Rehabilitation and closure plan for the proposed expansion project at Mogalakwena Mine

Report Prepared for

Anglo American Platinum Limited - Mogalakwena Mine

Report Number 532330/MM Expansion Closure

Report Prepared by

srk consulting

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Rehabilitation and closure plan for the proposed expansion project at Mogalakwena Mine

Anglo American Platinum Limited - Mogalakwena Mine

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September 2019

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Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK Consulting (South Africa) (Pty) Ltd (SRK) by Anglo American Platinum Limited (AAP). The opinions in this Report are provided in response to a specific request from AAP to do so. SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.
## List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AAP</td>
<td>Anglo American Platinum Limited</td>
</tr>
<tr>
<td>ARDML</td>
<td>Acid Rock Drainage Metal Leaching</td>
</tr>
<tr>
<td>BPG</td>
<td>Best Practice Guidelines</td>
</tr>
<tr>
<td>CMA</td>
<td>Catchment Management Authority</td>
</tr>
<tr>
<td>DMR</td>
<td>Department of Mineral Resources</td>
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<tr>
<td>DWAF</td>
<td>Department of Water and Forestry</td>
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<tr>
<td>DWS</td>
<td>Department of Water and Sanitation</td>
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<tr>
<td>EA</td>
<td>Environmental Authorisation</td>
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<tr>
<td>EC</td>
<td>Electrical Conductivity</td>
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<tr>
<td>EAP</td>
<td>Environmental Assessment Practitioner</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<tr>
<td>EIS</td>
<td>Ecological Importance and Sensitivity</td>
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<tr>
<td>EMPr</td>
<td>Environmental Management Programme</td>
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<tr>
<td>EMS</td>
<td>Environmental Management System</td>
</tr>
<tr>
<td>GNR</td>
<td>Government National Regulations</td>
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<tr>
<td>GW</td>
<td>Ground water</td>
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<tr>
<td>HCT</td>
<td>Humidity cell testing</td>
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<tr>
<td>IRP</td>
<td>Integrated Resource Plan</td>
</tr>
<tr>
<td>LC</td>
<td>Leachate Concentrate</td>
</tr>
<tr>
<td>LCT</td>
<td>Leachable concentration threshold</td>
</tr>
<tr>
<td>LEDET</td>
<td>Limpopo Economic Development, Environment and Tourism</td>
</tr>
<tr>
<td>LoM</td>
<td>Life of Mine</td>
</tr>
<tr>
<td>mamsl</td>
<td>meters above mean sea level</td>
</tr>
<tr>
<td>MM</td>
<td>Mogalakwena Mine</td>
</tr>
<tr>
<td>MPRDA</td>
<td>Mineral and Petroleum Resources Development Act (No. 68 of 2002)</td>
</tr>
<tr>
<td>Mtpa</td>
<td>Metric tons per annum</td>
</tr>
<tr>
<td>M3C</td>
<td>Mogalakwena 3rd Concentrator</td>
</tr>
<tr>
<td>NAG</td>
<td>Non-acid generating</td>
</tr>
<tr>
<td>NEM:BA</td>
<td>The National Environmental Management: Biodiversity Act (No. 10 of 2004)</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Environmental Management Act (No. 107 of 1998)</td>
</tr>
<tr>
<td>NEMAA</td>
<td>National Environmental Management Amendment Act (No. 62 of 2008)</td>
</tr>
<tr>
<td>NEM:AQA</td>
<td>National Environmental Management Air Quality Act (No. 39 of 2004)</td>
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<tr>
<td>NEM:PA</td>
<td>National Environmental Management: Protected Areas Act (No. 57 of 2003)</td>
</tr>
<tr>
<td>NEM:WAA</td>
<td>National Environmental Management Waste Amendment Act</td>
</tr>
<tr>
<td>NP</td>
<td>Neutralisation potential</td>
</tr>
<tr>
<td>NNP</td>
<td>Net neutralising potential</td>
</tr>
<tr>
<td>NPR</td>
<td>Neutralising potential ratio</td>
</tr>
</tbody>
</table>
NWA  National Water Act (No. 36 of 1998)
PAG  Potentially acid generating
PCD  Pollution Control Dam
PCLU  Post Closure Land Use
PGM  Platinum Group Metals
PPL  Potgietersrus Platinum Limited
RSRD  Residue Stockpiles and Residue Deposits
RWD  Return Water Dam
SANS  South African National Standards
SEAT  Socio-Economic Assessment Toolbox
SLP  Social and Labour Plan
SRK  SRK Consulting (South Africa) (Pty) Ltd.
STP  Sewage Treatment Plant
SW  Surface water
TC  Total Concentrate
TDS  Total Dissolved Solids
TSF  Tailings Storage Facility
VMP  Vegetation Management Plan
WML  Waste Management Licence
WRD  Waste Rock Dump
WUL  Water Use Licence
1 Introduction

1.1 Background

Mogalakwena Mine (MM) is a wholly owned subsidiary of Anglo American Platinum Limited Anglo American Platinum Limited (AAP) and is situated approximately 30 km northwest of the town of Mokopane within the Mogalakwena Local Municipality, which forms part of the greater Waterberg District Municipality of the Limpopo Province (refer to Figure 1-1).

Platinum group metals (PGM) and various base metals are currently mined at Mogalakwena Mine via open pits, namely the Sandsloot, Zwartfontein and Mogalakwena North, consisting of South, Central and North Pits. MPM also operates two concentrator plants (North and South Concentrators) and two tailings storage facilities (TSF): Vaalkop original dam and extension as one dam located on the farms Zwartfontein 818 LR and Vaalkop 819 LR and a relatively new TSF (known as the Blinkwater TSF) on the farm Blinkwater 820 LR. Mogalakwena Mine’s Life of Mine (LoM) extends well beyond 2060.

It is the intention of MM to expand its existing operations and add additional infrastructure to its operations to improve production capacity. The proposed expansion will be located within MM’s mining right and surface lease areas on remaining extent of Portions 0 of the farm Blinkwater 820 LR and Portions 0 of the farms Overysel 815 LR, Zwartfontein 818 LR, Vaalkop 819 LR and Sandsloot 236 KR.

1.2 Scope of the proposed Expansion Project

The infrastructure and activities associated with the proposed Expansion Project are:

- A new third concentrator plant and associated water management infrastructure located in close proximity to the North Concentrator and associated crusher plant and conveyor systems.
- Expansion of the approved second compartment of the existing Blinkwater TSF, including associated additional water management infrastructure.
- A new waste rock dump (WRD) planned to be situated to the north of the North Pit and associated haul roads.

The above key infrastructure will have secondary infrastructure and activities associated with them, which includes:

- A buffer water storage dam located west of the existing Vaalkop TSF and return water dams.
- Upgrading of the existing South Concentrator Plant.
- Potential contractor’s camp.
- Upgrade of the existing sewage treatment plant (STP) located at the North Concentrator.
- A contractor’s laydown area located adjacent to the existing North Concentrator Plant.
- Expansion of the existing mine fleet workshop area located at the North Mine Workshop area.
- Change house to be situated close to the North Mining Main Offices and existing change house facilities.
- Upgrade of an existing section of an internal mine road.
- Re-alignment of the previously approved of the Sandsloot (Pholotsi) River diversion.
1.3 Purpose of this report

The infrastructure and activities associated with the proposed Expansion Project requires amendment of the mine’s existing Environmental Management Programmes¹ (EMPrs), Water Use Licences² (WULs) and Waste Management Licences³ (WMLs). In this regard, SRK Consulting (South Africa) (Pty) Ltd. (SRK) has been appointed by AAP as the independent environmental assessment practitioner (EAP) to manage and facilitate the integrated Environmental Authorisation (EA) amendment application process.

This conceptual rehabilitation and closure plan for the infrastructure and activities associated with the proposed Expansion Project has been prepared as a specialist report to inform and accompany the integrated EA amendment application to the competent authorities.

The purpose of this report is to provide a plan that is measurable and auditable to AAP and the Department of Mineral Resources (DMR) that includes:

- The proposed post-mining end use of the Expansion Project area.
- Information that is necessary for the definition of the closure vision, objectives and design and relinquishment criteria.
- An indication of what infrastructure and activities will ultimately be decommissioned, closed, removed and remediated.
- The risk drivers determining actions.
- An indication of how the closure actions will be implemented to achieve closure relinquishment criteria.
- Monitoring, auditing and reporting requirements.

The plan (this document) for the proposed Expansion Project areas is aligned to the overall closure of the existing operations at Mogalakwena as documented in SRK 530337 (Final Decommission, Rehabilitation and Closure Plan (aligned to GN 1147) for Mogalakwena Mine) (SRK, 2018) (FDRCP).

1.4 Project team

This plan was developed by Mr James Lake (Pr Sci Nat/400445/04 with SACNASP⁴), a Principal Scientist at SRK with 22 years’ experience in Environmental Management and reviewed by Mr Marius van Huyssteen, who has 16 years’ experience in the environmental field.

2 Regulatory requirements

The National Environmental Management Act (Act No. 107 of 1998) (NEMA) Regulations Pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations (GNR 1147) were promulgated in November 2015. It required that a final rehabilitation, decommissioning and mine closure plan is developed, which includes the determination of financial provision to guarantee the availability of sufficient funds to undertake rehabilitation and remediation of the adverse environmental impacts of mining. This regulation initially required mines to comply with the legislation by end February 2017. However, certain technical issues with the legislation have resulted in an extension of the Transitional Arrangements (GNR 991 of 21 September 2018), to be compliant by end February

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² WULs in terms of the National Water Act (Act No. 36 of 1998) (NWA).
⁴ Registered with the South African Council for Natural Scientific Professions
2020, although draft regulations published in May 2019 indicate that compliance is required three months after the financial year end after February 2020.

While there have been changes to the regulations with the drafts promulgated, the requirements of the three plans (Annual Rehabilitation Plan, Final Rehabilitation, Decommissioning and Mine Closure Plan and Environmental Risk Assessment Report) considered under the legislation has remained consistent. This document has been prepared to comply with the requirements of Appendix 4 of GNR 1147 and Appendix 6 of GNR 1228, with these broadly aligning with the requirements of Appendix 5 of the Environmental Impact Assessment Regulations, 2014 (GN 982).

3 Project description

3.1 Land tenure

The Mogalakwena mine boundary area stretches over approximately 8 km from east to west and approximately 13 km from north to south.

The mine lease area, presented in Figure 1-1 covers approximately 51.05 km². Mogalakwena title within the lease is described in the FDRCP (SRK, 2018), with the infrastructure and activities associated with the proposed Expansion Project taking place on the following farms and associated farm portions:

- Portion 0 of the farm Overysel 815 LR.
- Portion 0 of the farm Zwartfontein 818 LR.
- Portion 0 remainder of the farm Blinkwater 820 LR.
- Portion 0 of the farm Sandsloot 236 KR.
- Portion 0 of the farm Vaalkop 819 LR.

3.2 Existing activities

The MM operations currently mine via open pits. The ore is beneficiated by the North and South Concentrators into concentrate which is transported to the Polokwane Smelter for smelting to produce furnace matte. The matte is then treated using the Anglo American Platinum Converting Process, which is carried out at the Waterval Smelter complex in Rustenburg. Final products include platinum and PGMs.

MM is divided into three operational areas, namely Mining, South Concentrator and North Concentrator. The existing key infrastructure associated with MM is as follows:

- Two metallurgical concentrator plants.
- Five open pits.
- Two TSF complexes with associated RWDs.
- Waste rock dumps, marginal ore and topsoil stockpiles.
- Stormwater dams.
- Three sewage plants.
- Offices and workshops.

3.3 Proposed activities

The proposed Expansion Project entails the following additional infrastructure and activities, all of which are shown in Figure 3-1:

- A new 3rd Concentrator (M3C) plant and associated water management infrastructure located in close proximity to the North Concentrator (MNC) and associated crusher plant and conveyor systems.
• Expansion of the approved second compartment of the existing Blinkwater tailings storage facility (TSF), including associated additional water management infrastructure.
• A new waste rock dump (WRD) planned to be situated to the north of the North pit and associated haul roads.

The above key infrastructure will have secondary infrastructure and activities associated with them, which includes:

• A buffer water storage dam located west of the existing Vaalkop TSF and return water dams.
• Upgrading of the existing South Concentrator (MSC) Plant.
• Potential contractor’s camp.
• Upgrade of the existing sewage treatment plant (STP) located at the MNC.
• A contractor’s laydown area located adjacent to the existing MNC plant.
• Expansion of the existing mine fleet workshop area located at the North mine workshop area.
• Change house to be situated close to the North mining main offices and existing change house facilities.
• Upgrade of an existing section of an internal mine roads.
• Re-alignment of the previously approved section of the Sandsloot (Pholotsi) River diversion.
Figure 3-1: Layout of proposed infrastructure

Legend:
- Conveyors crossings
- Pipeline crossings
- Powerline crossings
- Processed Sanddork River discretions
- Communities
- Surface Lease Area
- Mining Right Boundary
- Development Areas

Existing Infrastructure
- Road Pattern
- Forest Farm

Proposed Infrastructure
- Proposed Pipelines
- Upgrading of mine Road
- National Road
- Wetland
- River
- 1103 yr Floodline
- 120 yr Floodline

Data Source:
- SRK Consulting

MOGALAKWENA MINE EXPANSION PROJECT
PROJECT COMPONENTS AND INFRASTRUCTURE

Compiled by:

Date: 29/07/2019
Project No.: 532330
Fig No.: 3-1
4 Environmental context

The broader environmental and social context of the mine is described in detail in the MM Final Decommissioning, Rehabilitation and Closure Plan Report (SRK 530337, 2018) and is therefore not repeated here. The subsections that follow have therefore been extracted and summarised to focus on key issues that may/will have relevance to the eventual closure of the MM Expansion Project associated activities and infrastructure.

4.1 Topography

The Mogalakwena Mine can generally be described as flat, with granite koppies that gently slopes to the west from heights of 1,286 metres above mean sea level (mamsl) and 1,308 mamsl on the farms Overysel 815 LR and Zwartfontein 818 LR respectively. Koppies on the farm Blinkwater 820 LR slopes to southeast from 1,274 mamsl onto undulating plains below. The region is drained by the Groot Sandsloot River, which runs in a southwesterly direction draining into the Mogalakwena River. The Mogalakwena River drains into a northwesterly direction along the base of the Waterberg Mountains which rise to a maximum height of 1,746 mamsl.

The area surrounding the mine is host to rural villages and the subsistence agricultural activities associated with such communities. Villages bordering the mine have been relocated to make way for mine expansion and to ensure the safety of the community members.

4.2 Climate

The regional climate is typically hot summers and cool, dry winters. The mean minimum monthly temperature is 13.0 °C and the maximum mean monthly temperature is 26.3 °C. The main prevailing wind directions on the site vary from south-southwesterly (approx. 12%) to south-southeasterly (approx. 14%) with the southerly wind vector being the predominant wind prevailing approximately 21% of the time. Northerly winds prevail for <10% of the time. Calm wind conditions occur on average 10.5% of the time.

During the rainy season a maximum of 8 to 12 rain days per month is typically expected, whilst in the dry season a maximum of one rainy day may be expected per month. Most rain (85%) falls in the six month period between November and April. Only 8% of the rainfall occurs between May and September. The rainfall is mainly in the form of thunderstorms. Hail, which is often associated with thunderstorms, does occur during the hot summer months.

The average annual A-pan evaporation was 2,301 mm which indicates that evaporation exceeded the mean annual precipitation of 662 mm.

4.3 Geology

MM mines the structures of the Bushveld Complex where the Platreef, a local equivalent of the Merenskreef Reef, forms the floor of the Complex. The Platreef is both the world’s largest mafic-layered intrusive complex and hosts the greatest resource of PGM. Extending over 67,000 km², the complex consists of four major compartments or limbs. Each limb underwent similar process of crystallisation and stratification so that lithological successions were broadly similar throughout the complex. Within the Northern Limb, the broad stratigraphy of the layered sequence can be correlated with that of the Bushveld complex.

