana and Waterval / Klipfontein properties. A significant increase along the eastern limb was the result of additional Indicated and Measured Mineral Resources that previously fell in the Inferred Resources category. These resources could previously not be modified to Mineral Reserves as per the code requirements.

The graphs below indicate the year-on-year net Mineral Reserve movements.



The change in the Mineral Reserves for Rietvly is mainly as a result of mining depletion. The graph below shows the year-on-year Mineral Reserve movement for the Rietvly Silica operation.



AUDITING

An internal audit was conducted on the 2018 resource and reserves estimation process during November 2018. A number of minor issues have been identified of which most has been addressed and the balance to be addressed during the 2019 R&R estimation cycle. The findings had no material impact on the total resource and reserve base.

STATEMENT REGARDING INFERRED MINERAL RESOURCES AND FEASIBILITY STUDIES

No feasibility studies were conducted during the reporting period on any of the mines or projects and hence no inferred Mineral Resources have been included in any feasibility studies. *12.11 (iii) (1)*

No Inferred Mineral Resources have been modified to Mineral Reserves. *12.11 (iii) (9)*

MATERIAL RISK FACTORS

There are no foreseen material risk factors that could affect the validity of the current Mineral Resource and Mineral Reserve statement. All the legislative requirements have been met with respect to the rights to mining and prospecting for which the Mineral Resources and Mineral Reserves have been reported. All the operating mines are mining under new order, executed, Mining Rights. The Prospecting Rights of all the prospecting areas have been converted to new order Prospecting Rights. *12.11 (iii) (10)*

SUMMARY OF ENVIRONMENTAL FUNDING AND MANAGEMENT

All Venture operations have developed and implemented their own environmental management programs (EMP), and systems which are fully aligned with ISO 14001 and the ICMM principles of sustainable development. *12.11 (iii) (13)*

Baseline environmental, biodiversity and landscape function studies are conducted at the feasibility or exploration phase of projects and environmental risk assessments associated with impacts on environment, biodiversity and landscape functions are undertaken for new operations or major changes to existing operations. Information from these studies is used, in consultation with the affected parties and concerned external stakeholders, for the development and implementation of environmental, biodiversity and landscape function management systems and programmes.

All operations report in a centralised database on all the Global Reporting Index (GRI4) requirements, which include energy consumption, water, waste, soil and air emissions. Various audits are conducted across the operations. These range from internal audits to third party external audits which includes legal compliance. The Venture also makes use of specialist reports where necessary.

The Venture sets targets and effectively measures environmental performance against such targets and benchmarks their performance against leading practices in the industry. Such targets and performances are reviewed at regular intervals to ensure continual improvement of environmental performance. The Venture has introduced KPI's on the implementation of water and energy management plans.

All employees are coached and trained regarding the efficient use of natural resources, reducing input material and waste.

All mining operations closure plans and quantified closure cost were originally estimated by an external consultant as per the DMR Quantum Regulations.

During the period of 2016 and 2017 the Venture commenced with a project to re-assess the associated cost as per the new Financial Provision Regulations published in 2015 and this has been included in the provision for rehabilitation for the period 2017. The provision has been audited by an external auditor during 2017.

Merafe Ferrochrome and Mining (Pty) Ltd's 20.5% share of the Venture's provision for rehabilitation is set out in note 10 in Merafe 2018 Annual Financial Statements on pages 54 and 55. The Merafe 2018 Annual Financial Statements are on the Merafe website and form part of the Merafe 2018 online Integrated Annual Report.

The Closure and Rehabilitation plans for all operations were update during 2018 to determine the associated closure cost and required provision for rehabilitation. The provision has been audited by an external auditor during 2018.

MINERAL RESOURCES AND MINERAL RESERVES STATEMENT

The reporting date for the Mineral Resources and Mineral Reserves is the 31st December 2018.

