Rehabilitation and closure plan for the Der Brochen Amendment Project

DMRE Reference Number: LP 30/5/1/3/2/1 (182) EM

Report Prepared for

Anglo American Platinum: Rustenburg Platinum Mines Der Brochen Section

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SRK Consulting (South Africa) (Pty) Ltd
265 Oxford Rd
Illovo 2196
Johannesburg
South Africa

e-mail: johannesburg@srk.co.za
website: www.srk.co.za

Tel: +27 (0) 11 441 1111
Fax: +27 (0) 11 880 8086

SRK Project Number 533247

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Compiled by:

James Lake
Principal Scientist/Partner

Email: jlake@srk.co.za

Authors:

Catherine Smart; James Lake

Reviewed by:

Marius van Huyssteen
Principal Scientist/Associate Partner

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List of Abbreviations

AAP	Anglo American Platinum Limited
ARDML	Acid Rock Drainage Metal Leaching
BPG	Best Practice Guidelines
CMA	Catchment Management Authority
DB	Der Brochen Mine
DBAP	Der Brochen Amendment Project
DMRE	Department of Mineral Resources and Energy
DWAF	Department of Water and Forestry
DHWS	Department of Housing Water and Sanitation
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EC	Electrical Conductivity
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EMS	Environmental Management System
GNR	Government National Regulations
GW	Ground water
HCT	Humidity cell testing
IRP	Integrated Resource Plan
LC	Leachate Concentrate
LCT	Leachable concentration threshold
LEDET	Limpopo Economic Development, Environment and Tourism
LoM	Life of Mine
mamsl	meters above mean sea level
MPRDA	Mineral and Petroleum Resources Development Act (No. 68 of 2002)
Mtpa	Metric tons per annum
NAG	Non-acid generating
NEM:BA	The National Environmental Management: Biodiversity Act (No. 10 of 2004)
NEMA	National Environmental Management Act (No. 107 of 1998)
NEMAA	National Environmental Management Amendment Act (No. 62 of 2008)
NEM:AQA	National Environmental Management Air Quality Act (No. 39 of 2004)
NEM:PA	National Environmental Management: Protected Areas Act (No. 57 of 2003)
NEM:WA	National Environmental Management Waste Act (No. 59 of 2008)
NEM:WAA	National Environmental Management Waste Amendment Act
NP	Neutralisation potential
NNP	Net neutralising potential

NPR	Neutralising potential ratio
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
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

The Der Brochen Mine is a platinum project owned by Rustenburg Platinum Mines Limited (RPM), a wholly owned subsidiary of Anglo American Platinum (AAP), and is located approximately 30 km south-southwest of the town of Steelpoort (approximately 40 km by road) and 35 km west of Mashishing (Lydenburg) (approximately 65 km by road), in the Limpopo Province (Figure 1-1). The project area falls within the Fetakgomo Tubatse Local Municipality (FTLM), under jurisdiction of the Sekhukhune District Municipality (SDM).

Der Brochen Mine's mining right (LP 30/5/1/3/2/1 (182) MR) falls on the following farms and farm portions:

- Richmond 370 KT (Remaining extent, portions 1 and 2);
- St George 2 JT (Remaining extent, portions 1 and 2);
- Hermansdal 3 JT (Remaining extent);
- Hebron 5 JT (Remaining extent and portion 1);
- Helena 6 JT (Remaining extent and portion 3); and
- Der Brochen 7 JT (Remaining extent).

In addition to the above listed farms, RPM also holds the surface right to Portion 7 of the farm Mareesburg 8 JT on which the Mareesburg tailings storage facility (TSF), associated return water dams (RWDs) and tailings-return water pipeline system are located. The Mareesburg TSF operation forms part of the Der Brochen Mine operations.