There are a number of northeast trending dykes cutting through the Platreef and strike is terminated by faults to the north and south, which have a northeast orientation. The northern part of the Mogalakwena Mine is underlain by a footwall of Archaean Granite. Granite koppies occur to the west of the TSF complex site. This area is underlain by the Utrecht Granite, Hout River Gneiss and the
harzburgites of the Zoetveld subsuite of the Rustenburg suite. Hardpan ferricrete and calcrite underlies Blinkwater but does not appear to be laterally continuous.

4.4 Geochemistry

Itasca conducted a geochemical characterization and waste classification study in 2018 on 40 samples from the Mine site to evaluate the acid generation potential and neutralisation potential of the orebody, country rock, waste rock and tailings (Itasca 2019). The USEPA (1994), MEND (2009) and Price (1997) criteria as detailed below were used to characterise the materials:

- If the majority of the parameters indicate non-acid generating (NAG) material, the rock is classified as NAG.
- If the majority of the parameters indicate potentially acid generating (PAG), the rock is classified as PAG.

The following observations were made:

- All 40 samples had NAG pH >4.5 (after complete oxidation) and generally 1-2 units lower than the paste pH. Based on the NAG results, it is concluded that the sampled materials are likely to generate neutral drainage during mining and closure.
- Except for GC_10A (medium grade pyroxenite ore), all the samples had sulphur content below the recommended 0.3% threshold value for acid generation under oxidising conditions, and correlates well with the NAG as $H_2SO_4 < 1$ kg/tonne for all samples.
- The overall net neutralising potential (NNP) was high (>20) providing sufficient buffering capacity if any acid is generated. However, four of the five samples from the footwall granite/granofels had uncertain NNP within the range of -20 to 20. Most of these samples were taken in the lighter cross cutting veins within the sheared granite and pyroxenites in the North Pit approaching the major shear zone occurring in the northwestern corner.
- The neutralising potential ratio (NPR) defined as the bulk NP/AP is >2 for all samples and therefore non-PAG.
- The results to date support the conclusions from the previous geochemical testing work undertaken by SRK (2002) that the waste rock dump should not produce a leachate with low pH and high sulphate concentrations, although manganese was flagged as a potential metal of concern in seepage from the waste rock dump.
- However, it was noted that as the mineralogic Neutralisation Potential (NP) (Net Carbonate Value) is lower than the NP by titration (33% of the overall reported NP is not associated with carbonate minerals), many of the samples were classified as uncertain. Kinetic testing was therefore undertaken on the samples which are classified as uncertain (particularly the granofels footwall rocks), to confirm that there is enough neutralisation potential in the longer term.
- The humidity cell testing (HCT) over a 20 week period, results confirm that nitrate, chloride and sulphate are flushed out from the rock samples initially but decrease and stabilize after 12 weeks.
- The first flush of every HCT contained 1 – 6 mg/L nitrate (as N) and continued to leach for 3-6 flushes. These HCT results indicate that nitrate is released at approximately 2 to 10 mg NO₃ as N per kg rock.
- Waste characterization of the tailings material (SRK 2015) from the Mine was found to be non acid generating. However due to the As, Cu, Mn and Ni > leachable concentration threshold (LCT0), the tailings were classified as Type 3 material requiring disposal in a landfill engineered with a Class C barrier system.
- The samples from the tailings, waste rock dump and pit wall samples had B, Ba, Cu, Ni, Pb, V and Zn exceeding the TCT0 in some samples but not the TCT1 limits (TCT0<TC<TCT1). The LCT0 threshold was not exceeded in any of the samples.
- Based on the results of the Itasca 2018 Waste Classification, most of the samples from both the tailings material, ore stock pile and waste rock dump fall within the category TC≤TCT1 AND LCT0 < LC<LCT1 and are classified as Type 3 waste requiring a Class C liner or barrier system.

Although the geochemical characterization indicates a low risk of acid generation from the waste rock dump and tailings materials, leaching of sulphate, nitrate and chloride will result in increased salt
loading to the groundwater and therefore lining or a barrier system is required for the proposed new activities being the Blinkwater Expansion and the North WRD construction.

4.5 Land use, land capability and soils

The soils of MM are of moderate to poor quality due to their moderate natural fertility, soil structure, soil chemical properties, depth and rockiness in places. MM contains soils varying from shallow, rocky sandy loams to deep, weakly or moderately structured sandy clays. Free lime occurs throughout MM. The surface rockiness and variable depth, together with the marginal mean annual rainfall and other climatic conditions, attributes to the low agricultural potential of the soils. Natural soil erosion can be observed throughout MM and surrounding areas.

The land capability of MM falls into three classes:

- Arable land with low potential, which amounts to 20.0% of MM area.
- Grazing land, which comprises 48.3% of the area.
- Wilderness land making up 11.6%.

The remainder of the area is occupied by villages and streambeds.

4.6 Biodiversity

The general habitat in the study area falls within the Savanna Biome and the vegetation unit on the study site represented by Makhado Sweet Bushveld (SVcb 20) (Mucina and Rutherford 2006). The Makhado Sweet Bushveld is found in the Limpopo Province where it is present on the plains between the Soutpansberg (to the north) and the Waterberg (to the west). The vegetation is known for the short and shrubby bushveld with a poorly developed grass layer on the slightly to moderately undulating plains.

4.7 Surface water

4.7.1 Water management area

MM is situated in the Limpopo River catchment in quaternary catchment A61G. The Mohlosane River (Klein Sandsloot) and the Groot Sandsloot River are the two main rivers draining the area. The Mohlosane River drains from the Blinkwater TSF with the TSF situated to the east of the mine, with the river flowing to the west of the mine between the South and Zwartfontein Pits, before it exits the mine surface lease area. The Groot Sandsloot River enters the mine as it leaves the Vaalkop Dam and then flows around the north and west of the Sandsloot Pit where it exits the mine to the south. Both rivers flow through communities adjacent to the mine. The rivers are highly seasonal and only flow after large rainfall events, however, at certain localities, within the communities, groundwater comes to surface within the riverbeds which the communities make use of when available.

The highest point in the catchment of the Mohlosane is approximately 1,280 mamsl. The average watercourse slope is about 1:100 (or 1 percent), but the upper reach of the Mohlosane (upstream of the mining activity) has a slope of in excess of 1:50 (2 percent). The catchment is characterised by steep granite koppies on the northern catchment boundary and close to the confluence with the Mogalakwena River.

The Groot Sandsloot catchment can generally be described as flat, sloping gently to the west between the contours of 1,020 and 1,220 mamsl with an average gradient of 1:16. The river runs in a southwesterly direction draining into the Mogalakwena River, which drains in a northwesterly direction along the base of the Waterberg Mountains.
4.8 Surface water quality

Aqua Earth Consulting is tasked by MM to compile water quality reports linking mine activities and performance against the WUL conditions. Detailed water analysis of the data is provided in the Aqua Earth quarterly and annual reports, which are submitted to the DWS as per the WUL (Appendix III, Condition 5.1 – “Water quality reports shall be submitted to the Regional Director on a monthly basis under reference number 16/2/7/A600/C127/1”).

The sample analysis includes all major cations and anions, as well as physical parameters, such as Electrical Conductivity (EC), pH, Total Dissolved Solids (TDS), sulphate (SO\textsubscript{4}) and nitrate (NO\textsubscript{3}). Surface water samples are collected from surface water bodies situated around the mine on a monthly basis, provided water is present for sampling in the non-perennial rivers. Routine monitoring was initiated in January 2009.

A guideline value for the most sensitive user/condition for each constituent monitored has been identified and is referred to as the Identified Resource Protection (IRP) value. The IRP has been used for the water quality assessment in the absence of WUL limits. It must be stated that the IRP is a precautionary limit and does not represent the environmental considerations of this area, however, this approach is in line with the NEMA Precautionary Principle.

The Witrivier (Thwathwe), Mohlosane (Klein Sandsloot) River and Groot Sandsloot (Pholotsi) River flow in close proximity to and through the mining area. These rivers are tributaries of the Mogalakwena River. Current monitoring points and proposed new monitoring points are presented in Figure 4-1. Current monitoring points are located in areas where water is found in the river. These monitoring locations relate to areas where subsurface water flow daylighted in the river bed.
Figure 4-1: MM current and proposed surface water monitoring points
4.8.1 Witrivier (Thwathwe)

The Witrivier flows in a south westerly direction north of the north pit and through various communities up and downstream of the mine. Currently, the only mine monitoring point, RCU, is located downstream of the mine. Figure 4-2 below presents the water quality data spatially in the graphs where log plots present the percentage compliance of the water for the median data between February 2009 and March 2019 and relates to the IRP limits. Parameters extending over the line represent the percentage (on a logarithmic scale) above which the IRP limits are exceeded. Due to the river being non-perennial, water is not always available for sampling. Figure 4-2 indicates that only sodium and chloride median values exceed the IRP limits, the remainder of the parameters remain below the IRP limit. The parameters may indicate some impact from the mining activities, however, upstream monitoring is required in order to compare up and downstream water quality to improve the analysis.

![Witrivier downstream water quality monitoring point RCU](image)

**Figure 4-2: Water quality of monitoring point RCU on the Witrivier as compared to the IRP limit**

4.8.2 Mohlosane River (Klein Sandsloot)

The Mohlosane River, flows in a south westerly direction through the mining area. The original upstream monitoring location (MRU) is now below the Blinkwater TSF 1 and therefore is not representative of upstream conditions. MRU was replaced with MRO which is upstream of the Blinkwater TSF 1 and therefore represents the upstream monitoring point for the mining activities on the Mohlosane River. Figure 4-3 represents the statistical median of the water quality data from MRO between January 2013 and March 2019 and is compared as a percentage to the IRP limits. Figure 4-3 indicates that only suspended solids have exceeded the IRP limit which could be attributed to road runoff due to the proximity of the road to the river monitoring point. The downstream monitoring point is MRD and is used to identify possible impacts on the receiving environment from mining activities. MRD is located close to the mine western perimeter fence along the river. The water quality data of this monitoring point has been received from January 2008 to February 2019. The suspended solids have decreased downstream on the Mohlosane River, as illustrated in Figure 4-3, however the salt load has increased downstream with magnesium (geological influence), sodium and chloride (potential mining influence) exceeding the IRP limits.
4.8.3 Groot Sandsloot River (Pholotsi River)

The Groot Sandsloot River (Pholotsi River) flows within the mining activity area and Sandsloot community. The upstream monitoring points are VDS, which is located in close proximity to the Ga Molekana community and VDW, which is located within the DWS Vaalkop No. 2 in-stream Dam. Figure 4-4 illustrates the statistical median of the water quality data of VDS, received from March 1999 to March 2019, as a percentage compared to the IRP limit. As indicated in Figure 4-4 sodium, chloride and manganese exceeded the IRP limit for the upstream sample. The water quality downstream of the Groot Sandsloot River is monitored at SS. This monitoring point is located within the Danisane Community downstream of the mine. The water daylights here and is therefore the only point suitable for monitoring downstream of the mining activity. No other surface water downstream of the mine and upstream of the community has been found during sampling runs. Water quality data received for SS from May 2008 to March 2019, is presented in Figure 4-4 and indicates that calcium, magnesium, sulphate and nitrate exceed the IRP limit. Calcium and magnesium may be related to the geology of the area where as sulphate contribution may be the result of mining activities and nitrate contributions the result of both community and mining activities.
4.9 Sensitive areas survey

MM falls into the Savannah Biome. Vegetation types within this biome include Mixed Bushveld and Clay Thorn Bushveld. The area was previously disturbed through activities such as overgrazing, collecting wood for fuel purposes, trampling and dry land crop production activities. The rocky areas and riparian areas are in a slightly better condition.

The wetland identified to the northeast of the Blinkwater TSF as well as the Mohlosane and Sandsloot Rivers that traverse the mine area are considered to be sensitive areas. A 50 m buffer zone has been created around the wetland and in general development occurs at least 100 m away from the two rivers.

The Mogalakwena River has a high Ecological Importance and Sensitivity (EIS) rating due to the importance of conservation of natural areas such as the Ramsar Site, rare and endangered species and rich biodiversity in the area.

4.10 Groundwater

Groundwater is the primary source of water in MM and local communities are generally dependent on it for domestic purposes, including drinking, cooking and bathing, stock watering and small-scale irrigation. The local communities abstract water from boreholes situated in the villages.

There are three wellfields used to supply Mogalakwena Mine – Commandodrift, PPL and Blinkwater.

The associated shallow aquifer in the region of the MM is a sole source aquifer system. According to the DRASTIC (Depth to groundwater, Recharge, Aquifer material, Soil media, Topography, Impact to...
vadose zone and Hydraulic Conductivity) method, this aquifer requires a medium to high level of protection.

The water-quality sampling indicates marginal to poor water quality for the mine boreholes with elevated electrical conductivity and total dissolved solid concentrations above the maximum allowable South African National Standards (SANS) limit.

Open-pit bedrock-induced seepage will slightly increase within each open pit as they progress deeper. The magnitude of the increase is expected to be small due to the low hydraulic conductivity (K) values of the deep bedrock. As the open-pit mining cuts laterally expand the surface area of the open pit, the bedrock seepage rate will also increase.

Drawdown will extend along the Platreef from the Drenthe Fault to the Sandsloot South Pit. The drawdown will not propagate a significant distance away from the open pit due to the low K values of the bedrock. After the pit-lake infilling commences in 2085, the steady-state pit-lake water elevation will be below the pre-mining groundwater level at all open pits. The pit lakes will be terminal sinks to the groundwater system.

The centre of solute concentrations will be located around the locations of the Return Water Dam (RWD), TSFs and waste-rock facilities. As open-pit mining progresses, the hydraulic gradient within the groundwater system will be from the mining facilities to the open pits. Due to the low K value of the bedrock and the small hydraulic gradient across the Mine site, concentrations of chloride, sulphate, nitrate and Total Dissolved Solids (TDS) will not migrate significant distances downgradient away from the open pit. At the end of mining, the solutes from the TSFs will have reached the open pits, while the solutes from the waste-rock facilities will have migrated approximately 300 m downgradient of the open pits.

In addition to elevated constituent concentrations in the pit lakes, there are elevated solute concentrations in the weathered bedrock near key streams at the Mine site due to transport in the alluvial sediments along these water courses.

4.11 Socio-economic aspects

MM is located in the Mogalakwena Local Municipality, within the Waterberg District Municipality of the Limpopo Province. Many villages are within the mining rights area and are therefore directly affected by MM activities. The two main stakeholders in the area are the Mapela Tribal Authority and the State/Government. The operation of MM is associated with a number of positive economic benefits, which contribute to the generation of economic and job opportunities at a local, regional and national scale. The mine provides both temporary and permanent employment opportunities. The mine draws part of the required labour from surrounding villages. Further opportunities exist through the employment of local contractors (using local labour) where possible, as well as through the outsourcing of non-core activities during the operation phase.