The Mineral Resources and Mineral Reserves are reported as ROM (pre beneficiation plant) on a total basis with the attributable interests indicated. *12.11 (i) (3)*

Chrome Mineral Resources

Name of operation	Attributable Portion	Mining method	Commodity	Measured Mineral Resources		Indicated Mineral Resources		Measured and Indicated Resources		Inferred Mineral Resources		Competent Person
				31.12.18	31.12.17	31.12.18	31.12.17	31.12.18	31.12.17	31.12.18	31.12.17	
BUSHVELD COMPLEX - WESTERN LIMB												
WESTERN CHROME MINES - LG6 Chromitite Package and MG1 Chromitite Layer												
Waterval	20.50%	UG	Ore (Mt)	16.231	16.044	1.02	0.98	17.26	17.03	0.7	0.6	MM/DR
			Cr_2O_3 (%)	41.31	41.30	42.6	42.6	41.4	41.4	43	43	
Marikana West	20.50%	UG	Ore (Mt)	2.947	2.827	1.69	1.60	4.64	4.43	-	-	MM/DR
			Cr_2O_3 (%)	42.44	42.44	42.6	42.6	42.5	42.5	-	-	
Kroondal	20.50%	UG/OC	Ore (Mt)	8.590	8.803	1.57	1.57	10.16	10.37	-	-	MM/DR
			Cr_2O_3 (%)	42.84	42.70	41.6	41.6	42.6	42.5	-	-	
Kroondal Gemini	20.50%	UG/OC	Ore (Mt)	10.037	10.649	4.96	4.42	15.00	15.07	-	-	MM/DR
			Cr_2O_3 (%)	42.56	42.59	41.4	41.6	42.2	42.3	-	-	
Marikana East	20.50%	UG	Ore (Mt)	4.193	4.196	0.79	0.78	4.98	4.98	-	-	MM/DR
			Cr_2O_3 (%)	42.25	42.25	41.8	41.8	42.2	42.2	-	-	
Klipfontein/Waterval	20.50%	UG	Ore (Mt)	9.952	11.729	16.92	16.98	26.87	28.71	106.9	115.0	MM/DR
			Cr_2O_3 (%)	42.10	42.12	42.0	42.0	42.0	42.0	42	42	
Boshoek	20.50%	OC/UG	Ore (Mt)	-	-	17.09	17.09	17.09	17.09	-	-	MM/DR
			Cr_2O_3 (%)	-	-	40.5	40.5	40.5	40.5	-	-	
Townlands Extension 9	20.50%	UG	Ore (Mt)	-	-	12.94	12.94	12.94	12.94	-	-	MM/DR
			Cr_2O_3 (%)	-	-	41.4	41.4	41.4	41.4	-	-	
Total			**Ore (Mt)**	**51.951**	**54.248**	**57.00**	**56.38**	**108.95**	**110.63**	**107.6**	**115.6**	
			Cr_2O_3(%)	**42.10**	**42.09**	**41.4**	**41.4**	**41.7**	**41.7**	**42**	**42**	

BUSHVELD COMPLEX - EASTERN LIMB

EASTERN CHROME MINES - MG1 Chromitite Layer												
Thorncliffe	20.50%	UG/OC	Ore (Mt)	36.445	36.406	14.40	15.27	50.85	51.67	0.2	0.3	SV/DR
			Cr_2O_3 (%)	40.44	40.61	41.2	41.3	40.6	40.8	42	41	
Helena	20.50%	UG/OC	Ore (Mt)	23.667	23.309	13.58	14.53	37.25	37.84	9.1	9.1	SV/DR
			Cr_2O_3 (%)	39.75	39.84	38.4	39.0	39.3	39.5	38	39	
De Grooteboom	20.50%	UG/OC	Ore (Mt)	1.038	1.036	0.50	0.50	1.54	1.54	-	-	SV/DR
			Cr_2O_3 (%)	40.23	40.23	40.3	40.3	40.3	40.3	-	-	
Richmond	20.50%	UG	Ore (Mt)	0.595	0.613	12.26	12.28	12.86	12.89	13.9	13.9	SV/DR
			Cr_2O_3 (%)	41.32	41.33	41.1	41.1	41.1	41.1	41	41	
St George	20.50%	UG	Ore (Mt)	-	-	4.92	3.20	4.92	3.20	6.1	7.2	SV/DR
			Cr_2O_3 (%)	-	-	39.6	39.4	39.6	39.4	40	40	
Total - MG1			**Ore (Mt)**	**61.743**	**61.364**	**45.67**	**45.78**	**107.41**	**107.14**	**29.3**	**30.5**	
			Cr_2O_3(%)	**40.18**	**40.32**	**40.2**	**40.4**	**40.2**	**40.3**	**40**	**40**	
EASTERN CHROME MINES - MG2 Chromitite Layer												
Thorncliffe	20.50%	UG/OC	Ore (Mt)	-	-	-	-	-	-	41.8	41.8	SV/DR
			Cr_2O_3 (%)	-	-	-	-	-	-	38	38	
Helena	20.50%	UG/OC	Ore (Mt)	-	-	-	-	-	-	85.4	85.4	SV/DR
			Cr_2O_3 (%)	-	-	-	-	-	-	38	38	
De Grooteboom	20.50%	UG/OC	Ore (Mt)	-	-	-	-	-	-	-	-	SV/DR
			Cr_2O_3 (%)	-	-	-	-	-	-	-	-	
Richmond	20.50%	UG	Ore (Mt)	-	-	-	-	-	-	-	-	SV/DR
			Cr_2O_3 (%)	-	-	-	-	-	-	-	-	
St George	20.50%	UG	Ore (Mt)	-	-	-	-	-	-	-	-	SV/DR
			Cr_2O_3 (%)	-	-	-	-	-	-	-	-	
Total - MG2			**Ore (Mt)**	**-**	**-**	**-**	**-**	**-**	**-**	**127.2**	**127.2**	
			Cr_2O_3(%)	**-**	**-**	**-**	**-**	**-**	**-**	**38**	**38**	
Total - MG1 and MG2			**Ore (Mt)**	**61.743**	**61.364**	**45.67**	**45.78**	**107.41**	**107.14**	**156.5**	**157.7**	
			Cr_2O_3(%)	**40.18**	**40.32**	**40.2**	**40.4**	**40.2**	**40.3**	**38**	**38**	