Current operations at the Der Brochen Mine include the processing of platinum and chrome bearing ore at the existing Mototolo Concentrator Plant that is received from the underground workings at the Borwa and Lebowa shafts via an existing conveyor belt system. The Borwa and Lebowa shafts formed part of the previously known Mototolo Joint Venture[1] (JV) between RPM and Glencore Operations South Africa (Pty) Ltd (Glencore).

The final concentrate from the Mototolo Concentrator Plan is transported via trucks to the Polokwane Smelter for further processing, whilst the tailings material from the plant is disposed of on the exiting Helena TSF and recently constructed Mareesburg TSF via pipeline systems. The water contained in the tailings' slurry settles on top of the TSFs and collects in the existing RWDs associated with the Helena TSF and Mareesburg TSF respectively. From the RWDs the water is pumped back to the Mototolo Concentrator Plant for reuse via return water pipeline systems.

The operations at the Der Brochen Mine are undertaken in accordance with the mine's Consolidated Environmental Management Programme Report (EMPr) that was approved by the Department of Mineral Resources (now known as the Department of Mineral Resources and Energy (DMRE)) in 2016 (LP 30/5/1/3/2/1 (182) EM). The mine also operates under three approved Water Use Licences (WULs) issued by DWS in 2011 (WUL No. 24072959), 2016 (WUL No. 04/B41G/CI/4141) and 2017 (WUL Ref. No. 06/B41G/ABCFGIJ/5329), respectively.

[1] RPM acquired Glencore's shares in the Mototolo JV during November 2018 and will combine the Mototolo JV area with the downdip and adjacent Der Brochen resource to create a major platinum hub for the company.

Figure 1-1: Der Brochen Mine Locality Map

1.2 Scope for the proposed amendment

RPM is currently planning to commence with the opencast activities at the Northern Openpit before the end of 2019, as previously authorised by the competent authorities. The Northern Openpit will be developed to mine the near-surface layer of the Upper Group 2 (UG 2) Reef. The Life of Mine (LOM) for the Northern Openpit is expected to be 3.5 to 4 years. Ore mined from the Northern Openpit will be crushed using a mobile crusher, where after the ore will be transported to the existing Mototolo Concentrator for processing via haul roads.

Waste rock from the openpit will be re-used for construction purposes, which will include the use of the material for terracing, constructing the services corridor, as road aggregate, buttressing and as construction material for containment facilities embankments.

The original Der Brochen Project included a co-disposal facility that was originally designed and approved for the disposal of waste rock material and tailings material, but recent amendments to the designs have been made by RPM to the co-disposal facility to consist of a waste rock embankment with lined containment dams within the embankment faculty for the storage of raw (clean) water and dirty water as part of the mine's updated water management strategy. As the Mareesburg TSF has been commissioned the co-disposal facility is no longer required for disposal of tailings.

1.3 Purpose of this report

This conceptual rehabilitation and closure plan for the infrastructure and activities associated with the proposed Der Brochen Amendment Project (DBAP) 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 DMRE that includes:

- The proposed post-mining end use of the DBAP.
- 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 DBAP areas is aligned to the overall closure of the existing operations at Der Brochen as documented in SRK 469113/RCP prepared in 2014 to support the Der Brochen EMP Amendment and Alignment.

1.4 Project team

This plan was developed by Mr James Lake (Pr Sci Nat/400445/04 with SACNASP[2]), a Principal Scientist at SRK with 22 years' experience in Environmental Management.

[2] Registered with the South African Council for Natural Scientific Professions

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 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

Der Brochen Mine's mining right (LP 30/5/1/3/2/1 (182) MR) falls on the following farms and farm portions:

- Richmond 370 KT (Remaining extent, portions 1 and 2);
- St George 2 JT (Remaining extent, portions 1 and 2);
- Hermansdal 3 JT (Remaining extent);
- Hebron 5 JT (Remaining extent and portion 1);
- Helena 6 JT (Remaining extent and portion 3); and
- Der Brochen 7 JT (Remaining extent).