4.11.1 Stakeholder issues and comments

Stakeholder engagement has been conducted during the authorisation process, with the intent of the engagement being to identify stakeholder issues. The engagement has therefore not been focussed necessarily just on closure, although issues relating to closure and or rehabilitation have been raised by the stakeholders. The issues that relate to closure and / or rehabilitation are documented in Table 4-1 and Table 4-2.
### Table 4-1: Summary of comments and responses relating to closure during pre-application phase

<table>
<thead>
<tr>
<th>Comments, issues, suggestions raised by stakeholders</th>
<th>Stakeholder name</th>
<th>Organisation/Village</th>
<th>Date</th>
<th>Source of comment (meeting / written / telephonic)</th>
<th>Response by SRK and MM Project team</th>
</tr>
</thead>
</table>
| As an I&AP and recent graduate in environmental studies I am more concerned on how the mine impact our communities socially, economically and environmental. So I believe that the proposed activities by the mine will have severe negative impacts on the environment i.e. it will disturb the ecosystem, impact on the water sources both quality and quantity and also the aquatic life, and lastly will impact the community more negatively than positively as we can see with the current mining operations. So my question is how are you planning to mitigate these potential impacts? Since we both know that the previous and present mitigation measures they are not that effective. The mine must put proper measures to mitigate the negative environmental impacts i.e. noise, flora and fauna and water. | Tendani Bridget Neluheni | Skimming | 25-Jan-19 | Comment form | The following specialists have been appointed to assess the potential impacts that the infrastructure and activities associated with the proposed expansion project may have:  
- Air Quality.  
- Socio-Economics.  
- Rehabilitation and Closure.  
- Geochemistry.  
- Biodiversity (including wetlands).  
- Hydrology.  
- Geohydrology.  
- Noise.  
- Heritage.  
- Soil, land use and land capability.  
- Visual.  
Once the impacts have been identified, appropriate management measures will be developed to manage the impacts. The management measures will be reviewed by the authorities as part of the EIA/EMPr and should they authorise the project to proceed, the authorisation will include conditions which the mine is obliged to comply with and will be audited on and reported to the DMR. |
| Once you divert the Sandsloot River, you also change its direction. Will there be a rehabilitation programme. | Reitumetse Sephesu | Mokopane Task Team | 19-Feb-19 | Follow-up meeting with the Mokopane Task Team | The impact associated with the proposed diversion of the Sandsloot River will be assessed during the impact assessment phase by the relevant specialists. The impact assessment will be done for the anticipated impacts during construction, operational phase and rehabilitation and closure phase. Management measures, which will include rehabilitation requirements, will be assigned to mitigate these impacts during all the phases. These management measures will be included in the Draft EIA/EMPr which will be made available for public comment. |
| As Makhondo Baloyi Construction and Project, we would like to be part of the proposed expansion project as we are qualified. Our company is based at Skimming- Mapela and we hope that we will benefit from the construction and | Dikeledi Emelia Mothlola | Mahwelereng | 05-Feb-19 | Comment Form |  |


<table>
<thead>
<tr>
<th>Comments, issues, suggestions raised by stakeholders</th>
<th>Stakeholder name</th>
<th>Organisation/Village</th>
<th>Date</th>
<th>Source of comment (meeting / written / telephonic)</th>
<th>Response by SRK and MM Project team</th>
</tr>
</thead>
<tbody>
<tr>
<td>operation of the concentrator. This will help alleviate poverty and unemployment.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When chemicals have spilled on the ground, what happens then? What does the mine do to clean it up?</td>
<td>Josephine Madiba</td>
<td>Ga-Madiba</td>
<td>28-Jan-19</td>
<td>Meeting with Mokopane TA Leadership Forum</td>
<td>The mine has a number of procedures and guidelines in place to deal with all types of spillages. Once a spillage is reported the mines teams have to clean it up immediately and safely dispose of it at a registered landfill site.</td>
</tr>
<tr>
<td>Mines allocate funds for rehabilitation after closure and give this money to the government. However, government does not implement closure properly, that is why we have zama-zamas.</td>
<td>Kgoshi Vaaltyn Kekana</td>
<td>Moshate</td>
<td>28-Jan-19</td>
<td>Meeting with Mokopane TA Leadership Forum</td>
<td>The cost associated with the rehabilitation of the proposed infrastructure and activities associated with the expansion project will be calculated and a financial provision provided in line with legal requirements. The mine ultimately remains responsible for the implementation of the approved closure plan.</td>
</tr>
</tbody>
</table>

Table 4-2: Summary of comments and responses relating to closure during scoping phase

**MAPELA TRADITIONAL AUTHORITY**

<table>
<thead>
<tr>
<th>Comments, Issues, suggestions raised by stakeholders</th>
<th>Stakeholder name</th>
<th>Organisation/Village</th>
<th>Date</th>
<th>Source of comment (meeting / written / telephonic)</th>
<th>Response by SRK and MM Project team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our community does not have any Environmental Rehabilitation Programmes for the Waste Rock Dump placed into the Pholotsi River by the Mogalakwena Platinum Mines Limited, which should detail how the mine managers the obvious Acid Mine Drainage and related environmental impacts towards villages/communities on the farm Sandsloot 236 KR. Reference to Mine water management in the Witwatersrand gold fields with special emphasis on the acid mine drainage report to the inter-ministerial committee on acid mine drainage, December 2010.</td>
<td>Ga-Mabusela Sandsloot</td>
<td></td>
<td>05/02/19</td>
<td></td>
<td>SRK notes the comments raised in the correspondence and will provide a formal response to the letter and additional feedback during impact assessment phase of the project.</td>
</tr>
</tbody>
</table>
5 Environmental risk assessment findings

The objective of the environmental risk assessment is to:

- Ensure timeous risk reduction through appropriate interventions.
- Identify and quantify the potential latent environmental risks related to post closure.
- Detail the approach to managing the risks.
- Quantify the potential liabilities associated with the management of the risks.
- Outline monitoring, auditing and reporting requirements.

The risk assessment is limited to the mining lease area and the selected off-site infrastructure. The risk assessment considered the following categories: health/safety, environmental, financial, legal/regulatory and social/reputational/community. The external influences include but are not limited to the parties that are affected or interested in the closure of the mine; and biophysical influences such as climate, ground and surface water entering the mine lease area.

5.1 Methodology

A baseline closure risk assessment was undertaken during 2016 using the Anglo American Plc risk assessment process, where the risk is described and then a determination is taken to assess the nature of the risk and then the risk is ranked according to predetermined criteria for probability and consequence. This baseline was subsequently updated in 2017 and 2018. For purposes of this report, the 2018 risk assessment has been updated to reflect possible closure risks associated with the Expansion Project.

Five categories are considered to describe the nature of the risk, with the primary category being the one that the assessors determine is impacted most significantly should the risk be manifest. The nature of the risk is assessed to fall into one of the following categories:

- Health and safety.
- Environment.
- Financial.
- Legal and regulatory obligations.
- Reputational, social or community.

Once the risks had been captured the probability of the risk occurring as well as the consequence of the risk occurring were rated according to the criteria presented in Appendix A.

SRK is of the opinion that the health and safety and environmental risks typically represent external risks to the biophysical and socio-economic environment that may exist at closure, and the financial, legal and reputational risks are internal and represent how risks at closure influence AAP.

A matrix (Table 5-1) listing the probability and consequence is then used to numerically rank the risk and determine whether the risk level is:

- High (H).
- Significant (S).
- Medium (M).
- Low (L).
Table 5-1: Risk assessment matrix

<table>
<thead>
<tr>
<th></th>
<th>Consequence (Details to be found in Appendix A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Safety</td>
<td></td>
</tr>
<tr>
<td>Occupational Health</td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td></td>
</tr>
<tr>
<td>Community/Social</td>
<td>Insignificant</td>
</tr>
<tr>
<td>Legal and Social regulatory obligations</td>
<td></td>
</tr>
<tr>
<td>Material Losses</td>
<td></td>
</tr>
<tr>
<td>Reputational</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Probability</th>
<th>Risk ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost certain</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>11 (M)</td>
</tr>
<tr>
<td></td>
<td>16 (S)</td>
</tr>
<tr>
<td></td>
<td>20 (S)</td>
</tr>
<tr>
<td></td>
<td>23 (H)</td>
</tr>
<tr>
<td></td>
<td>25 (H)</td>
</tr>
<tr>
<td>Likely</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>3 (M)</td>
</tr>
<tr>
<td></td>
<td>12 (M)</td>
</tr>
<tr>
<td></td>
<td>17 (S)</td>
</tr>
<tr>
<td></td>
<td>21 (H)</td>
</tr>
<tr>
<td></td>
<td>24 (H)</td>
</tr>
<tr>
<td>Possible</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4 (L)</td>
</tr>
<tr>
<td></td>
<td>8 (M)</td>
</tr>
<tr>
<td></td>
<td>13 (S)</td>
</tr>
<tr>
<td></td>
<td>18 (S)</td>
</tr>
<tr>
<td></td>
<td>22 (H)</td>
</tr>
<tr>
<td>Unlikely</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>2 (L)</td>
</tr>
<tr>
<td></td>
<td>5 (L)</td>
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<td></td>
<td>9 (M)</td>
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<td></td>
<td>14 (S)</td>
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<td></td>
<td>19 (S)</td>
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<tr>
<td>Rate</td>
<td>1</td>
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<tr>
<td></td>
<td>1 (L)</td>
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<td></td>
<td>3 (L)</td>
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<td></td>
<td>6 (M)</td>
</tr>
<tr>
<td></td>
<td>10 (M)</td>
</tr>
<tr>
<td></td>
<td>15 (S)</td>
</tr>
</tbody>
</table>

5.2 Outcomes of the risk assessment

Table 5-2 includes the risks that were identified as significant or high and require particular attention during closure. Although attention is given to mitigation of the significant and high risks in this section, conceptual closure strategies have also been prepared for the risks assessed as being low. This has been undertaken as, although a low risk is potentially acceptable to AAP, there are opportunities to reduce the residual risk after management to a lower category, with risk mitigation being one of the primary drivers associated with AAP closure planning activities.

5.3 Sensitive indicators

Regulation in 3(c)ii of Appendix 4 [GN 1147] requires an “identification of indicators that are most sensitive to potential risks and the monitoring of such risks with a view to informing rehabilitation and remediation activities”. SRK interprets this to relate specifically to external risks, being those associated with how MM influence the environment, rather than health and safety, financial, legal and reputational, social and community risks. An examination of the risks that fall into the environmental category indicates that the risks relate primarily to material imbalance, biodiversity, land capability and impacts on water quality or quantity. There are a variety of indicators that can be used to indicate how the environment may have been impacted during operations, which can then be used to inform the rehabilitation actions. These indicators include:

- Growth medium balance.
- Formation of rilles and gulleys.
- PM$_{10}$ fallout.
- Water quality of both the surface and groundwater resources that are predicted to be impacted on by the activities by Mogalakwena Mine.
- Growth medium cover placed to restore land capability.
- Biodiversity – flora and fauna presence, diversity and density.
Based on the current understanding of the closure risks, this monitoring program will be sufficient to collect data to inform further assessment of closure risks and to potentially alter proposed conceptual closure strategies for the management of the risks already identified.

5.4 Residual risk assessment

A risk assessment of the residual risk that remains after the conceptual closure strategies have been implemented was undertaken to determine whether the residual risk is acceptable to AAP. As with the initial risk assessment, this assessment of residual risks was performed using the Anglo American Plc risk assessment approach, based on a 5 x 5 risk matrix, defining probability and consequence. The ranking of all the residual risks is presented in Table 5-2.
<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>Ref no.</th>
<th>Hazard / Risk Source Description</th>
<th>Description of Unwanted Event</th>
<th>Cause of Hazard</th>
<th>Resulting Hazards</th>
<th>Current Controls</th>
<th>Likelihood of the Event (given current controls)</th>
<th>Consequence (should the event happen)</th>
<th>Max Risk Rank</th>
<th>Major Risk (Y, N)</th>
<th>Priority Unwanted Event (Y, N)</th>
<th>Possible Improvements or Additional Controls</th>
<th>Agreed Action (complete for non-priority unwanted events)</th>
<th>Residual Risk Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFRASTRUCTURE</td>
<td>MOG 01</td>
<td>Post closure Mining/Processing Infrastructure</td>
<td>People injuring themselves while accessing the post closure infrastructure at Mogalakwena Third Concentrator and other infrastructure associated with the expansion</td>
<td>Compromised structural integrity due to lack of maintenance of infrastructure as a result of limited resources post closure</td>
<td>Safety and health issues due to exposure to unknown environment with specialised equipment and chemicals. Financial consequences due to theft of equipment.</td>
<td>Routine inspection and maintenance is carried out during operational phase</td>
<td>3: Possible 4: High</td>
<td>18 (S)</td>
<td>Yes</td>
<td>Closure Action: Ensure routine inspection and maintenance of the existing infrastructure post closure. In addition, decommission unsafe infrastructure immediately after the operation ceases.</td>
<td>1. Ensure routine inspection and maintenance of the existing infrastructure post closure. 2. Decommission unsafe infrastructure immediately after the operation ceases.</td>
<td>6(M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MINES RESIDUE</td>
<td>MOG 02</td>
<td>Residue deposits/Stockpiles (Waste rock dumps or WRD)</td>
<td>Not achieving the success criteria for rehabilitation</td>
<td>The basis of success criteria i.e. the detailed rehabilitation prescription including the feasible slope angles, ideal topsoil/growth media depth, suitable seed mix etc. has not yet been established.</td>
<td>Unproductive land use, dust issues etc</td>
<td>Continue with long term rehabilitation trials</td>
<td>4: Likely</td>
<td>4: High 5: Maj</td>
<td>24 (H)</td>
<td>Yes</td>
<td>Yes</td>
<td>Operational Management: 1. Undertake WRD rehabilitation trials to understand which seed mixes work at what slope angles; 2. Undertake a thorough monitoring plan to establish the success/failure of the trials and document it. 3. The Waste rock placement should be undertaken in a way that enables adequate concurrent rehabilitation opportunities at the WRD side slopes.</td>
<td>1. Undertake WRD rehabilitation trials to understand which seed mixes work at what slope angles; 2. Undertake a thorough monitoring plan to establish the success/failure of the trials and document it. 3. The Waste rock placement should be undertaken in a way that enables adequate concurrent rehabilitation opportunities at the WRD side slopes.</td>
<td>14(S)</td>
</tr>
<tr>
<td>MOG 04</td>
<td>Residue deposits/Stockpiles (TSF)</td>
<td>TSF/slope failure</td>
<td>Multiple reasons such as phreatic surface close to eroded slopes due to inadequate maintenance, inadequate design, wrong operating process etc.</td>
<td>Safety and Environmental consequences, reputational damage, legal and financial consequences</td>
<td>Operational monitoring and management (controls) to ensure that the side slopes are safe and stable are in existence.</td>
<td>2: Unlikely 5: Maj</td>
<td>19 (S)</td>
<td>Yes</td>
<td>Yes</td>
<td>Closure Action: Keep all operational controls in place till the phreatic surface is completely dry. Especially, retain drainage structure during closure to maximise consolidation and in post closure limit water infiltration through vegetation establishment</td>
<td></td>
<td>15(S)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CATEGORY</td>
<td>Ref no.</td>
<td>Hazard / Risk Source Description</td>
<td>Description of Unwanted Event</td>
<td>Cause of Hazard</td>
<td>Resulting Hazards</td>
<td>Current Controls</td>
<td>Likelihood of the Event (given current controls)</td>
<td>Max Risk Rank</td>
<td>Major Risk (Y, N)</td>
<td>Priority Unwanted Event (Y, N)</td>
<td>Possible Improvements or Additional Controls</td>
<td>Agreed Action (complete for non-priority unwanted events)</td>
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<td>MOG 06 Biodiversity</td>
<td></td>
<td>Degradation of land capability due to deteriorated biodiversity during operational phase</td>
<td>Long term mining pollution and construction activities</td>
<td>Loss of biodiversity, Alien species removal plan is currently being drafted and will be implemented on site.</td>
<td>3: Possible</td>
<td>4: High</td>
<td>18 (S)</td>
<td>Yes</td>
<td>8(M)</td>
<td></td>
<td>Operational Management: 1. Implement the alien invasive species removal plan on regular basis; 2. Develop concurrent closure measures where covers are placed, and indigenous vegetation established to aid ecological recovery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOG 07 Surface Water (SW)/Ground Water (GW)</td>
<td></td>
<td>Contamination of SW/GW during operational phase</td>
<td>Discharges from mine residue deposits and contaminated areas</td>
<td>Environmental and health consequences</td>
<td>4: Likely</td>
<td>4: High</td>
<td>31 (H)</td>
<td>Yes</td>
<td>8(M)</td>
<td></td>
<td>Operational Management: 1. Understand and address the GW/SW contamination 2. Cost the remediation plan as liability and make financial provision for.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOG 08 Air Quality</td>
<td></td>
<td>Dust pollution from top surfaces of TSFs post closure</td>
<td>Lack of sustainable vegetation on the TSFs</td>
<td>Surrounding soil contamination of surrounding community</td>
<td>3: Possible</td>
<td>3: Mod</td>
<td>13 (S)</td>
<td>No</td>
<td>8(M)</td>
<td></td>
<td>Operational Management: Sustainably vegetate the side slopes of the TSFs during operational phase. Closure Action: Soon after closure, vegetate the top of TSF sustainably</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CATEGORY</td>
<td>Site Impediment</td>
<td>Description of Unwanted Event</td>
<td>Cause of Hazard</td>
<td>Resulting Hazards</td>
<td>Likelihood of the Event (given current controls)</td>
<td>Current Controls</td>
<td>Max Risk Rank</td>
<td>Major Risk Event (Y, N)</td>
<td>Possible Improvements or Additional Controls</td>
<td>Agreement Action</td>
<td>Residual Risk Rating</td>
<td></td>
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</tr>
<tr>
<td>SOCIAL</td>
<td>MOG 9 Social Issues</td>
<td>People injuring themselves while accessing the post-closure infrastructure and mining area especially open pits and concentrators</td>
<td>Value of unclaimed material in the mining area</td>
<td>Reputational, legal obligations</td>
<td>Adequate access control in place during operational life</td>
<td>5: Almost Certain</td>
<td>4: High</td>
<td>3: Mod</td>
<td>1: Ins</td>
<td>23 (H)</td>
<td>Yes</td>
<td>Closure Action: 1. Ensure adequate access control around the open pits to discourage access into the pits. 2. Maintain security and access control in the rest of the mining area till the area is sustainably rehabilitated and relinquished.</td>
<td>14(S)</td>
<td></td>
</tr>
<tr>
<td>SOCIAL</td>
<td>MOG 10 Social Issues</td>
<td>Loss of livelihood of surrounding communities</td>
<td>Dependency of surrounding community and businesses created by mining operations</td>
<td>Loss of living and basic services to people, unrealistic expectations from communities resulting in unrest</td>
<td>None</td>
<td>5: Almost Certain</td>
<td>4: High</td>
<td>23 (H)</td>
<td>Yes</td>
<td>Closure Action: 1. Programs to multi-skill/re-skill employees to ensure they are employable in other industries. 2. Diversify mining operations to replace jobs as mine moves to closure</td>
<td>13(S)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOCIAL</td>
<td>MOG 11 Social Issues</td>
<td>Inadequate land access for mining activities</td>
<td>Unsatisfactory relocation of adjacent communities due to non-availability of land for relocation and not meeting the relocation commitments</td>
<td>Huge waste rehandling cost and significant increase in liability</td>
<td>4: Likely</td>
<td>3: Mod</td>
<td>17 (S)</td>
<td>No</td>
<td>Operational Management: LoM related relocation plan for community relocation must be prepared and implemented well in advance to mining activities.</td>
<td>8(M)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
6 Design principles