BUSHVELD COMPLEX - WESTERN LIMB

WESTERN CHROME MINES - Tailings												
Kroondal Dam	20.50%	Tailings	(Mt)	-	-	-	-	-	-	1.3	1.0	MM
			Cr_2O_3(%)	-	-	-	-	-	-	16	17	
Waterval East Dam	20.50%	Tailings	(Mt)	-	-	-	-	-	-	0.9	-	MM
			Cr_2O_3(%)	-	-	-	-	-	-	19	-	
Waterval West Dam	20.50%	Tailings	(Mt)	-	-	-	-	-	-	0.3	-	MM
			Cr_2O_3(%)	-	-	-	-	-	-	15	-	
Cashan Dam	20.50%	Tailings	(Mt)	-	-	-	-	-	-	0.0	-	MM
			Cr_2O_3(%)	-	-	-	-	-	-	15	-	
Subtotal			**Tailings (Mt)**	-	-	-	-	-	-	**2.6**	-	
			Cr_2O_3(%)	-	-	-	-	-	-	**17**	-	

BUSHVELD COMPLEX - EASTERN LIMB

EASTERN CHROME MINES - Tailings												
Thorncliffe Dam	20.50%	Tailings	(Mt)	-	-	-	-	-	-	3.9	-	SV
			Cr_2O_3(%)	-	-	-	-	-	-	20	-	
Helena Paste	20.50%	Tailings	(Mt)	-	-	-	-	-	-	0.3	-	SV
			Cr_2O_3(%)	-	-	-	-	-	-	17	-	
Subtotal			**Tailings (Mt)**	-	-	-	-	-	-	**4.2**	-	
			Cr_2O_3(%)	-	-	-	-	-	-	**19**	-	

Notes :

Tonnages are quoted as million metric dry tonnes for the chromitite layers. The tailings are quoted as dry cubic meters.

Grades are quoted as %Cr_2O_3.

The Measured and Indicated Mineral Resources are inclusive of those Mineral Resources modified to produce Mineral Reserves.

No cut-off grades are applied to the chromitite layers currently being mined because of the exceptional regional grade consistency and continuity.

The Mineral Resources are estimated as chromitite tonnages and grades to reflect the grades of the various individual chromitite layers. Both the LG6 and MG1 Chromitite Layers which the Venture is currently mining, is discrete solid chromitite layers. Along the Western Limb of the Bushveld Complex, the LG6 Chromitite Package is mined on the Waterval and Kroondal properties. The Klipfontein/Waterval property is an extension area for both the Waterval and Kroondal Mines. Thorncliffe, Magareng and Helena Mines, along the Eastern Limb of the Bushveld Complex are mining the MG1 Chromitite Layer.

Changes in the year on year Mineral Resource tonnage and grade estimates are mainly due to mining depletion and changes due to additional geological information gained through exploration.

The LOM (Life-of-Mine) for the operating mines vary between 1 year and 5 years based on the declared Mineral Reserves. The LOM periods for the operating mines based on all the Mineral Reserves (excluding Inferred Mineral Resources) converted to Mineral Resources vary between 5 years and 38 years. The Mining Rights expire from 2022 to 2039 for the various operating mines.