In addition to the above listed farms, RPM also holds the surface right to Portion 7 of the farm Mareesburg 8 JT on which the Mareesburg tailings storage facility (TSF), associated return water dams (RWDs) and tailings-return water pipeline system are located. The Mareesburg TSF operation forms part of the Der Brochen Mine operations

3.2 Existing activities

Other activities and infrastructure associated with the Der Brochen Mine, as authorised through the Der Brochen Mine's approved Consolidated EMPr and current WULs, includes:

Existing facilities and activities:

- The Mototolo Concentrator;
- The Helena TSF with associated RWDs;
- The Mareesburg TSF and associated RWDs;
- Tailings-return water pipeline systems from the Helena TSF and Mareesburg TSF, respectively, to Mototolo Concentrator;
- Mine offices and access roads;
- Prospecting activities comprising of site preparation, drilling of prospecting boreholes, site rehabilitation and monitoring;
- Trial mining area on the Richmond farm (activity is completed, and the soil stockpile and waste rock dump are well vegetated);
- Abstraction of groundwater in support of mining from the Helena and Richmond licenced wellfields; and
- Abstraction from Der Brochen Dam based on an existing lawful industrial allocation.

Activities previously authorised, but which have not yet commenced:

- The Helena and Richmond wellfields;
- Helena and Richmond shafts and associated waste rock dumps;
- Two openpits (Northern and Southern Pits) and associated waste rock/overburden dumps and pollution control dam;
- Re-routing of a 132 kV powerline; and
- A Co-Disposal Facility.

RPM is currently planning to commence with the opencast activities at the Northern Openpit before the end of 2019, as previously authorised by the competent authorities. The Northern Openpit will be developed to mine the near-surface layer of the Upper Group 2 (UG 2) Reef. The Life of Mine (LOM)

for the Northern Openpit is expected to be 3.5 to 4 years. Ore mined from the Northern Openpit will be crushed using a mobile crusher, where after the ore will be transported to the existing Mototolo Concentrator for processing via haul roads.

Waste rock from the openpit will be re-used for construction purposes, which will include the use of the material for terracing, constructing the services corridor, as road aggregate, buttressing and as construction material for containment facilities embankments.

3.3 Proposed activities

It is the intention of RPM to apply for the necessary environmental and waste authorisations, as well as a water use licence for the proposed Der Brochen Amendment Project (DBAP), and amending the Der Brochen Mine's approved Consolidated EMPr and associated Environmental Authorisation (EA) to include the following:

- The construction of a buttress wall at the existing Helena TSF and the additional filter press plant at the existing Mototolo Concentrator Plant, due to emergency situation[3], as agreed by the Department of Mineral Resources and Energy (DMRE) in October 2017. The construction of the buttress wall and filter press plant commenced in October 2017 after permission was obtained from the DMRE to implement these infrastructures as mitigation measures to prevent and contain the emergency situation or to mitigate the effects of the emergency situation in accordance with Section 30(A)(2)(b) of the National Environmental Management Act, Act 107 of 1998 (NEMA); and
- The development and operation of the following additional mining related infrastructure as part of the mine's development strategy:
    - The South Decline Shaft with associated infrastructure, i.e. water management infrastructure, to access the new underground mining operation area to be mined through the bord-and-pillar mining method.
        - RPM intends to locate the South Decline Shaft within the previously approved Southern Openpit areas, thereby converting the previously approved opencast mining operation of the Southern Openpit to an underground mining operation.
    - Three up-cast ventilation shafts required for the underground workings associated with the South Decline Shaft;
    - A Dense Medium Separation (DMS) Plant to be located within the existing footprint area of the Mototolo Concentrator Plant area;
    - A DMS Stockpile with associated pollution control dams;
    - The conversion of the existing Mototolo chrome recovery plant, located within the existing Mototolo Concentrator Plant area, from a final tailings' arrangement to an inter-stage arrangement;
    - The installation of a Mainstream Inert Grinding (MIG) mill at Mototolo Concentrator Plant area;
    - Additional Run of Mine stockpiles and associated silos;
    - Change houses and office complex to be located at the proposed South Decline Shaft area;
    - An explosive destruction bay area to be located near the proposed South Decline shaft;
    - Staff accommodation camp to be located near the Der Brochen Dam; and