6.1 Legal and governance framework

There are a number of legal and regulatory frameworks with which AAP must comply. The following presents what SRK considers the key legislation, which could materially affect rehabilitation and closure:

- Mineral and Petroleum Resources Development Act (Act 68 of 2002) (MPRDA) as it pertains to the social and labour plan.
- Waste Classification and Management Regulations.

Table 6-1 provides a brief description of the legislation as it pertains to closure.
Table 6-1: Summary of SA legislation and implications for closure

<table>
<thead>
<tr>
<th>Legislation</th>
<th>Implications for Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The Constitution</strong></td>
<td>Constitutional requirement to ensure that the Plan includes measures that protect the rights of people to an environment that is not harmful to health or well-being post closure.</td>
</tr>
<tr>
<td>In terms of Section 24 of the Constitution “Everyone has the right to:</td>
<td></td>
</tr>
<tr>
<td>• An environment that is not harmful to their health or well-being.</td>
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</tr>
<tr>
<td>• Have the environment protected, for the benefit of present and future generations.”</td>
<td></td>
</tr>
<tr>
<td><strong>National Environment Management Act (107 of 1998)</strong></td>
<td>The measures required in terms of subsection (1) may include measures to:</td>
</tr>
<tr>
<td>Sections 28 (1) and (3) of NEMA set out the duty of care principle, which is applicable to all types of pollution and must be taken into account in considering any aspects of potential environmental degradation.</td>
<td></td>
</tr>
<tr>
<td>Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.</td>
<td></td>
</tr>
<tr>
<td><strong>Environmental Impacts Assessment Regulations, 2014 as amended in 2017</strong></td>
<td>Any new EIAs or BAs for the mine will be required to consider closure during planning and to include a closure plan and closure estimate to support an authorisation application.</td>
</tr>
<tr>
<td>These regulations were developed for the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations.</td>
<td></td>
</tr>
<tr>
<td><strong>National Environment Management: Waste Act (59 of 2008)</strong></td>
<td>Contamination resulting from operational activities will require remediation, with the final soil quality meeting requirements as specified in the Acts Regulations.</td>
</tr>
<tr>
<td>Part 8 of Chapter 4 of the Act indicates the requirement to identify the status and risk of contaminated sites and provides a legal mechanism for remediation activities to be instigated and controlled.</td>
<td></td>
</tr>
<tr>
<td><strong>Waste Classification and Management Regulations</strong></td>
<td>The Waste Classification and Management Regulations and the supporting Norms and Standards as well as Regulations regarding the Planning and Management of Residue Deposits and Residue Stockpile do not contain specifications around closure, other than the requirements in Regulations regarding the Planning and Management of Residue Deposits and Residue Stockpile that stockpiles and deposits be closed according to the relevant provisions in the environmental authorisations, an EMPr and any other applicable legislation.</td>
</tr>
<tr>
<td>The Waste Classification and Management Regulations and Management require that (Chapter 2, 4(2)) all waste generators must ensure that the waste they generate is classified in accordance with SANS 10234 within 180 days of generation and if the waste is to be disposed of to landfill that (Chapter 2 (8)1) (a) the waste is assessed in accordance with the Norms and Standards for Assessment of Waste for Landfill Disposal.</td>
<td></td>
</tr>
<tr>
<td>Legislation</td>
<td>Implications for Closure</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits</strong></td>
<td>Closure planning process will need to be expanded to include:</td>
</tr>
<tr>
<td>The regulations specify design approach and considerations for Residue Stockpiles and Residue Deposit (RSRD), but more importantly specify that these facilities must comply with the Norms and Standards.</td>
<td>• Annual rehabilitation plan.</td>
</tr>
<tr>
<td>• Final rehabilitation, decommissioning and mine closure plan.</td>
<td>• Final rehabilitation, decommissioning and mine closure plan.</td>
</tr>
<tr>
<td>• Environmental risk assessment report.</td>
<td>• Environmental risk assessment report.</td>
</tr>
<tr>
<td>• Care and maintenance plan.</td>
<td>• Care and maintenance plan.</td>
</tr>
<tr>
<td><strong>Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations</strong></td>
<td>Other aspects of the NEM:AQA such as monitoring and application of management/mitigation measures may apply during closure.</td>
</tr>
<tr>
<td>The purpose of these Regulations is to regulate the determine and making of financial provision as contemplated in the Act for the costs associated with the undertaking of management, rehabilitation and remediation of environmental impacts from prospecting, exploration, mining or production operations through the lifespan of such operations and latent or residual environmental impacts that may become known in the future. The Regulations also include detailed descriptions of the wording required in the documentation to support the provisioning for liability using Bank Guarantees and Trust Funds. Finally, the legislation also provides detailed on the information to be contained in the following plans:</td>
<td></td>
</tr>
<tr>
<td>• Annual rehabilitation plan.</td>
<td></td>
</tr>
<tr>
<td>• Final rehabilitation, decommissioning and mine closure plan.</td>
<td></td>
</tr>
<tr>
<td>• Environmental risk assessment report.</td>
<td></td>
</tr>
<tr>
<td>• Care and maintenance plan.</td>
<td></td>
</tr>
<tr>
<td><strong>The National Environment Management: Air Quality Act (39 of 2004)</strong></td>
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</tr>
<tr>
<td>This Act regulates atmospheric pollution and repealed the Atmospheric Pollution Prevention Act. The Act came into full effect on 1 April 2010 and entrusts the Department of Environmental Affairs with the task of preventing pollution and ecological degradation, while at the same time promoting justifiable economic and social development. Metropolitan and District Municipalities are charged with issuing atmospheric emission licenses for certain listed activities. It must be shown that the best practical means are being employed to limit air pollution before these certificates will be issued. Penalties and criminal sanctions are imposed for non-compliance with the National Management: Air Quality Act. On 1 April 2010, the Department of Environmental Affairs established a list of activities, which require atmospheric emission licenses. The Department has published the minimum emission standards resulting from these listed activities. These include the permissible amount, volume, emission rate or concentration of that substance or mixture of substances that may be emitted into the atmosphere and the manner in which measurements of such emissions must be carried out. The consequences of the listing of these activities is that no person may, without a</td>
<td></td>
</tr>
<tr>
<td>Other aspects of the NEM:AQA such as monitoring and application of management/mitigation measures may apply during closure.</td>
<td></td>
</tr>
<tr>
<td>Legislation</td>
<td>Implications for Closure</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>provisional atmospheric emission licence or an atmospheric emission license, conduct an activity listed on the list anywhere in the Republic or listed on the list applicable in a province anywhere in that province.</td>
<td>If relevant species or threatened ecosystems are present on the mine concession, a management plan must be developed in alignment with these norms and standards.</td>
</tr>
</tbody>
</table>

**The National Environmental Management: Biodiversity Act, (10 of 2004)**

The Act seeks amongst other things, to manage and conserve biological diversity, to protect certain species and ecosystems, to ensure the sustainable use of biological resources and to promote the fair and equitable sharing of benefits arising from bio-prospecting involving those resources. The NEM:BA includes a Regulation related to the management of threatened and protected species. A similar Regulation is applied to Threatened Ecosystems. NEM:BA has a set of norms and standards for the development of management plans for both species (e.g. Threatened or Migratory Species) and ecosystems (Endangered or Critically Endangered).

**The National Environmental Management: Protected Areas Act, (57 of 2003)**

Protected areas such as nature reserves and special nature reserves are declared and managed in terms of this Act. Depending on the nature of the protected area, certain activities (such as mining) may require Ministerial consent or be prohibited outright. The Act also aims to promote the sustainable use of protected areas and the participation of local communities in such areas. In addition, it provides for the continued existence of the South African National Parks.

**Mineral and Petroleum Resources Development Act (Act 28 of 2002)**

The MPRDA makes provision for equitable access to and sustainable development of South Africa’s mineral resources. The MPRDA requires that the environmental management principles set out in NEMA shall apply to all mining operations and serves as a guideline for the interpretation, administration and implementation of the environmental requirements of NEMA.

Historically requirements relating to closure planning and provisioning were included in the MPRDA. These have now been replaced by those in the Financial Provision Regulations under NEMA.

**MPRDA 2002 Part II Social and Labour Plan (SLP)**

The objectives of the social and labour plan are to:

- Promote employment and advance the social and economic welfare of all South Africans.
- Contribute to the transformation of the mining industry.
- Ensure that holders of mining rights contribute towards the socio-economic development of the areas in which they are operating.

A social and labour plan lodged with the Regional Manager is valid until a closure certificate has been issued in terms of Section 43 of the Act.

The contents of a social and labour plan relevant to closure includes:

- A human resources development programme.
- A local economic development programme.

Provisions for the ongoing implementation of SLP commitments across the three core Social and Labour Action Plan content areas must be included in financial and resourcing commitments.
<table>
<thead>
<tr>
<th>Legislation</th>
<th>Implications for Closure</th>
</tr>
</thead>
</table>
| • Processes pertaining to management of downscaling and retrenchment which must include:  
  - The establishment of the future forum.  
  - Mechanisms to save jobs and avoid job losses.  
  - Mechanisms to provide alternative solutions and procedures for creating job security where job losses cannot be avoided.  
  - Mechanisms to ameliorate the social and economic impact on individuals.  
  - Regions and economies where retrenchment or closure of the mine is certain. | This places the obligation to mitigate any aspects that cause or have caused pollution as well as to remediate any residual contaminated water at closure. |
| To provide financially for the implementation of the social and labour plan in terms of the implementation of:  
  • The human resource development programme.  
  • The local economic development programmes.  
  • The processes to manage downscaling and retrenchment. | |

**National Water Act (36 of 1998)**
Section 19 of the NWA sets out the principles for "an owner of land, a person in control of land or a person who occupies or uses land" to:
• Cease, modify or control any act or process causing pollution.  
• Comply with any prescribed waste standard or management practice.  
• Contain or prevent the movement of pollutants.  
• Eliminate any source of pollution.  
• Remedy the effects of the pollution.  
• Remedy the effects of any disturbance to the bed and banks of a watercourse.  
It also describes the actions that can be taken by the catchment management agency to enforce the requirements of the NWA.

**Mine Health and Safety Act (29 of 1996)**
This Act deals with the protection of the health and safety of persons in the mining industry but has some implications for environmental issues due to the need for environmental monitoring within mine operations and maintenance of mine residue deposits.

All closure activities will have to be undertaken in a safe manner where the Health and Safety of all workers involved in closure activities is protected.
6.1.1 Environmental regulatory requirements

The EMP and WUL conditions dealing specifically with rehabilitation of the existing operation are presented in the FDRCP (SRK 2018). These will inform the requirements for the expansion project where relevant. In the event that existing obligations are not relevant to the expansion, appropriate requirements will be developed through the authorisation process.

6.1.2 South African good practice

Due to the fact that the post closure impacts associated with mining operations very often include significant impacts on the water resource, the Department of Water and Sanitation (DWS) has a particular interest in the water management aspects associated with mine closure. Recognising the potential mining impact on water, the DWS formerly known as the Department of Water Affairs and Forestry (DWAF) – commissioned a series of Best Practice Guidelines (BPG) to assist with aspects of DWAF’s water management hierarchy. Included in this series of guidelines is BPG5: Water Management Aspects for Mine Closure. The principles in the BPG5 that are appropriate and that have been used to formulate the rehabilitation strategy are:

- Management measures at closure should primarily be of a passive nature with minimal long-term maintenance and operating costs.
- The final landform must be sustainable, must be free-draining, must minimise erosion and avoid ponding.
- Concurrent rehabilitation must be undertaken in a manner that supports the final closure landform in order to ensure that rehabilitation does not need to be redone at a later stage.
- Land use plan which is directly interlinked with water management issues insofar as water is required to support the intended land use and the land use itself may have an impact on the water resource.
- Biodiversity plan will address issues that are interrelated with the mine water management plan, particularly with regard to the environmental water balance and the effects that mining may have thereon.

6.1.3 Corporate Standards

Anglo American Mine Closure Standard

The purpose of this standard is to give uniform guidance for closure planning in Anglo American.

**Overall objectives:**

- Closure to satisfy internal and external stakeholders.
- Consideration for closure to be integrated into operation of site, rather than left until end of LOM.
- Value may be realised through improved mine closure planning by reducing or eliminating closure risks.
- Minimum requirements ensure maximum value realised through improved integrated closure planning.

The Standard incorporates the following requirements:

**Planning and design:**

- Develop a closure plan that is fundamentally aligned with the Mine Closure Toolbox.
- Design with closure in mind and develop the preliminary closure plan in the project phase and review the overall closure plan at least every three years or when there is a significant change that would lead to material misalignment with the existing plan.
- Establish and maintain a closure vision with associated specific closure objectives and land-use plan endorsed by the site leadership team.
- Identify relevant actions to rate unquantified risks, and decrease the rating of all identified significant and high closure risks, between successive closure plans.
• Complete actions identified in the Gap Analysis from the Mine Closure Toolbox at the appropriate identified time and before the next review of the plan if relevant.
• Minimise closure liabilities through proactive integrated planning through the operations life cycle.
• Engage with external stakeholders at the appropriate level throughout the mine closure planning process, in line with the requirements of the Mine Closure Toolbox.

**Implementation and management:**

• Promote the beneficial re-use of infrastructure post closure wherever possible.
• Demonstrate the existence of a proven rehabilitation technique that meets the closure vision and associated land-use.
• Optimise progressive rehabilitation and develop success criteria as early as possible.
• Minimise post closure active treatment requirements through integrated closure planning.
• Manage and reduce the dependency of relevant surrounding communities through the life cycle of the operation in order to leave behind a positive post closure legacy.
• Include social costs in closure planning as an operational expense until the site is closed when it should be provisioned.
• Calculate both premature and planned closure liabilities utilising the remaining Life of Mine from the approved Life of Mine plan.
• Review and update closure liability estimates (accounting provision) internally at least annually and externally every three years (approval from the Technical Services Mine Closure Department is required for exemptions from the independent review that would only be appropriate for low risk operations or those whose liability has not materially changed).
• Provide a financial provision (cash, guarantee, trust fund) to cover premature closure costs as required by the regulatory requirements of the relevant country.