Competent Persons;

PJG – Pieter-Jan Gräbe, Glencore Operations SA, (SACNASP). Overall responsibility for Mineral Resources and Mineral Reserves.

SV – Solly Vaid, Glencore Operations, Eastern Chrome Mines, (PLATO). Responsible for Mineral Resources and Mineral Reserves.

MM – Mogomotsi Maputle, Glencore Operations SA, Western Chrome Mines, (SACNASP). Responsible for Mineral Resources and Mineral Reserves.

DR –Dean Richards, Obsidian Consulting Services (SACNASP). Responsible for geostatistical analysis of data, Mineral Resource classification and construction of tonnage and grade block models and reporting of tonnage and grades from block models.

Chrome Mineral Reserve Statement

Name of operation	Attributable Portion	Mining method	Commodity	Proved Mineral Reserves 31.12.18	Proved Mineral Reserves 31.12.17	Probable Mineral Reserves 31.12.18	Probable Mineral Reserves 31.12.17	Total Mineral Reserves 31.12.18	Total Mineral Reserves 31.12.17	Competent Person
BUSHVELD COMPLEX - WESTERN LIMB										
WESTERN CHROME MINES - LG6 Chromitite Package										
Waterval	20.50%	UG	Ore (Mt)	8.548	8.727	0.89	0.89	9.44	9.61	MM/DR
			Cr_2O_3 (%)	31.36	31.40	26.8	26.8	30.9	31.0	
Marikana West	20.50%	UG	Ore (Mt)	0.150	0.110	-	-	0.15	0.11	MM/DR
			Cr_2O_3 (%)	29.88	28.93	-	-	29.9	28.9	
Kroondal	20.50%	UG/OC	Ore (Mt)	2.199	2.142	1.36	1.92	3.56	4.07	MM/DR
			Cr_2O_3 (%)	29.38	29.27	28.8	28.5	29.2	28.9	
Kroondal Gemini	20.50%	UG/OC	Ore (Mt)	6.036	6.178	4.05	4.72	10.08	10.89	MM/DR
			Cr_2O_3 (%)	31.57	31.42	28.9	28.5	30.5	30.2	
Marikana East	20.50%	UG	Ore (Mt)	0.725	-	0.15	-	0.87	-	MM/DR
			Cr_2O_3 (%)	28.58	-	28.5	-	28.6	-	
Klipfontein/Waterval	20.50%	UG	Ore (Mt)	0.820	-	0.34	-	1.16	-	MM/DR
			Cr_2O_3 (%)	28.65	-	28.7	-	28.7	-	
Boshoek	20.50%	UG/OC	Ore (Mt)	-	-	0.58	0.58	0.58	0.58	MM/DR
			Cr_2O_3 (%)	-	-	26.1	26.1	26.1	26.1	
Total			**Ore (Mt)**	**18.477**	**17.157**	**7.37**	**8.11**	**25.84**	**25.26**	
			Cr_2O_3 (%)	**31.00**	**31.13**	**28.4**	**28.1**	**30.4**	**30.2**	
EASTERN CHROME MINES - MG1 Chromitite Layer										
Thorncliffe Mine	20.50%	UG/OC	Ore (Mt)	24.093	22.267	9.09	8.15	33.18	30.41	SV/DR
			Cr_2O_3 (%)	35.13	33.76	35.9	34.2	35.3	33.9	
Helena Mine	20.50%	UG/OC	Ore (Mt)	2.957	3.250	-	-	2.96	3.25	SV/DR
			Cr_2O_3 (%)	33.92	33.45	-	-	33.9	33.5	
Total - MG1			**Ore (Mt)**	**27.050**	**25.517**	**9.09**	**8.15**	**36.14**	**33.66**	
			Cr_2O_3 (%)	**35.00**	**33.72**	**35.9**	**34.2**	**35.2**	**33.8**	

Notes;

Tonnages are quoted as million metric dry tonnes for the chromitite layers.

Grades are quoted as $\%Cr_2O_3$

No cut-off grades are applied to the chromitite layers currently being mined due to the exceptional regional grade consistency and continuity. A minimum mining cut of 1.8m is applied to the Mineral Reserve tonnage to accommodate the mechanized mining equipment employed by the underground mining operations. External waste is included to make up the minimum cut where applicable.