[3] 'Emergency situation' means a situation that has arisen suddenly that poses an imminent and serious threat to the environment, human life or property, including a 'disaster' as defined in section 1 of the Disaster Management Act, 2002 (Act No. 57 of 2002).

- Additional linear infrastructure, i.e.:
  - *Two conveyor systems*. One conveyor belt system will be constructed to connect the proposed South Decline Shaft with the proposed DMS Plant that will be located in the existing footprint area of the Mototolo Concentrator Plant, for the purpose of transporting ore from the South Decline Shaft to the plant area. Another conveyor belt system will be required to transport DMS material from the proposed DMS Plant to the proposed DMS Stockpile area. It is currently anticipated that the DMS conveyor system will run along the existing Mareesburg tailings pipeline system.
  - *Access and haul roads*. New access roads to the proposed ventilation shafts will be required for maintenance purposes. Certain existing roads will also be required to be upgraded to provide sufficient access roads to the project related infrastructure, such as the North Opencast Pit area, the South Decline Shaft and offices. The mine is also considering including a haul road within the proposed corridor associated with the ore conveyor belt system to transport ore from the proposed South Decline Shaft to the Mototolo Concentrator Plant area as an interim measure, whilst the conveyor belt system is being constructed.

Waste rock from the authorised north openpit will be re-used for construction purposes, which will include the use of the material for terracing, constructing the services corridor, as road aggregate, buttressing and as construction material for containment facilities embankments. The original Der Brochen Project included a co-disposal facility that was originally designed and approved for the disposal of waste rock material and tailings material, but recent amendments to the designs have been made by RPM to the co-disposal facility to consist of a waste rock embankment with lined containment dams within the embankment facility for the storage of raw (clean) water and dirty water as part of the mine's updated water management strategy. As the Mareesburg TSF has been commissioned the co-disposal facility is no longer required for disposal of tailings.

Figure 3-1: Layout of proposed infrastructure

4 Environmental context

The broader environmental and social context of the mine is described in detail in the DBAP Environmental Impact Assessment & Environmental Management Programme Report 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 DBAP associated activities and infrastructure.

4.1 Topography

The area is characterised by a rugged topography with the relief measuring between 940 m and over 2 000 m above mean sea level (mamsl). The prominent north-south trending Steenkamps Mountains extend across the study area, with two deeply incised valleys lying in a north-south direction between the mountain ranges. Within these valley floors are the Groot-Dwars River in the east and the Klein-Dwars River in the west (both flowing northwards through the area).

The highest elevation of 2 300 mamsl is located to the extreme south of the project area, and the lowest elevation of 1 035 mamsl is located to the northern drainage path of the Groot Dwars River.

4.2 Climate

The Der Brochen project area falls within the Highveld climatic region. This climatic region is associated with warm temperature and summer rainfall. The average daily maximum temperature for the region is 28°C in January and 21.6°C in July.

Rainfall occurs mostly in the summer (85%) from October to March, with a maximum in December. The ten-year average recorded at the Helena TSF of 624 mm (2010-2018). The average annual S-pan evaporation is 1 703 mm.

4.3 Geology

The Project area overlies intrusive rocks of Bushveld Complex (BC), which intruded into the Transvaal Supergroup on the Kaapvaal Craton at about 2 060 Ma. Of the various layers within the BC, the Project area is underlain by the upper portion of the Critical Zone (Dwars River Sub-suite) which, in this area, consists of alternating layers of pyroxenites, norites and anorthosites. The igneous layering dips in the order of 9° to 12° to the west. Economic zones of interest include the platiniferous Merensky reef and the UG2 chromitite reef. The former outcrops with a N-S strike on the Der Brochen farm, occupying the mid-slope section west of the Groot-Dwars River. The UG2 lies some 180 to 210 m below the Merensky reef and outcrops in the gently sloping lower-slope section of the Groot-Dwars River valley.