**Performance Monitoring:**

• Include all post production monitoring and maintenance costs in the closure liability estimates and allow sufficient time for realistic lease relinquishment (generally 5-10 years post the decommissioning phase).

**Anglo American Rehabilitation Performance Standard**

The purpose of this standard is to ensure that all Anglo American projects rehabilitate disturbed land safely and responsibly to avoid or mitigate potential adverse impacts on the environment (Anglo American 2009). Rehabilitation of on-site disturbances need to ensure that there is no detrimental effect on future land use, resource access, ground and surface water quality and quantity. Anglo American shall ensure where possible that no residual risks remain without an on-going and sustainable management plan. For the purpose of annual rehabilitation plan, the implementation of environmental programmes and operational controls will include, as appropriate:

• Progressive rehabilitation maintenance, in accordance with the approved closure and post closure plan.
• Measures to prevent rehabilitation, being used for purposes other than its intended use/capability.
• Monitoring programmes to confirm the rehabilitation stability and effectiveness.
• Soil fertility and content for deterioration, vegetation and soil covers will be monitored where appropriate for stability, land use and productivity.
• Finally progress of, and expenditure on, rehabilitation activities should be monitored.

**Anglo American Mine Closure Toolbox**

In addition to the Anglo Technical Standards for rehabilitation of disturbed land, a guidance tool was launched in 2008 called Anglo Mine Closure Toolbox. The toolbox details what is needed to achieve a successful mine closure that leaves the positive and sustainable legacy for the host communities after our operations have closed.
6.2 Interpretation of the legislation

Legislation, as described in Table 6-1, influencing closure is varied. However, a common thread, is that after mitigation, the impacts of the operation on the environment need to be mitigated and the solutions implemented are required to be sustainable within the existing constraints presented by the biophysical environment, with there in particular being no significant residual impact that water resources will be impacted on.

As described in Section 7 below, closure objectives have been developed to support the closure vision and to assist with complying with the various requirements of the legislation.

7 Closure vision and objectives

The closure vision for MM is intended to inform the closure objectives. The vision for the mine is adopted for the Expansion Project.

The vision is underpinned by the objectives listed below:

The closure objectives which will drive the closure criteria and which have been developed to support the closure vision are:

- Adhere to all statutory and other legal requirements.
- To develop landforms and land-uses that are stable, sustainable and aesthetically acceptable on closure.
- Ensure safety & health of all stakeholders during closure and post closure and that communities using the site after closure are not exposed to unacceptable risks.
- Ensure that closure supports productive uses considering pre-mining conditions and agree with commitments to stakeholders.
- Physically and chemically stabilise remaining structures to minimise residual risks.
- Promote biodiversity and biological sustainability to the maximum extent practicable.
- Utilize closure strategies that promote a self-sustaining condition with little or no need for ongoing care and maintenance.
- To achieve agreed quality targets set by the Catchment Management Authority (CMA) and the DWS as far as practical relative to impacts and reasonability to achieve.

8 Alternatives

A number of potential alternatives for closure of the Expansion Project can and are likely to be considered as the operation progresses, within the context that the remaining Life of Mine is likely to extend into the next century, although the current Life of Mine plan only extends to 2060. These alternatives include:

- Rehabilitation methods on the waste rock dump and the tailings embankments. Given that the material balance for the operation indicates a potential shortfall of closure materials, potential alternatives to covering the entire dump surfaces with growth medium will be considered. This could include utilising a combination of stockpiled topsoil, stockpiled subsoil and possibly tailings material. Furthermore, there may be opportunities to establish nodes of vegetation across the surface of the dump, where pockets of growth medium are placed at strategic locations to act as nodes of vegetation dispersal across the dumps, allowing natural colonisation to establish vegetation on areas not actively rehabilitated.
• There may be opportunities to have multiple slope angles on a dump, dependent on the slope's aspect, slope length and where individual benches are located on the facility. Reshaping of the entire facility may therefore not be required as the closure strategy.

• There is an expectation that after closure, groundwater levels will recover in the various pits. Modelling currently indicates that the pits will remain a hydraulic sink. The implication of this is that decant is not expected from the pits and migration from the pits into the surrounding aquifer is unlikely. This has potential implications on groundwater remedial measures that are implemented in closure at the various areas of the mine where mining and processing activities have impacted.

• A number of structures may have the potential to be utilised in closure for a variety of activities. These may include medical, educational or light and heavy industry. These opportunities will be explored as the mine developed and the end of LoM approaches.

• As further assessment and trials are required to develop the alternatives, and then the required authorisation obtained, the alternatives described above have not been costed in the assessment of liability. Rather the costing is based on the obligations as they currently exist.

8.1 Closure and post closure period

The purpose of implementing closure actions is to reduce closure risk to an acceptable residual risk timeously. Based on the work required, AAP has determined that closure will be implemented over a five-year period, based on the premise that significant remedial work will have been undertaken on the waste rock dumps and decommissioned infrastructure during the remaining Life of Mine.

Once the closure activities have been completed, the operation will enter a ten-year post closure period. During this time, erosion repair and vegetation establishment will be undertaken, if monitoring activities indicate that it is required. This is within the context that the areas under consideration in this plan are flat and are not likely to be subject to significant erosion.

A post closure period of ten years is considered by AAP to be sufficient time as biological process can be demonstrated to be occurring, leading to vegetation covers being stable and sustainable, within this timeframe. Furthermore, sufficient data can be collected to demonstrate that the achievement of the specific relinquishment criteria comply with the trend for the biophysical category under consideration.

8.2 Closure options research

On-going research and investigations on closure options will be focussed on soil remediation and post closure water management.

8.3 Closure assumptions

This closure plan has been developed based on available information including environmental data. Some of the information currently available may need to be supplemented during the operational period. Therefore, as outlined below, a number of assumptions have been made about general conditions as well as closure and rehabilitation of the specific facilities at the site (i.e. as they pertain to the Expansion Project) to develop proposed closure actions. As additional information is collected during the operations of the Expansion Project, these assumptions will be reviewed and revised as appropriate.

General assumptions used

• The commencement of closure varies for the different infrastructure. For purposes of this plan the following has been assumed:
  - Concentrators – closure commences once the “last ton” has been milled and the residue deposited on the tailings dam. The last ton could include low grade material that may have been stockpiled, or it could include material recovered from a TSF for reprocessing.
  - Waste rock dumps – closure commences once the WRD is at its design capacity and no more overburden is deposited.
- Tailings dams – disposal of the last ton of tailings.
- Workshops – closure commences once the last ton or ore has been mined and processed.
- Administrative – Some of the administrative functionality will be required during the closure period and infrastructure will be required to support this. Closure of these facilities will therefore occur approximately 12 months before expected relinquishment.

- A detailed closure material balance has not yet been undertaken for the operation. An underlying assumption of the costing is that sufficient growth medium material will be sourced within 5 km of where it will be required during closure.
- Security will be required during the closure period to limit access of unauthorized people. Once the closure activities are complete and the operation enters the care, maintenance and monitoring period, MM assumes that security will be withdrawn from the site.

Waste rock dumps
- SRK assumes there is no potential to generate acidity or leach significant metals from the waste rock dumps. The lack of acid generating or metal leaching potential on the dumps implies that low permeability-infiltration reducing covers are not required on the dumps.
- SRK assumes that as the rainfall is relatively limited in the region, engineered dump runoff control structures are not required in the closure design criteria.

Tailings dam complex (including RWD)
- SRK assumes there is no requirement to enhance the dewatering of the tailings. Consolidation that occurs naturally will be sufficient to allow mechanical plant to operate on the surface for cover placement.
- Current data indicates that the TSF has a low potential to generate Acid Rock Drainage Metal Leaching (ARDML). SRK, therefore assumes low permeability cover material is not required to reduce infiltration and the mobilisation of potential contaminants.

Water management
- As evaporation exceeds precipitation, SRK assumed that contact water that requires management, can be evaporated from appropriately protected facilities.
- SRK assumes that sediments in the various water management infrastructures are not likely to be classified as hazardous.
- All diversion structures will remain post closure, to divert clean water from the unnamed tributaries around the project related infrastructure. SRK assumes that integrity issues with the structures will be identified and rectified during operations and there will be no further actions required on the diversion structures at closure.

Infrastructure
- SRK assumes all demolition rubble is considered General Waste as per the definition of demolition waste in Category B of Schedule 3 of the National Environmental Management Waste Amendment Act (NEMWAA) and based on the classification as General can placed on a waste rock dump prior to closure of the dump.

It is important that the validity of these assumptions is re-visited with each upgrade of the closure plan to ensure that the final decommissioning and closure plan is based on a sound baseline description.

9 Final land use
Post closure land use (PCLU) is determined in consultation with stakeholders so that the PCLU meets the requirements of the stakeholders, within the context of what can reasonably be achieved on site. This activity is undertaken for the whole mine lease area affected by mining activities and integrates stakeholder requirements with risk mitigation. As specific consultation regarding PCLU has not been undertaken at this stage of the closure process for the Expansion Project nor has it been undertaken for the large mining rights area, for purposes of current planning and liability costing for the Expansion Project, various assumptions relating to closure have been developed.
Given the extent of the disturbance within the lease area, with the majority of the disturbance remaining post closure in the form of mine residues (tailings and waste rock) and various open pits, post closure land use is unlikely to contain alternatives that could be utilised sustainably by the community. However, should infrastructure be demolished, there are opportunities that the footprints could be utilised for sustainable post closure uses.

Based on the limitations presented by the permanence of the disturbances associated with the mining activities, the overall post closure land use for the mine has been determined to be:

- Landforms, that sustain indigenous vegetation which limits water and wind erosion.
- Mosaic of nodes where existing infrastructure is utilised by stakeholders for a variety of post closure activities surrounded by areas rehabilitated back to a land capability possible of supporting indigenous vegetation as well as land capable of supporting the various community initiatives in which the mine is involved.

The land capability developed on the footprints where covers are placed, and vegetation established will be a land capability defined as grazing by the Chamber of Mines\(^5\), with these covers expected to support landforms that support indigenous vegetation. Flat areas where decommissioning activities are undertaken will be converted to a mosaic of land where the intended use is industrial and agricultural.

As the nature of the disturbance associated with the Expansion Project is similar to that which already exists for the operational infrastructure, the PCLU for the Expansion Project is aligned with the above. It is likely that on closure of the expansion infrastructure, the residues will present few sustainable land use options to the communities, however, infrastructure that remains, as well as the footprints that remain, after decommissioning may have associated sustainable post closure land uses.

As the demographics of the areas surrounding the mine may change at closure as communities potentially move in seek of other livelihoods, pressures on the land may reduce. This may however, be countered by population growth between now and when the mine closes. It is likely that for the next 20 to 30 years, land use will be associated with mining and will remain so until closure. After closure, the mine is likely to enter into a period of care and maintenance on the rehabilitated areas, further limiting opportunities for community use. However, once sufficient data has been obtained to indicate that the mine has met its relinquishment criteria, use of rehabilitated areas may commence.

\(^5\) Now known as Minerals Council South Africa
10 Closure actions/criteria

The rehabilitation actions that the operation intends undertaking at the end of the life of the Expansion Project are described below, with these based on the closure actions for the remainder of the operation as described in the FDRCP (SRK, 2018). These actions are designed to comply with the requirements of this rehabilitation plan’s objectives and the requirement for the development of risk mitigation closure strategies identified during the risk’s assessment (Section 5).

10.1 North waste rock dump

The strategy will be to undertake closure activities that will result in a stable landform, capable of supporting a vegetation community analogous with surrounding grasslands, where the generation of contact water and sediment laden runoff is limited by the incorporation of appropriate covers in the closure design. Aesthetics associated with the dumps will be improved as a consequence of the establishment of vegetation on these facilities.

Trials will be undertaken to identify the optimal closure slope angles, with there being a possibility that different angles can be used on different positions on the dump and on different morphological aspects. It is likely that the closure angles will be between 18° to 24°.

Historical information indicates that opportunistic vegetation is limited, implying that a form of growth medium is required. During operations, trials will be conducted to determine whether there is a blend of saprolite and topsoil that can be formed to sustain vegetation, without the blend being dispersive and subject to slumping and erosional influences. The cover placement strategy, after reshaping to the desired angle, is likely to include:

- Growth medium placed on the lower slopes of all facilities. This is required to limit sediment washout from higher up the slopes, migrating to the toe of the facilities. It is also required to limit sediment generation from the lower slopes. Vegetation will be established in line with the Vegetation Management Plan (VMP) that will be developed to support revegetation activities at the mine.
- Islands of growth medium placed on the higher slopes to form nodes from which plants may be distributed to other portions of the slopes. The size and spacing of these nodes will be determined from field trials established during the operational period. Vegetation will then be established in line with the VMP.
- The top surfaces of all facilities may require cover with growth medium and vegetation establishment to limit dust generation. Trials will be conducted to determine whether saprolite with appropriate ameliorants will support a vegetation population on these surfaces.
- Access ramps to the top of the dumps will remain while the top is being reclaimed. Once complete, ramps will be reshaped to a profile similar to the rest of the dump.

Where the potential exists as determined by the physical and geochemical characteristics of the waste rock, the waste rock facilities will remain open for processing by third parties.

10.2 Tailings storage facility

Closure activities that will result in a stable landform capable of supporting a vegetation community analogous with surrounding grasslands, where the generation of contact water is limited by the incorporation of vegetation covers in the closure design will be implemented for Blinkwater 2. This is in line with the requirements for the existing Blinkwater 1 TSF.

Closure actions for the will include the following:

- As there is a negative meteoric water balance, excess inventory on the TSF’s and in the Return Water Dams will be evaporated and no active dewatering is anticipated.
• All civil structures not required for the management of the facility will be decommissioned, which includes the backfilling of the decant structures.

• The final design profile of the Blinkwater 2 will be downstream embankment at a slope of 2.4H: 1V slopes. Reshaping requirements will be assessed based on the outcomes of the vegetation trials to be undertaken by MM on the operational waste rock dumps. Vegetation will then be established in line with the requirements of the VMP.

• A system of paddocks created on the top surface may limit vegetation establishment, depending on how saturated these paddocks remain. Therefore, storm water management will include the construction of spillways discharging to the environment to manage the 1:100 year return flood events, rather than containing water for evaporation in paddocks on the top surface. MM assume that the quality of the contact water will achieve discharge standards, particularly as there will be limited evaporative concentration of any rain water falling on the surface.

• During the final stages of the life of the TSF, deposition will be undertaken to achieve a beach which drains towards the spillways on each of the facilities.

• Experience indicates that vegetation can be established directly onto the surface of the tailings without the placement of growth medium. Therefore, vegetation will be established straight onto the tailings surface. However, a growth medium cover will be required on the rock embankments. Given the material size distribution on the embankment, an intermediate cover of crushed waste rock may be required to provide a more homogenous surface for growth medium placement. The requirement for this will be determined during future iterations of the closure plan. Vegetation will be established in line with the requirements of the VMP.

• Energy dissipaters will be used on the downstream side of the conveyance structure from the spillway to reduce velocity prior to discharge of the water to the receiving water body.

• The existing seepage control structures at the toe of the TSF will be retained for the closure period.

10.3 Concentrators and associated infrastructure

All infrastructure for which there is no approved third party post closure (either at the proposed Third Concentrator or at the upgrades to the North Concentrator) use will be decommissioned and the footprints reclaimed for the establishment of grasslands. Infrastructure where there is a third party use will be legally transferred to the relevant third parties.

Material inventories will be managed near the end of operations to minimize any surplus materials at closure. Fuel, lubricants and other materials needed to support the closure activities will be utilized during the closure period. The majority of the fuel storage facility will be closed during the first year of operations, but some fuel storage capacity will be required until all equipment has been demobilized from the site at the end of the closure period.