The chromitite layers are mined mainly underground using trackless mechanized mining methods on a board-and-pillar mine lay-out design.

Changes in the year on year Mineral Reserves tonnage and grade estimates are mainly due to mining depletion and changes due to additional geological information gained through exploration.

Competent Persons;

PJG – Pieter-Jan Gräbe, Glencore Operations SA, (SACNASP). Overall responsibility for Mineral Resources and Mineral Reserves.

SV – Solly Vaid, Glencore Operations SA, Eastern Chrome Mines, (PLATO). Responsible for Mineral Resources and Mineral Reserves.

MM – Mogomotsi Maputle, Glencore Operations SA, Western Chrome Mines, (SACNASP). Responsible for Mineral Resources and Mineral Reserves.

DR –Dean Richards, Obsidian Consulting Services (SACNASP). Responsible for geostatistical analysis of data, Mineral Resource classification and construction of tonnage and grade block models and reporting of tonnage and grades from block models.

Silica Mineral Resources

Name of operation	Attributable Portion	Mining method	Commodity	Measured Mineral Resources		Indicated Mineral Resources		Measured and Indicated Resources		Inferred Mineral Resources		Competent Person
				31.12.18	31.12.17	31.12.18	31.12.17	31.12.18	31.12.17	31.12.18	31.12.17	
MAGALIESBERG QUARTZITE FORMATION												
Rietvly Silica Mine – Quartzite												
Rietvly	20.5%	OC	Ore (Mt)	-	-	22.96	23.27	22.96	23.27	-	-	MM
			SiO_2 (%)	-	-	91	91	91	91	-	-	

Silica Mineral Reserves

Name of operation	Attributable Portion	Mining method	Commodity	Proved Mineral Reserves		Probable Mineral Reserves		Total Mineral Reserves		Competent Person
				31.12.18	31.12.17	31.12.18	31.12.17	31.12.18	31.12.17	
MAGALIESBERG QUARTZITE FORMATION										
Rietvly Silica Mine – Quartzite										
Rietvly	20.5%	OC	Ore (Mt)	-	-	1.70	2.05	1.70	2.05	MM
			SiO_2 (%)	-	-	90	91	90	91	

Notes;

Tonnages are quoted as million metric dry tonnes

Grades are quoted as $\%SiO_2$.

The Rietvly silica ore is mined through opencast mining methods and the ROM (Run-of-Mine) ore is crushed, washed and sized on site to produce a final sized and quality graded product. No silica cut-off grades are applied to the Mineral Resource estimation. The quartzite is mined mainly to supply the Ventures furnaces with silica.

Changes in the year on year tonnage and grade estimates are mainly due to mining depletion, reclassification of the Mineral Resource categories and changes in the Mineral Resource tonnages and grades due to additional geological information gained through exploration.

No significant changes have been recorded in the year-on-year Mineral Resource estimation.

The LOM for Rietvly Silica is 5 years based on the declared Mineral Reserves and a production rate of ~28.3kt Plant Feed per month. The Mining Right expires in 2037.

Competent Person;

PJG – Pieter-Jan Gräbe, Glencore Operations SA, (SACNASP), Overall responsibility of Mineral Resources and Mineral Reserves.