4.4 Land use, land capability and soils

The area is dominated by shallow soils of Mispah/Outcrop, Milkwood, Glenrosa, Bonheim and Mayo soil forms, whilst moderately deep soils of Hutton/Mispah occupies a small proportion of the area. The land capability of the soils and associated landscape is predominantly grazing, although a small proportion (less than 5%) is considered arable.

4.5 Biodiversity

The proposed project area is predominantly located in areas of high biodiversity and increased sensitivity. The Der Brochen Amendment Project area has four defined habitat units. These habitat units are:

- Freshwater Resources;

- Open Bushveld;
- Sekhukhune Mountain Bushveld; and
- Transformed areas.

The Freshwater Habitat Unit is of high ecological sensitivity and if any activities are to infringe upon this habitat unit there is likely to be a significant impact on floral Species of Conservation Concern (SCC), as well as the diverse floral communities associated with this habitat unit. The Open Bushveld Habitat Unit, with its high floral diversity and association with a high abundance of floral SCC, is considered to be of high ecological importance and sensitivity. From a floral perspective, the Sekhukhune Mountain Bushveld Habitat Unit is of high ecological sensitivity and importance. This habitat unit has the highest diversity of floral SCC; however, these species occur sporadically throughout the habitat unit, many of which being associated with the rockier habitats.

4.6 Surface water

The Der Brochen site falls in the extreme south of the Eastern Limb of the Bushveld Complex within the Klein and Groot Dwars River catchments of the B41G quaternary catchment. This catchment falls within the Olifants River Water Management Area B4.

The Der Brochen Project area is characterised by rugged topography with prominent north-south trending mountain ranges (the Steenkampsberge) extending across the project area. Two deep valleys extend in a north-south direction between the Steenkampsberge mountain ranges and the Groot-Dwars River (in the east) and the Klein-Dwars River (in the west) are contained within these valley floors.

Surface water from the Der Brochen Project area flows via a number of unnamed ephemeral tributaries and drainage lines into the perennial Groot-Dwars River. The Der Brochen dam is situated on the Groot-Dwars River upstream of the Der Brochen Project area and proposed activities. The main tributary of the Groot-Dwars River in the project area is the ephemeral Mareesburg Stream, which is adjacent to the partially constructed Mareesburg TSF. The Groot-Dwars River together with the Klein-Dwars River joins the Dwars River on the farm Dwarsrivier 372 KT approximately 10 km north-northwest of Der Brochen. The Dwars River then joins the Tubatse River (formerly Steelpoort River), which in turn feeds into the Olifants River.

The pre-mining baseline water quality data is extracted from the IWWMP Report, (SRK 527471, 2018). The pre-mining surface water quality was determined through sampling at various locations along the Groot Dwars River. The general water quality profile in the site area, obtained during surveys in 2001 and 2002, was described as very good with pristine conditions prevailing. The water is suited for all uses if compared against the SAWQG (DWAF, 1996) and the SANS 241, 2015 for drinking water (excluding bacterial content).

4.7 Groundwater

The major flow paths in the study area are within the upper shallow overburden/weather aquifer, while the fracture zones and dykes across the site act as preferential flow paths for contaminants to travel. It is expected that contamination of the deeper aquifer will be limited due to limited hydraulic connectivity between the shallow and deep aquifers. Flow and transport are furthermore compartmentalized by the more competent dyke structures at depth.