Where practicable, equipment and materials with value not needed for post closure operations will be sold and removed from the site. All other equipment will be demolished and disposed of on-site. Equipment with scrap or salvage value will be removed from the plant and stored either in the existing salvage yard or a facility designated for this purpose during the closure period.

A soil contamination investigation will be conducted on completion of demolition activities, particularly in excavations remaining open following decommissioning. The purpose of this will be to identify areas of possible contamination and design and implement appropriate remedial measures to ensure that the soil closure criteria are obtained.

Excavations remaining following demolition, foundation and slab removal and those where contamination remediation has been undertaken will be filled with waste rock and covered with growth medium. The depth of growth medium placed and the vegetation established will be dependent on the outcomes of VMP. Sufficient growth medium will be placed to allow for the successful establishment of vegetation. Cover and growth medium placement will be undertaken to promote proper runoff drainage and prevent the formation of low points where water may pond.
Closure actions for the buildings will include the following:

- The water and power reticulation and associated infrastructure will be retained until such time as water and power are no longer needed on site. Once no longer required, all power and water services to be disconnected and certified as safe prior to commencement of any demolition works.
- All remaining inert equipment and demolition debris will be placed in the base of the nearest open pit.
- Salvageable equipment will be removed and transported offsite prior to the commencement of demolition.
- All fittings, fixtures and equipment within buildings will be dismantled and removed to designated temporary salvage yards until removed as scrap or disposed as waste.
- All tanks, pipes and sumps containing hydrocarbons to be flushed or emptied prior to removal to ensure no hydrocarbon/chemical residues remain.
- All above ground electrical, water and other service infrastructure and equipment to be removed and placed designated temporary salvage yards until removed as scrap or disposed as waste.
- All pond liners to be removed for disposal in designated landfills.
- Electrical, water and other services that are more than 400 mm below ground surface will remain.
- All pipes and structures deeper than 400 mm need to be sealed to prevent possible ingress and ponding of water.
- Concrete slabs and footings will be removed to a depth of 500 mm below ground surface. This concrete (and metal) will be broken up and disposed of in the pit.
- All concrete below 500 mm depth will remain underground with the invert of all structures broken/sealed to prevent possible ingress and ponding of water.
- Soils beneath the plant, storage tanks and chemical storage areas will be sampled. Any contaminated soils found will be removed for disposal as per the mines Waste Management Plan.
- All subsurface cavities such as reinforced concrete tunnels under stockpiles and septic tanks will be backfilled.
- All excavations resulting from demolition of plant, buildings, roads, conveyor platforms, etc. and earth structures will be left in a safe manner.
- All telecommunication towers and dishes to be dismantled and removed.

10.4 Roads, laydown and parking areas

Mine roads that are not needed for closure and post closure uses at the site (e.g. security and monitoring) will be closed. Where possible the larger roads that are retained will be resized for post closure use by regrading and ripping to a width that is appropriate for anticipated post closure traffic.

Closure actions for the roads, laydown and parking areas will include the following:

- Removal of all signage, fencing, shade structures, traffic barriers, etc.
- All ‘hard top’ surfaces to be ripped and bitumen removed along with any culverts and concrete structures.
- Where possible preserve existing vegetation – native trees and plants that may currently be incorporated in parking areas.
- All concrete lined drainage channels and sumps to be broken up and removed.
- All excavations or vertical walls resulting from removal of foundations or structures are to have sides slopes battered to 2H:1V and are to be made safe pending final reclamation work.
- All potentially contaminated soils are to be identified and demarcated for later remediation.
- All haul routes that have been treated with dust suppression water need to be sampled to determine whether they need to be treated as “sealed” roads with the upper surface ripped and removed and disposed of as per the mines Waste Management Plan.
- Any slag placed as dust suppression medium needs to be lifted and placed at the base of the nearest pit.
10.5 Buffer dam

The dam will ultimately be reclaimed and the area shaped to form a stable landform congruent with the surrounding landscape. The dam will, however, be retained during the majority of the closure period to provide water for closure activities as well as to capture any residual seepage and contact water which may be generated on the site.

Closure actions for the dam will include:

- Demolish all concrete structures.
- Remove any silt that accumulated in the dam and classify in line with regulations. Silt to be managed as per the mines Waste Management Plan.
- Remove liners and following waste classification testing, dispose appropriately. If the liner is not identified as a potential future contamination risk, the liner will be buried in situ. Prior to burial, the liner will be punctured or cut so that that natural geohydrological conditions are minimally impacted at closure.
- Backfill excavations with material removed during construction which will be located adjacent to the dams.
- Profile footprint to be free draining with no low points to accumulate water.

10.6 Waste management

Waste will be classified as necessary and then depending on the classification handled according to the mines Waste Management Plan. Likely activities are:

- Designated temporary salvage yards will be developed for the storage of mobile equipment, structural steel and mechanical equipment or other equipment with a potential resale or scrap value. The location of these yards will be dictated by existing permitted land clearance. Material will be stored in these salvage yards until opportunities for resale/reuse are exhausted. Residual material will be disposed of according to the Waste Management Plan.
- It may be necessary for security reasons to fence temporary salvage yards particularly where these are located close to public roads.
- Once material is removed from the yards (either through sale or disposal), temporary infrastructure will be demolished, compaction loosed by ripping and the footprint revegetated as per the VMP.

10.7 Storm water management

Prior to closure, a water management plan will be prepared to identify which structures are required at closure and which can be decommissioned. Ditches decommissioned will be closed by backfilling the excavations with the material removed and placed adjacent to the structures. Bunds not required will be flattened by redistributing the material across the footprint used to borrow the material for construction.

10.8 Fencing and walling

Walls will be demolished by breaking the concrete panels or bricks and mortar and removing support posts from the ground. Rubble and scrap metal will be disposed of in the pit and the excavations for support posts will be backfilled with growth medium. The footprints of the demolished walls will then be rehabilitated as per the footprints for other infrastructure being demolished.

Security fencing around individual infrastructure will be removed once fences are redundant. Support posts will be removed by excavating to base level if necessary. Excavations will be backfilled with growth medium and vegetation established.
10.9 Vegetation and wildlife

Successful revegetation will help control erosion of soil resources, maintain soil productivity and reduce sediment loading in streams. As part of biodiversity management, revegetation will enhance the resulting biodiversity opportunities by utilizing non-invasive plants that fit the criteria of the habitat (e.g. soils, water availability, slope and other appropriate environmental factors). Invasive species will be avoided, and the area will be managed to control the spread of these species.

The slopes at the mine residue facilities are likely to be susceptible to erosion, even after reshaping the facilities to a lower gradient. To counter the effects of erosion, naturally occurring grassland species will be planted on the slopes and tops of the facilities. At this time, these species will provide soil holding capacity and reduce runoff velocity. The composition of the natural species and their planting strategy will be determined through revegetation trials conducted concurrently with mining.

The flatter areas, such as those not on mine residue facilities, will be revegetated with the objective of creating a sustainable ecosystem similar to an analogous reference plots.

No specific measures will be taken to reintroduce wildlife as the different animals still occupying the remaining habitat are expected to expand their territories into the MM area.

11 Threats, opportunities and uncertainties

As the expected mine life is well beyond 2060 and the plan is based on predicted impacts rather than actual impacts measured as closure approaches, there are a number of assumptions that have been made around the biophysical and socio-economic environment that will exist at the end of the life of operations. These assumptions represent uncertainties, but also represent areas where there may be threats and opportunities that cannot at this stage be adequately defined. The guideline in GNR 1147 requires that a list of these uncertainties and threats and opportunities be identified and maintained during subsequent revisions of the closure plan. AAP understands that the purpose of this list is to inform future revisions of the plan relating to the focus of resources. During these revisions, it is expected that resources can be focused to determine whether either the threats or opportunities are realised and whether uncertainties are addressed. The uncertainties, threats and opportunities are reflected in Table 11-1 below.

**Table 11-1: Threats and opportunities relating to closure**

<table>
<thead>
<tr>
<th></th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biophysical</strong></td>
<td>The remaining LoM is in excess of 50 years which provides time in which to undertake trials to determine appropriate growth media, slope and vegetation requirements.</td>
<td>The low rainfall may hinder vegetation establishment and sustainability. Future regional mining developments may result in significant cumulative impacts occurring if closure occurs simultaneously.</td>
</tr>
<tr>
<td><strong>Economic</strong></td>
<td>The large quantities of waste rock available can potentially be utilised as construction aggregate.</td>
<td>The community reliance on the mine for livelihood will impact the workforce and their dependents at closure with little opportunity for livelihood replacement. Simultaneous mine closure resulted in cumulative impact of loss of livelihood on the community.</td>
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<tr>
<td><strong>Social</strong></td>
<td>Existing forums can be utilised to communicate and engage around closure. SLP and Socio-Economic Assessment Toolbox (SEAT) process already in place and can be used to develop projects during operations to alleviate the closure impacts.</td>
<td>Land pressures may result in communities utilising reclaimed footprint inappropriately. The high population density around the mines perimeter may result in numerous community members accessing the mine, increasing health and safety risks.</td>
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<tr>
<td><strong>Other</strong></td>
<td></td>
<td>Legislation changes may result in unrealistic closure requirements.</td>
</tr>
<tr>
<td><strong>Uncertainty</strong></td>
<td>Stakeholder requirements at closure.</td>
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</tbody>
</table>
12 Final rehabilitation, decommissioning and closure schedule of actions

12.1 Closure schedule

A schedule of actions for final rehabilitation, decommissioning and closure, which will ensure avoidance, rehabilitation and management of impacts is presented in Table 12-1 below. The schedule is linked to AAP’s intention to undertake rehabilitation activities over a five-year closure period at the end of the Life of Mine.

This schedule is based on implementing the actions described in Section 10 and relates to the aspects considered in this section.

Appendix 4 of GNR 1147 requires that a spatial map or schedule, showing planned spatial progression throughout operations be included in the plan. However, as the spatial progression is limited to the available benches on the mine residue facility once the footprint is fully utilised, the inclusion of a plan showing the spatial progression will not add any further information than that included in the table above.

12.2 Organisational capacity and capacity building

AAP has the in-house capacity to undertake mine closure activities or will ensure that the personnel with the correct capacity and experience will be employed. There is therefore unlikely a need for internal capacity building.

AAP however, recognises that there is likely to be the need to build the capacity of the local communities who are influenced by activities at the retained assets at MM and who would be considered as closure stakeholders. MM will at the appropriate time, most likely five years before closure, embark on a capacity building program with stakeholders so that stakeholders are in a position to understand the risks that may exist at closure and limitations around risk mitigation strategies and that the stakeholders are able to provide meaningful input to engagements around possible post closure land use.

The diagram in Figure 12-1 provides the current organisational structure in place to ensure the knowledge gaps identified are addressed and the schedule of actions is implemented so that a seamless transition can be achieved at closure. The organisational structure provides a generic structure which is to be adapted as required during the operational period. Two years from planned closure, a closure champion is to be elected who will implement the closure plan to ensure a seamless transition at closure is achieved.
### Table 12-1: Schedule for closure

<table>
<thead>
<tr>
<th>Description</th>
<th>Yr-3</th>
<th>Yr-2</th>
<th>Yr-1</th>
<th>Yr-2</th>
<th>Yr-3</th>
<th>Yr-4</th>
<th>Yr-5</th>
<th>Yr-6</th>
<th>Yr-7</th>
<th>Yr-8</th>
<th>Yr-9</th>
<th>Yr-10</th>
<th>Yr-11 - Yr-15</th>
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<td>Third Concentrator plant</td>
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<td>Blinkwater 2 TSF</td>
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<td>Northwest waste rock dump</td>
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<td>Buffer dam</td>
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<td>Mine fleet workshop</td>
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<td>Monitoring</td>
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<td>Stability</td>
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<tr>
<td>Vegetation</td>
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<td>Dust</td>
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<td>Surface water</td>
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</tbody>
</table>
13 Identified gaps in the plan

As documented in Section 8.3, a number of assumptions were required to develop this plan. The existence of these assumptions is that there is not sufficient information for definitive actions to be developed. Information therefore needs to be collected to confirm the assumptions and develop the assumptions into closure actions. These primarily relate to:

- A potential shortfall in growth medium required to support vegetation covers on rehabilitated and restored footprints. Alternative growth media sources need to be explored.
- The final slopes of the waste rock dump need to be determined to identify slopes which are likely to be sustainable in the post closure environment.
- Post closure water management.

14 Relinquishment criteria

Following the implementation of the closure actions described in Section 10, it is necessary to have measurable criteria against which to assess the effectiveness of the plan and its implementation. These criteria will assist the MM in identifying when the standard of closure achieved is sufficient to relinquish responsibility for a specific area. The site specific relinquishment criteria for the MM are documented in Table 14-1. Also included in the table are the indicators required to demonstrate achievement with the relinquishment criteria and the reporting requirements. The reporting requirements are those that are expected to fulfil the monitoring requirements set out by legislation.
Table 14-1: Relinquishment criteria

<table>
<thead>
<tr>
<th>Category</th>
<th>Closure criteria</th>
<th>Indicators</th>
<th>Reporting requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground and surface water</td>
<td>Compliance with the WUL.</td>
<td>Downstream/gradient water quality monitoring.</td>
<td>Monitoring report.</td>
</tr>
<tr>
<td>Air</td>
<td>Compliance with the standards as per the National Environmental Management: Air Quality Act (No. 39 of 2004).</td>
<td>Records of air quality measurements for PM$<em>{10}$ and PM$</em>{2.5}$.</td>
<td>Monitoring report.</td>
</tr>
<tr>
<td>Soil quality</td>
<td>Soil quality as assessed against the Norms and Standards to support Chapter 8 of NEM:WA.</td>
<td>Soil quality in areas where contamination is identified.</td>
<td>Results of soil quality and risk assessment.</td>
</tr>
<tr>
<td>Land productivity</td>
<td>Land capability and productivity similar to that which existed prior to mining.</td>
<td>Land capability and productivity.</td>
<td>Comparison to analogue areas and pre-mining aerial photographs.</td>
</tr>
<tr>
<td>Erosion</td>
<td>Implementation or construction of erosion control measures.</td>
<td>Establishment of vegetation.</td>
<td>See vegetation row in this table.</td>
</tr>
<tr>
<td>Safety / stability</td>
<td>The site is safe for use by humans and animals, including in the foreseeable future.</td>
<td>Geotechnical and hydrological studies of existing structures.</td>
<td>Evidence in rehabilitation report that appropriate risk assessment has been undertaken and control measures are in place.</td>
</tr>
<tr>
<td>Aquatic ecosystem</td>
<td>Wetland and aquatic macro invertebrate populations at crossing using appropriate biomonitoring techniques.</td>
<td>Species and composition.</td>
<td>Monitoring report.</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Establishment of self-sustaining vegetation population which stabilizes soils and is not invasive to the region.</td>
<td>Species cover and composition.</td>
<td>Monitoring report.</td>
</tr>
</tbody>
</table>

15 Closure cost estimation

The liability has been estimated using the approach documented in the “DMR Guideline” (Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine – 2005). Rates have been annually updated with the prevailing Consumer Price Index (CPI) as obtained from StatsSA. The rates included in the assessment are those relevant for 2019.

The approach to calculating the closure quantum is that specified in the DMR Guideline and summarised below.

**Step 1: Determine the Mineral Mined**

In the first step the mineral mined has been identified in the tables provided in the DMR Guideline (Table B.12) as “Platinum”.

**Step 2A: Determine Primary Risk Class**

The “Primary Risk Class” has been determined from Table B.12 of the DMR Guideline as “Class B”.

**Step 2B: Revision of Primary Risk Class**

The Primary Risk Class can be revised on the basis of saleable by-products if required. However, this is not applicable at MM.
Step 3: Determine Environmental Sensitivity

The “Environmental Sensitivity” has been determined by reference to Table B.4 of the DMR Guideline as “High”.