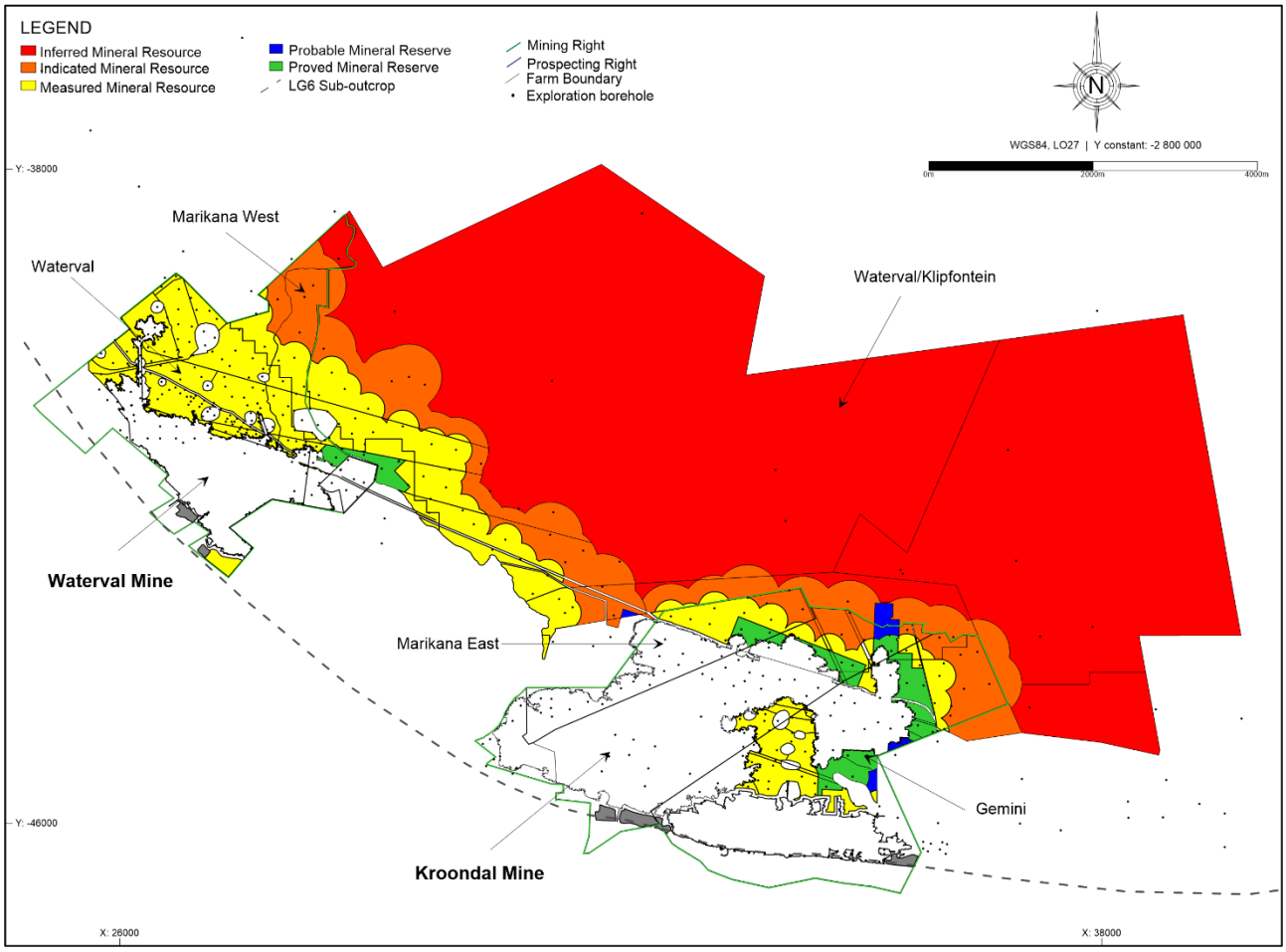
MM – Mogomotsi Maputle, Glencore Operations SA, (SACNASP), Responsible for Mineral Resources and Mineral Reserves.

MINERAL RESOURCE AND MINERAL RESERVE MAPS

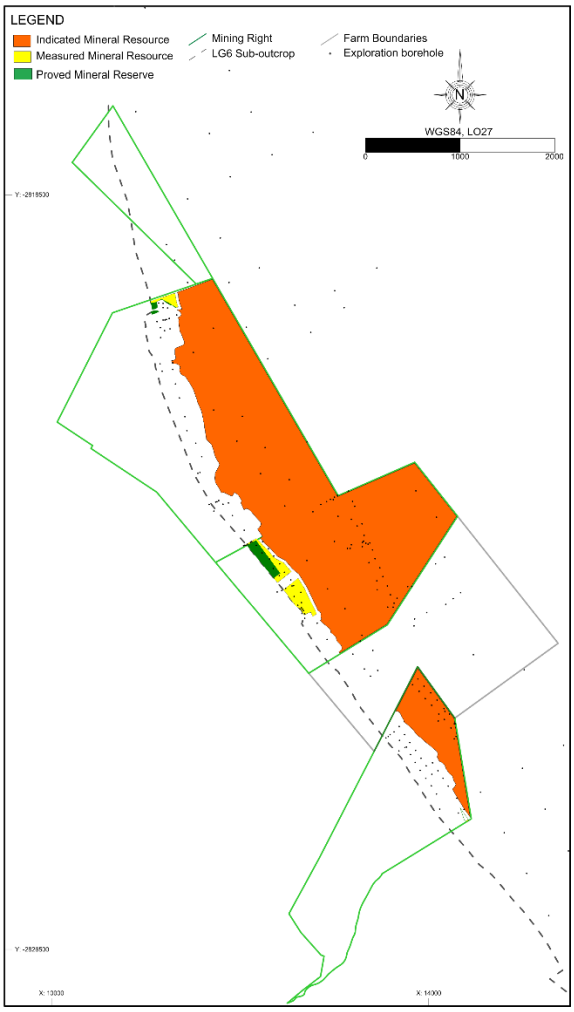
The plans below indicate the various Mineral Resource and Mineral Reserve categories of the Venture. *12.11 (iii) (12)*

Chrome - Bushveld Complex, Western Limb.

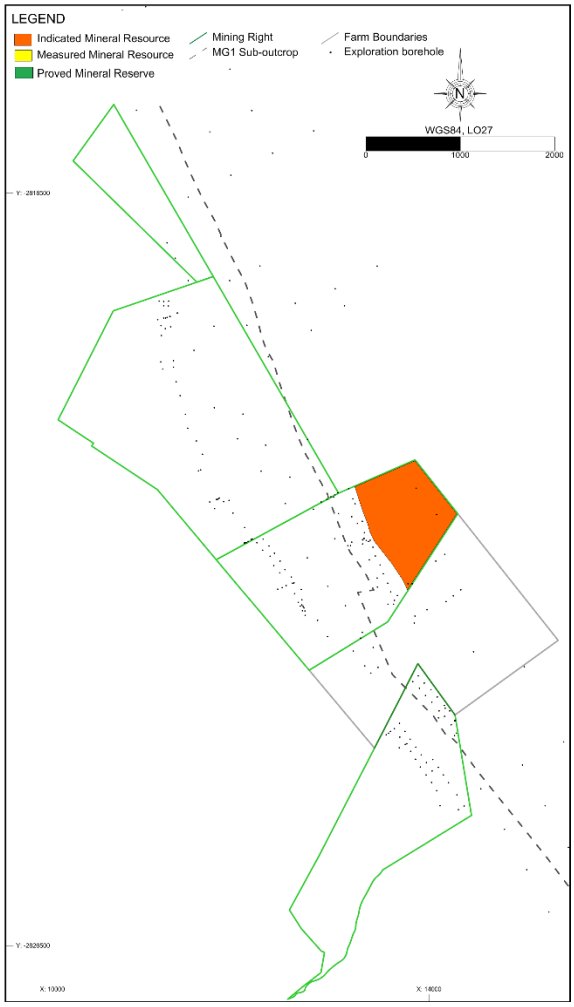
Waterval and Kroondal Mines - LG6 Chromitite Package Mining.



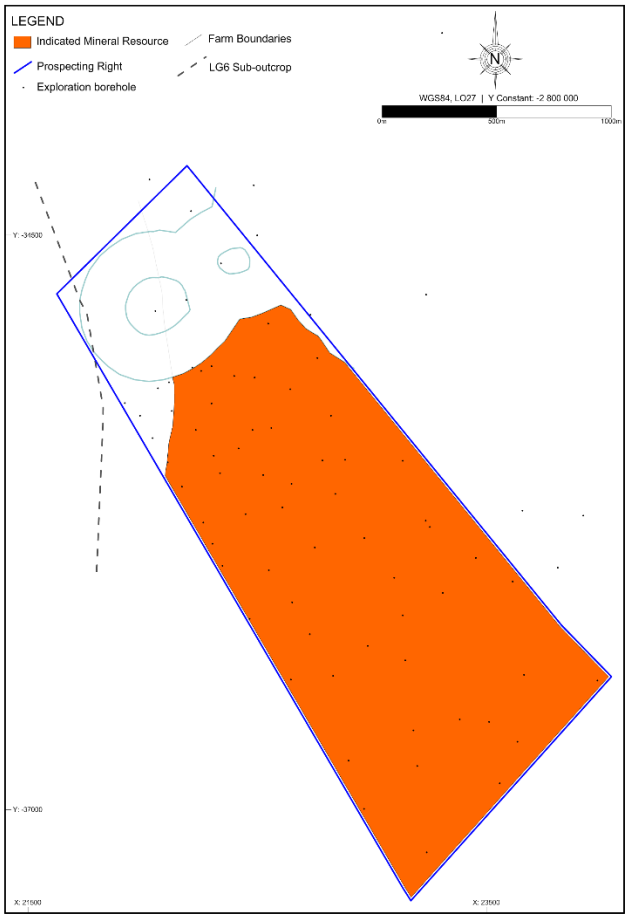
Boshoek Mine- LG6 Chromitite Layer.