Table B.4 DMR Sensitivity matrix

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Sensitivity criteria</th>
<th>Biophysical</th>
<th>Social</th>
<th>Economic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Largely disturbed from natural state, Limited natural fauna and flora remains, Exotic plant species evident, Unplanned development, Water resources disturbed and impaired.</td>
<td>The local communities are not within sighting distance of the mining operation, Lightly inhabited area (rural).</td>
<td>The area is insensitive to development, The area is not a major source of income to the local communities.</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>Mix of natural and exotic fauna and flora, Development is a mix of disturbed and undisturbed areas, within an overall planned framework, Water resources are well controlled.</td>
<td>The local communities are in the proximity of the mining operation (within sighting distance), Peri-urban area with density aligned with a development framework, Area developed with an established infrastructure.</td>
<td>The area has a balanced economic development where a degree of income for the local communities is derived from the area, The economic activity could be influenced by indiscriminate development.</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Largely in natural state, Vibrant fauna and flora, with species diversity and abundance matching the nature of the area, Well planned development, Area forms part of an overall ecological regime of conservation value, Water resources emulate their original state.</td>
<td>The local communities are in close proximity of the mining operation (on the boundary of the mine), Densely inhabited area (urban/dense settlements), Developed and well-established communities.</td>
<td>The local communities derive the bulk of their income directly from the area, The area is sensitive to development that could compromise the existing economic activity.</td>
<td></td>
</tr>
</tbody>
</table>

Step 4.1: Determine level of information available

The Mine has an approved EMP and a good environmental data base. The level of information available is therefore considered to be “Extensive”.

Step 4.2: Identify closure components

The closure components have been identified - shown in the cost table presented in Table 15.2.

Step 4.3: Unit rates of closure

The unit rates of closure have been identified from Table B.6 of the DMR Guideline and are as shown in the cost table presented in Section 3.

Step 4.4: Weighting factors

The weighting factors have been determined from Tables B.7 and B.8 of the DMR Guideline.

Weighting Factor 1 = 1.0 (Flat terrain) – the site is surrounded by rugged terrain, but as the mine is located in a valley, SRK opinion is that the footprint would classify as flat.

Weighting Factor 2 = 1.05 (Peri Urban)
The areas of disturbance were determined from the design drawings with the areas summarised in Table 15.1. Quantities for the third concentrator were obtained from the already constructed North Concentrator as the proposed third concentrator will be similar to the North Concentrator.

**Table 15-1: Areas used in the liability assessment**

<table>
<thead>
<tr>
<th>NAME OF ACTIVITY</th>
<th>AERIAL EXTENT OF THE ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction and operation of a M3C plant and associated infrastructure including crusher and bulk ore sorting facility</td>
<td>Approximately 42 ha</td>
</tr>
<tr>
<td>Establishment of the North WRD, ore stockpiles and associated haul roads</td>
<td>Approximately 210 ha (haul road area 21.4 ha)</td>
</tr>
<tr>
<td>Construction of a buffer dam to store mine-related process water. The proposed buffer dam will include a pipeline system connecting the buffer dam with the M3C, RWDs of the Vaalkop TSF and Dam 1160</td>
<td>Approximately 30 ha</td>
</tr>
<tr>
<td>Expansion of the approved footprint of Blinkwater TSF compartment 2 Expansion of the NEMA approved, but not constructed Blinkwater compartment 2 TSF to provide additional capacity to support the development of the M3C. The expansion will include a paste plant operation</td>
<td>Approximately 245 ha (Previously approved area 160 ha)</td>
</tr>
<tr>
<td>Upgrade of the existing MSC plant and associated infrastructure to assist with increasing the current crushing capacity of the MSC and will include a conveyor system (and associated maintenance road), crushing and screening operations</td>
<td>Approximately 3.5 ha</td>
</tr>
<tr>
<td>Upgrade of the existing STP at the contractor’s camp and the North STP</td>
<td>Approximately 0.2 ha</td>
</tr>
<tr>
<td>Expansion of workshop area to accommodate anticipated increase in mining equipment and associated mining equipment assembly areas</td>
<td>Approximately 0.9 ha</td>
</tr>
<tr>
<td>Establishment of a temporary lay-down area for contractors to support the construction phase to be located between the M3C and the buffer dam</td>
<td>Approximately 0.9 ha</td>
</tr>
<tr>
<td>Potential contractor's camp as a temporary accommodation facility to be used during the construction phase</td>
<td>Approximately 7 ha</td>
</tr>
<tr>
<td>Upgrade of mine access road</td>
<td>Approximately 4 ha</td>
</tr>
<tr>
<td>Upgrade of the access road from the Bakenberg Road turnoff (going toward the MNC) to the M3C area to manage traffic congestion during the construction</td>
<td>Approximately 15 ha</td>
</tr>
<tr>
<td>Realignment of approved Sandsloot (Pholotsi) River diversion and application for Water Use Licence</td>
<td>Approximately 0.65 ha</td>
</tr>
<tr>
<td>Linear infrastructure</td>
<td></td>
</tr>
<tr>
<td>Watercourse crossings and diversions associated with new activities</td>
<td></td>
</tr>
<tr>
<td>Conveyor crossings over the Mohlosane River near the proposed M3C and Bulk Ore Sorting Facility</td>
<td></td>
</tr>
</tbody>
</table>

Although the final closure quantum will only be assessed once the project is completed, commissioned and fully operational, SRK is of the opinion that the estimate of liability presented in Table 15-2 is a reasonable reflection of the anticipated closure costs and is of the opinion that the liability is sufficient for the operation to adhere to the closure objectives that are documented in Section 7. In particular the appropriate implementation of closure actions will:

- Develop landforms and land-uses that are stable, sustainable and aesthetically acceptable on closure.
- Ensure safety and health of all stakeholders during closure and post closure and that communities using the site after closure are not exposed to unacceptable risks.
- Ensure that closure supports productive uses considering pre-mining conditions and agree with commitments to stakeholders.
- Physically and chemically stabilise remaining structures to minimise residual risks.
- Promote biodiversity and biological sustainability to the maximum extent practicable.
- To achieve agreed quality targets set by the Catchment Management Authority (CMA) and the DWS as far as practical relative to impacts and reasonability to achieve.
### Table 15-2: Areas used in the liability assessment

<table>
<thead>
<tr>
<th>Main Description (if not applicable, indicate as N/A)</th>
<th>Units</th>
<th>Quantities</th>
<th>DMR Master Rate</th>
<th>DMR Multiplication Factor</th>
<th>Weighing Factor 1</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dismantling of processing plant and related structures (including overland conveyors and powerlines)</td>
<td>m³</td>
<td>18 446</td>
<td>15.69</td>
<td>1.00</td>
<td>1.00</td>
<td>R 289 333.96</td>
</tr>
<tr>
<td>Demolition of steel buildings and structures</td>
<td>m²</td>
<td>10 595</td>
<td>218.58</td>
<td>1.00</td>
<td>1.00</td>
<td>R 2 315 716.37</td>
</tr>
<tr>
<td>Demolition of reinforced concrete buildings and structures</td>
<td>m²</td>
<td>44 214</td>
<td>322.11</td>
<td>1.00</td>
<td>1.00</td>
<td>R 14 241 676.52</td>
</tr>
<tr>
<td>Rehabilitation of access roads</td>
<td>m²</td>
<td>214 000</td>
<td>39.12</td>
<td>1.00</td>
<td>1.00</td>
<td>R 8 370 615.61</td>
</tr>
<tr>
<td>Demolition and rehabilitation of electrified railway lines</td>
<td>m</td>
<td>379.62</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>R 0.00</td>
</tr>
<tr>
<td>Demolition and rehabilitation of non-electrified railway lines</td>
<td>m</td>
<td>207.06</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>R 0.00</td>
</tr>
<tr>
<td>Dismantling of housing and facilities</td>
<td>m²</td>
<td>6 379</td>
<td>437.14</td>
<td>1.00</td>
<td>1.00</td>
<td>R 2 788 677.42</td>
</tr>
<tr>
<td>Rehabilitation of overburdens and spoils</td>
<td>ha</td>
<td>225.00</td>
<td>152 770.32</td>
<td>1.00</td>
<td>1.00</td>
<td>R 34 373 322.75</td>
</tr>
<tr>
<td>Rehabilitation of processing waste deposits and evaporation ponds (basic, salt producing waste)</td>
<td>ha</td>
<td>275.00</td>
<td>190 272.68</td>
<td>1.00</td>
<td>1.00</td>
<td>R 52 324 986.32</td>
</tr>
<tr>
<td>Rehabilitation of processing waste deposits and evaporation ponds (acid, metal rich waste)</td>
<td>ha</td>
<td>552 642.04</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>R 0.00</td>
</tr>
<tr>
<td>Rehabilitation of subsided areas</td>
<td>ha</td>
<td>127 922.14</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>R 0.00</td>
</tr>
<tr>
<td>General surface rehabilitation, including grassing of all denuded areas</td>
<td>ha</td>
<td>56.2</td>
<td>121 019.86</td>
<td>1.00</td>
<td>1.00</td>
<td>R 6 795 265.14</td>
</tr>
<tr>
<td>River diversions</td>
<td>ha</td>
<td>15.0</td>
<td>121 019.86</td>
<td>1.00</td>
<td>1.00</td>
<td>R 1 815 297.90</td>
</tr>
<tr>
<td>Fencing</td>
<td>m</td>
<td>138.05</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>R 0.00</td>
</tr>
<tr>
<td>Water management (separating clean and dirty water, managing polluted water and managing the impact on ground water, including treatment when required)</td>
<td>ha</td>
<td>56.2</td>
<td>46 015.15</td>
<td>1.00</td>
<td>1.00</td>
<td>R 2 583 750.77</td>
</tr>
<tr>
<td>2 to 3 years of maintenance and aftercare</td>
<td>ha</td>
<td>592.6</td>
<td>16 105.31</td>
<td>1.00</td>
<td>1.00</td>
<td>R 9 543 200.98</td>
</tr>
<tr>
<td><strong>Sub Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R 135 441 843.75</td>
</tr>
<tr>
<td><strong>Weighting Factor 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.05</td>
</tr>
<tr>
<td><strong>R 142 213 935.94</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1</strong> Preliminary and General</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R 8 532 836.16</td>
</tr>
<tr>
<td><strong>2</strong> Contingency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R 14 221 393.59</td>
</tr>
<tr>
<td><strong>Sub Total 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R 22 754 229.75</td>
</tr>
<tr>
<td><strong>Sub Total 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R 164 968 165.69</td>
</tr>
<tr>
<td><strong>VAT @ 15%</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R 24 745 224.85</td>
</tr>
<tr>
<td><strong>Grand Total - Sub Total 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R 189 713 390.54</td>
</tr>
</tbody>
</table>
AAP will provide for the closure liability associated with the project through the purchase of a Bank Guarantee as allowed by the Financial Provision for Prospecting, Exploration, Mining or Production Operations Regulations, with the Bank Guarantee provided to the DMR following authorisation of the project.

16 Monitoring, auditing and reporting

AAP's understanding of the regulations is that there are two requirements under this category. The first relates to monitoring, auditing and reporting on future revisions to this plan, which is required annually. The second relates to monitoring and reporting on the monitoring required achieving relinquishment criteria. Both these requirements are discussed in this section.

16.1 Monitoring, auditing and reporting on future revisions

AAP's interpretation of the regulation is that there are three sets of reviews to which the plan must be subjected on an annual basis. These audits and their purpose as understood by AAP are:

- Internal monitoring, auditing and reporting – a review undertaken by AAP or appointed consultant to update the plan to account for changes to the environment and risk profile and to update the liability assessment to reflect liability at that point in time.
- External monitoring, auditing and reporting – a review undertaken by the financial auditors as part of the annual financial/accounting audit to determine that the plan is appropriate and that the quantum of the liability is included in the operational provisions.
- Legislated audits – these are the auditing requirements of the Act, Regulations, EIA/EMP and EA. Pertinent aspects relating to closure, such as changes to the risk assessment, changes in closure options and changes in the quantum of the liability will be reported.

The current planning for these audits is presented in Table 16-1. It is currently envisaged that findings of the audit will be reported on within three months of the audit (likely date in Table 16-1).

<table>
<thead>
<tr>
<th>Audit</th>
<th>Internal Responsibility</th>
<th>Frequency</th>
<th>Likely date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal</td>
<td>Environmental manager / Closure manager</td>
<td>Annual</td>
<td>Q3</td>
</tr>
<tr>
<td>External</td>
<td>Financial manager</td>
<td>Annual</td>
<td>Q4</td>
</tr>
<tr>
<td>Legislated</td>
<td>Mine manager</td>
<td>Annual</td>
<td>Q1 of following year</td>
</tr>
</tbody>
</table>

The findings from the various audits will be captured in the operations Environmental Management System (EMS). Responsibilities and timelines will be allocated to the rectification of the findings, as practical. Once addressed, these findings will be closed out in a manner similar to the other findings captured in the EMS and will not be closed out until a second party has assessed that the findings are appropriately addressed.

16.2 Monitoring, auditing and reporting to track relinquishment progress

The objective of the monitoring programme will be to track the recovery of the site towards the long-term post closure land capability goals, in accordance with the overall closure objectives. The monitoring programme will be designed to collect information to demonstrate that the relinquishment criteria have been achieved. The anticipated monitoring will include:

- **Surface water**: Quality monitoring against parameters as required by the WUL. Sampled monthly for a minimum ten-year post closure period and thereafter until relinquishment criteria have been achieved.
• **Groundwater**: Quality monitoring of both the shallow and deep aquifers against the parameters required by the WUL. Sampled quarterly for a minimum ten-year post closure period and thereafter until relinquishment criteria have been achieved.

• **Erosion monitoring**: This will take the form of developing a representative reference site on the disturbed footprint and undertaking visual and topographic assessments to determine erosion rate, using standard erosion monitoring techniques. This will be undertaken once a year at the end of the wet season for a ten-year post closure period.

• **Vegetation establishment**: Vegetation condition will be monitored using standard field techniques to determine whether the vegetation has been established with a species composition and density similar to that of a reference analogue site established in a similar ecotype, conducted annually for a ten-year post closure period.

• **Bio-monitoring**: Upstream and downstream of the mining activities. A long-term operational bio-monitoring programme will be implemented to monitor physico-chemical and biological components of the aquatic ecosystems within the mining area, which will be extended into the closure period. Appropriate biological index will be included in order to quantify and classify the longer-term changes in biotic integrity, with monitoring being undertaken annually.

Photographic records should be maintained together with findings, follow up actions and close out records as part of the Mogalakwena EMS. Annual reports will be prepared to document the results of the monitoring during the closure and post closure phases. These reports will provide important information required to manage the on-going closure activities, with the data and reports being used to:

- Provide recommendations for improving subsequent rehabilitation activities.
- Indicate where rehabilitation and closure activities have not been successful, requiring a potential change in design criteria.
- Provide information where care and maintenance is required during the post closure period.
- Indicate if relinquishment criteria have been achieved.

### 17 Plan amendments as a result of monitoring and gaps

This report is the first plan to be compiled and an explanation of motivations for any amendments made to the final rehabilitation, decommissioning and mine closure plan, given the monitoring results in the previous auditing period and the identification of gaps will only become applicable in subsequent updates.
18 Conclusions

AAP will provide for the closure liability associated with the project through the purchase of a Bank Guarantee as allowed by the Financial Provision for Prospecting, Exploration, Mining or Production Operations Regulations, with the Bank Guarantee provided to the DMR following authorisation of the project.

Prepared by

James Lake
Principal Scientist

Reviewed by

Marius van Huyssteen
Project Reviewer

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.
19 References


Itasca Africa (Pty) Ltd. and Itasca Denver Inc, 2018, Mogalakwena Geochemical Characterisation August 2018.