Boshoek Mine - MG1 Chromitite Layer.

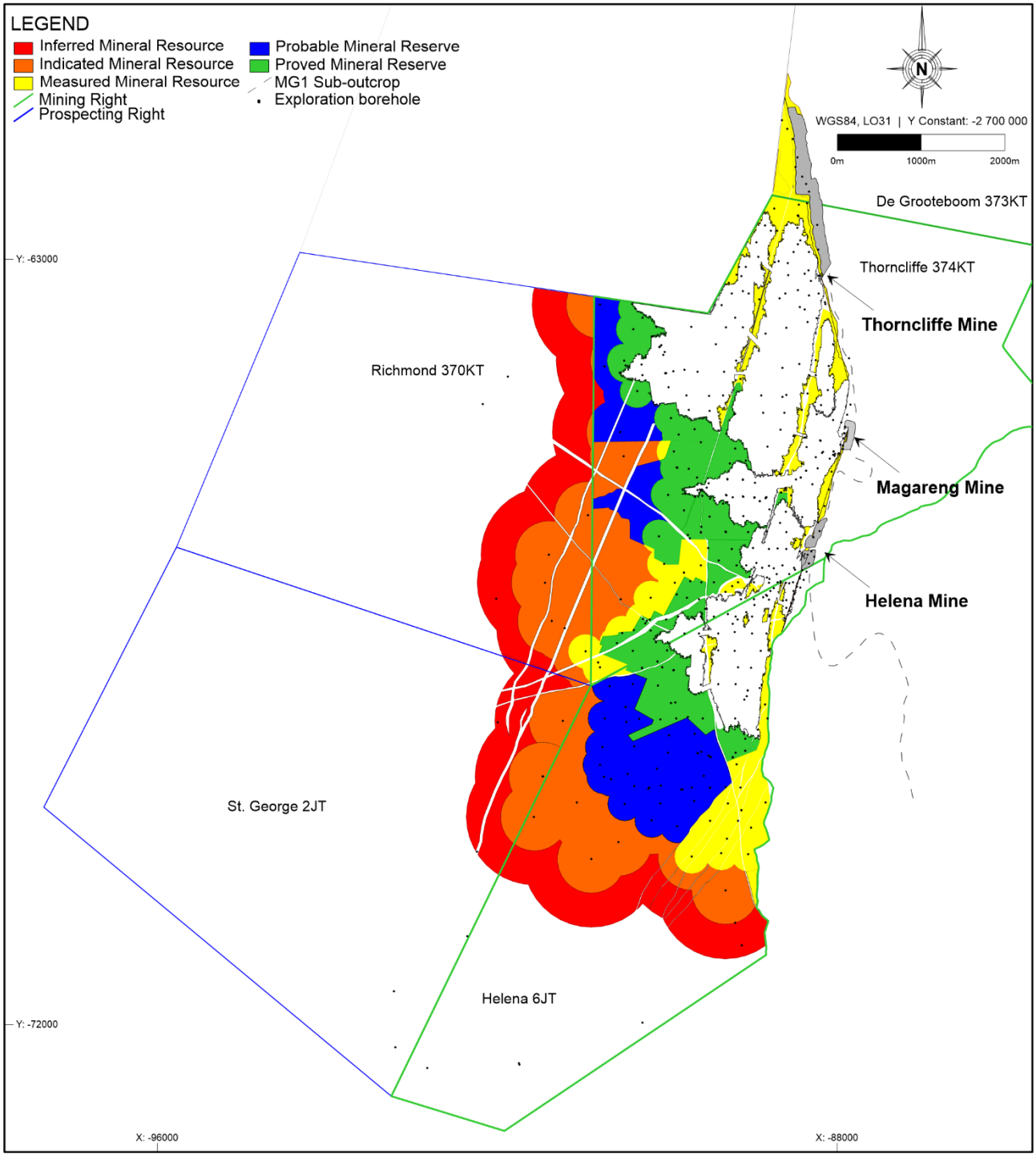


Extension 9 - LG6 Chromitite Package.



Chrome - Bushveld Complex, Eastern Limb

Thorncliffe, Magareng and Helena Mines – MG1 Chromitite Layer Mining.



Silica

Rietvly Silica Mine