Appendices
Appendix A: Risk Assessment Criteria
<table>
<thead>
<tr>
<th>Consequence</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insignificant</strong></td>
<td>Medical treatment case / Exposure to health hazards/agents (over the OEL) resulting in temporary impact on health (with lost time)</td>
<td>Lost time/ Exposure to health hazards/agents (over the OEL) resulting in irreversible impact on health with loss of quality of life or single fatality</td>
<td>Permanent disability or single fatality/ Exposure to health hazards/agents (significantly over the OEL) resulting in irreversible impact on health with loss of quality of life of a numerous group/ population or multiple fatalities</td>
<td>Numerous permanent disabilities or multiple fatalities/ Exposure to health hazards/agents (significantly over the OEL) resulting in irreversible impact on health with loss of quality of life of a numerous group/ population or multiple fatalities</td>
<td></td>
</tr>
<tr>
<td><strong>Minor</strong></td>
<td>First aid case / Exposure to health hazard resulting in temporary discomfort</td>
<td>Lasting days or less; limited to small area (metres); receptor of low significance/sensitivity (industrial area)</td>
<td>Lasting months; impact on an extended area (kilometres); area with some environmental sensitivity (scarce/valuable environment)</td>
<td>Lasting years; impact on sub-basin; environmentally sensitive environment/receptor (endangered species/habitats)</td>
<td>Permanent impact; affects a whole basin or region; highly sensitive environment (endangered species, wetlands, protected habitats)</td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
<td>Lasting weeks; reduced area (hundreds of metres); no environmentally sensitive species/habitat</td>
<td>Lasting months; impact on an extended area (kilometres); area with some environmental sensitivity (scarce/valuable environment)</td>
<td>Lasting years; impact on sub-basin; environmentally sensitive environment/receptor (endangered species/habitats)</td>
<td>Permanent impact; affects a whole basin or region; highly sensitive environment (endangered species, wetlands, protected habitats)</td>
<td>Permanent impact; affects a whole basin or region; highly sensitive environment (endangered species, wetlands, protected habitats)</td>
</tr>
<tr>
<td><strong>High</strong></td>
<td>No disruption to operation/5% of current liability estimate - R7 million</td>
<td>Partial disruption to operation/10% of current liability estimate - R13 million</td>
<td>Partial shutdown/15% of current liability estimate - R20 million</td>
<td>Partial loss of operation/20% of current liability estimate – R26 million</td>
<td>Substantial or total loss of operation/25% of current liability estimate – R29 million</td>
</tr>
<tr>
<td><strong>RARE</strong></td>
<td>Breach of regulatory requirements; report/involvement of authority, attracts administrative fine</td>
<td>Minor breach of law; report/investigation by authority, attracts compensation/penalties/enforcement action</td>
<td>Breach of the law; may attract criminal prosecution, penalties/enforcement action, individual licence temporarily revoked</td>
<td>Significant breach of the law, individual or company law suits; permit to operate substantially modified or withdrawn</td>
<td>Noticeable reputational damage; national/international public attention and repercussions/Major widespread social impacts. Community reaction affecting business continuity. &quot;License to operate&quot; under jeopardy</td>
</tr>
<tr>
<td><strong>POSSIBLE</strong></td>
<td>Limited impact; concern/complaints from certain groups/organizations (e.g. NGOs) / Some impacts on local population, mostly repairable. Single stakeholder complaint in reporting period</td>
<td>Local impact; public concern/adverse publicity localised within neighbouring communities / On-going social issues. Isolated complaints from community members/stakeholders</td>
<td>Suspected reputational damage; local/ regional public concern and reactions / Significant social impacts. Organized community protests threatening continuity of operations</td>
<td>Suspected reputational damage; local/ regional public concern and reactions / Significant social impacts. Organized community protests threatening continuity of operations</td>
<td>Suspected reputational damage; local/ regional public concern and reactions / Significant social impacts. Organized community protests threatening continuity of operations</td>
</tr>
<tr>
<td><strong>LIKELY</strong></td>
<td>ALMOST CERTAIN</td>
<td>5</td>
<td>The unwanted event has occurred frequently: occurs in order of one or more times per year &amp; is likely to reoccur within 1 year</td>
<td>The unwanted event has occurred infrequently: occurs in order of less than once per year &amp; is likely to reoccur within 5 years</td>
<td>The unwanted event has happened in the business at some time: or could happen within 10 years</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Probability</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALMOST CERTAIN</td>
<td>5</td>
<td>The unwanted event has occurred frequently: occurs in order of one or more times per year &amp; is likely to reoccur within 1 year</td>
<td>The unwanted event has occurred infrequently: occurs in order of less than once per year &amp; is likely to reoccur within 5 years</td>
<td>The unwanted event has happened in the business at some time: or could happen within 10 years</td>
<td>The unwanted event has happened in the business at some time: or could happen within 20 years</td>
</tr>
</tbody>
</table>
Appendix B: Full Risk Assessment Tables
<table>
<thead>
<tr>
<th>Ref no.</th>
<th>Hazard / Risk Source Description</th>
<th>Description of Unwanted Event</th>
<th>Cause of Hazard</th>
<th>Resulting Hazards</th>
<th>Current Controls</th>
<th>Likelihood of the Event (given current controls)</th>
<th>Consequence (should the event happen)</th>
<th>Max Risk Rank</th>
<th>Major Risk (Y, N)</th>
<th>Priority Unwanted Event (Y, N)</th>
<th>Possible Improvements or Additional Controls</th>
<th>Agreed Action (complete for non-priority unwanted events)</th>
<th>Priority unwanted events</th>
<th>Residual Risk Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOG 01</td>
<td>Post-closure Mining/Processing Infrastructure</td>
<td>People injuring themselves while accessing the post closure infrastructure at Mogalakwena North &amp; South Concentrators</td>
<td>Compromised structural integrity due to lack of maintenance of infrastructure as a result of limited resources post closure</td>
<td>Safety and health issues due to exposure to unknown environment with specialised equipment and chemicals. Financial consequences due to theft of equipment.</td>
<td>Routine inspection and maintenance is carried out during operational phase</td>
<td>3: Possible 4: High</td>
<td></td>
<td>18 (S)</td>
<td>Yes</td>
<td></td>
<td>Closure Action: Ensure routine inspection and maintenance of the existing infrastructure post closure. In addition, get rid of unsafe infrastructure immediately after the operation ceases.</td>
<td>1. Ensure routine inspection and maintenance of the existing infrastructure post closure; 2. Get rid of unsafe infrastructure immediately after the operation ceases.</td>
<td></td>
<td>6(M)</td>
</tr>
<tr>
<td>MOG 02</td>
<td>Residue deposits/Stockpiles (Waste rock, dumps or WRD)</td>
<td>Not achieving the success criteria for rehabilitation</td>
<td>The basis of success criteria i.e. the detailed rehabilitation prescription including the feasible slope angles, ideal topsoil/growth media depth, suitable seed mix etc. has not yet been established.</td>
<td>Unproductive land use, dust issues etc</td>
<td>In 2017, the mine commenced with the rehabilitation trials at Big-mike WRD. However, as at end 2018, no detailed monitoring plan has been initiated to establish the success of the trials</td>
<td>4: Likely</td>
<td></td>
<td>24 (H)</td>
<td>Yes</td>
<td>Yes</td>
<td>Operational Management: 1. Undertake WRD rehabilitation trials to understand which seed mixes work at what slope angles; 2. Undertake a thorough monitoring plan to establish the success/failure of the trials and document it. 3. The Waste rock placement should be undertaken in a way that enables adequate concurrent rehabilitation opportunities at the WRD side slopes.</td>
<td>1. Undertake WRD rehabilitation trials to understand which seed mixes work at what slope angles; 2. Undertake a thorough monitoring plan to establish the success/failure of the trials and document it. 3. The Waste rock placement should be undertaken in a way that enables adequate concurrent rehabilitation opportunities at the WRD side slopes.</td>
<td></td>
<td>14(S)</td>
</tr>
<tr>
<td>MOG 03</td>
<td>Residue deposits/Stockpiles (Tailings Storage Facility or TSF)</td>
<td>Erosion of side slopes at Vaalkop TSF. Due to steep slopes and lack of vegetation</td>
<td>Dust generation, surface water contamination, loss of veg cover, decrease in bio diversity; not meeting relinquishment criteria</td>
<td>Concurrent rehabilitation of the TSF side slopes has been undertaken but with not much success with vegetation establishment</td>
<td>4: Likely</td>
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<td>Operational Management: 1. Undertake TSF side slope rehabilitation trials to understand which seed mixes and environmental conditions work on the side slopes. 2. Undertake a thorough monitoring plan to establish the success/failure of the trials and document it. 3. Undertake concurrent revegetation of side slopes of TSF based on the learnings from the trials and maintain them.</td>
<td>1. Undertake TSF side slope rehabilitation trials to understand which seed mixes and environmental conditions work on the side slopes. 2. Undertake a thorough monitoring plan to establish the success/failure of the trials and document it. 3. Undertake concurrent revegetation of side slopes of TSF based on the learnings from the trials and maintain them.</td>
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<td>CATEGORY</td>
<td>Ref no.</td>
<td>Hazard / Risk Source Description</td>
<td>Description of Unwanted Event</td>
<td>Cause of Hazard</td>
<td>Resulting Hazards</td>
<td>Current Controls</td>
<td>Likelihood of the Event (given current controls)</td>
<td>Max Risk Rank</td>
<td>Major Risk (Y, N)</td>
<td>Priority Unwanted Event (Y, N)</td>
<td>Possible Improvements or Additional Controls</td>
<td>Agreed Action (complete for non-priority unwanted events)</td>
<td>Possible Improvements or Additional Controls</td>
<td>Residual Risk Rating</td>
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<td>BIO-PHYSICAL</td>
<td>MOG 04</td>
<td>Residue deposit/Stockpiles (TSF)</td>
<td>TSF/slope failure</td>
<td>Multiple reasons such as phreatic surface close to eroded slopes due to inadequate maintenance, inadequate design, wrong operating process etc.</td>
<td>Safety and Environmental consequences, reputational damage, legal and financial consequences</td>
<td>This is one of the operational PUEs that has adequate operational monitoring and management (controls) to ensure that the side slopes are safe and stable.</td>
<td>2: Unlikely</td>
<td>5: Maj</td>
<td>19 (S)</td>
<td>Yes</td>
<td>Yes</td>
<td>Closure Action: Keep all operational controls in place till the phreatic surface is completely dry. Especially, retain drainage structure during closure to maximize consolidation and in post closure limit water infiltration through vegetation establishment</td>
<td></td>
<td>15(S)</td>
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<td></td>
<td>MOG 05</td>
<td>Surface Openings (open pits)</td>
<td>Inadequate financial provision if backfilling of pits is required</td>
<td>Unaccounted liability as currently the MOG pits are approved (in EMP) for no backfill; however, there might be a legal requirement to backfill due to the general perception that pits should be backfilled at closure</td>
<td>Not meeting relinquishment criteria</td>
<td>None</td>
<td>3: Possible</td>
<td>4: High</td>
<td>18 (S)</td>
<td>Yes</td>
<td>Yes</td>
<td>Operational Management: Backfilling option for all pits needs to be looked at during LoM planning</td>
<td>Backfilling option for all pits needs to be looked at during LoM planning</td>
<td>8(M)</td>
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<td>MOG 06</td>
<td>Biodiversity</td>
<td>Degradation of land capability due to deteriorated biodiversity during operational phase</td>
<td>Long term mining pollution and construction activities</td>
<td>Loss of biodiversity.</td>
<td>Alien species removal plan is currently being drafted and will be implemented on site.</td>
<td>3: Possible</td>
<td>4: High</td>
<td>18 (S)</td>
<td>Yes</td>
<td>Yes</td>
<td>Operational Management: 1. Implement the alien invasive species removal plan on regular basis; 2. Develop concurrent closure measures where covers are placed, and indigenous vegetation established to aid ecological recovery</td>
<td>1. Implement the alien invasive species removal plan on regular basis; 2. Develop concurrent closure measures where covers are placed, and indigenous vegetation established to aid ecological recovery</td>
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<td>SOCIAL</td>
<td>MOG 07</td>
<td>Surface Water (SW)/Ground Water (GW)</td>
<td>Contamination of SW/GW during operational phase</td>
<td>Discharges from mine residue deposits and contaminated areas</td>
<td>Environmental and health consequences</td>
<td>Currently, the GW flow and transport model indicates that the present as well as predicted LOM contamination from pollution sources will required to be contained through the scavenger borehole system so that it cannot impact the nearby receptors.</td>
<td>4: Likely</td>
<td>4: High</td>
<td>3: Mod</td>
<td>21 (H)</td>
<td>Yes</td>
<td>Operational Management: 1. Understand and address the GW/SW contamination 2. Cost the remediation plan as liability and make financial provision for. 1. Understand and address the GW/SW contamination 2. Cost the remediation plan as liability and make financial provision for.</td>
<td>8(M)</td>
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<tr>
<td>SOCIAL</td>
<td>MOG 08</td>
<td>Air Quality</td>
<td>Dust pollution from top surfaces of TSFs post closure</td>
<td>Lack of sustainable vegetation on the TSFs</td>
<td>Surrounding soil contamination of surrounding community</td>
<td>Concurrent revegetation of the TSF side slopes is undertaken</td>
<td>3: Possible</td>
<td>3: Mod</td>
<td>3: Mod</td>
<td>13 (S)</td>
<td>No</td>
<td>Operational Management: Sustainably vegetate the side slopes of the TSFs during operational phase. Closure Action: Soon after closure, vegetate the top of TSF sustainably.</td>
<td>8(M)</td>
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<td>SOCIAL</td>
<td>MOG 09</td>
<td>Social Issues</td>
<td>People injuring themselves while accessing the post closure infrastructure and mining area especially open pits and concentrators</td>
<td>Value of unclaimed material in the mining area</td>
<td>Reputation, legal obligations</td>
<td>Adequate access control in place during operational life</td>
<td>5: Almost Certain</td>
<td>4: High</td>
<td>3: Mod</td>
<td>1: Ins</td>
<td>23 (H)</td>
<td>Yes</td>
<td>Closure Action: 1. Ensure adequate access control around the open pits to discourage access into the pits. 2. Maintain security and access control in the rest of the mining area till the area is sustainably rehabilitated and relinquished.</td>
<td>14(S)</td>
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<td>SOCIAL</td>
<td>MOG 10</td>
<td>Social Issues</td>
<td>Loss of livelihood of surrounding communities</td>
<td>Dependency of surrounding community and businesses created by mining operations</td>
<td>Loss of living and basic services to people, unrealistic expectations from communities - resulting in unrest</td>
<td>None</td>
<td>5: Almost Certain</td>
<td>4: High</td>
<td></td>
<td>23 (H)</td>
<td>Yes</td>
<td>Closure Action: 1. Programs to multi-skill/ re-skill employees to ensure they are employable in other industries 2. Diversify mining operation to replace jobs as mine moves to closure 1. Programs to multi-skill/ re-skill employees to ensure they are employable in other industries 2. Diversify mining operation to replace jobs as mine moves to closure</td>
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<td>HAZARD / RISK SOURCE</td>
<td>DESCRIPTION OF UNWANTED EVENT</td>
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<td>LIKELIHOOD OF THE EVENT (GIVEN CURRENT CONTROLS)</td>
<td>MAX RISK RANK</td>
<td>MAJOR RISK (Y, N)</td>
<td>PRIORITY UNWANTED EVENT (Y, N)</td>
<td>POSSIBLE IMPROVEMENTS OR ADDITIONAL CONTROLS</td>
<td>AGREED ACTION (COMPLETE FOR NON-PRIORITY UNWANTED EVENTS)</td>
<td>RESIDUAL RISK RATING</td>
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<td>MOG 11 Social Issues</td>
<td>Inadequate land access for mining activities</td>
<td>Unsuccessful relocation of adjacent communities due to non-availability of land for relocation and not meeting the relocation commitments</td>
<td>Huge waste rehandling cost and significant increase in liability</td>
<td>4: Likely</td>
<td>3: Mod</td>
<td>17 (S)</td>
<td>No</td>
<td>Operational Management: LoM related relocation plan for community relocation must be prepared and implemented well in advance to mining activities.</td>
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<td>MOG 12 Technical</td>
<td>Not achieving the Criteria</td>
<td>Due to substandard Rehabilitation, contracts mismanagement</td>
<td></td>
<td>5: Almost Certain</td>
<td>2: Min</td>
<td>16 (S)</td>
<td>No</td>
<td>Operational Management: 1. Manage the concurrent rehabilitation programs with reputable rehabilitation management experts. A clear rehabilitation success criteria should be established. 2. Follow the closure planning process appropriately to ensure that standard of rehabilitation meets design criteria</td>
<td></td>
<td>6(M)</td>
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532330/MM Expansion Closure

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