The groundwater type is generally calcium / magnesium – bicarbonate (Ca/Mg-HCO3) rich, which is typical of shallow groundwater in the Bushveld Complex (BC). The magnesium and calcium dominance for the cations can be directly linked to the underlying geology (with magnesium and calcium rich gabbroic norites), while the bicarbonate anion dominance of the samples indicates

relatively young or fresh groundwater in equilibrium with carbon-dioxide in the atmosphere and soil zone.

4.8 Socio-economic aspects

The Der Brochen Mine located within the Fetakgomo - Greater Tubatse Local Municipality[4] (FGTLM), under jurisdiction of the Greater Sekhukhune District Municipality (GSDM). Thaba Chweu Local Municipality (TCLM) is an important labour sending area for the mine and as such, has been included in this report. The TCLM falls under the Ehlanzeni District Municipality, within the Mpumalanga Province.

50.3% of the population in the FGTLM is unemployed and 62% households are living on less than R76,400 per annum. The TCLM has a much lower unemployment rate (20.5%). 59.6% of economically active youth is unemployed in the FGTLM. More than half of those employed in the FGTLM work in the mining and quarrying sector, while mining, agriculture and trade are significant employment sectors in the TCLM.

43.2% of the FGTLM population have completed some primary school education, while 39.3% completed their secondary school education. Only 0.8% have received higher education, while 1.6% have no schooling. The TCLM has poorer education levels, with 38.6% having some primary school education, 15.4% having completed their secondary school education and slightly more having achieved higher education (1.5%) than the FGTLM.

Sanitation and water delivery is a constant constraint, while over 16.0% of the population do not have access to energy for warmth in the colder months in the FGTLM. Service delivery in the TCLM is better than the FGTLM; however, many rural and informal settlements find themselves with poor service delivery. Minimal health facilities and a growing population will be a cause for concern for both municipalities as populations continue to increase.

Local governance structures in the study area are complex and are likely to become more complex. A number of land claims have been lodged for the same land by a number of claimants, and the final land distribution could lead to violence and conflict between communities.

Three communities reside on farms falling within the ZoI, those being the Gamawela, Moletsi and PakanengChoma.

The Choma, Mawela and the Malepa A Makanyane communities together lodged a land claim against these two farm portions. Vygenhoek 10 JT was restituted to the PakanengChoma community in 2010. Schaapkraal 42 JT has not yet been restituted to the PakanengChoma community. However, following the separation between the three families/communities after 2010, the only claim that remains is the Choma claim (Table 5 5). The Mawela and Makanyane families/communities have indicated that they would be lodging a claim against this farm portion as well.

4.8.1 Stakeholder issues and comments

Stakeholder engagement has been conducted during the authorisation process, with the intent of the engagement being to identify stakeholder issues. During the engagement, the comments received related to potential biophysical environmental impacts, as well as various opportunities that the communities have indicated they would like access to. No issues relating to closure were raised.

[4] The FGTLM was established by the amalgamation of the Fetakgomo and Greater Tubatse Local Municipalities in August 2016, prior to which they were separate entities.

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

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. 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 that may exist at closure, typically represent external risks to the biophysical and socio-economic environment, while 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).

The ranking criteria for consequence is presented in Appendix A.

As risks have been assessed for the already on the operational areas associated with the 2014 Der Brochen authorisations, this assessment is limited to areas still to be developed or those specifically associated with the DBAP. Although the placement of the buttress at Helena TSF forms part of the DBAP, these risks are not assessed in this document becasue the risks associated with the Helena TSF and the buttress are assessed in the Final Rehabilitation, Decommissioning and Closure Plan for the Mototolo Concentrator and Mines.

Table 5-1: Risk assessment matrix

		Consequence (Details to be found in Appendix A)				
		1	2	3	4	5
Safety Occupational Health Environment Community/Social Legal and regulatory obligations Material Losses Reputational		Insignificant	Minor	Moderate	High	Major
Probability		**Risk ranking**				
Almost certain	5	11 (M)	16 (S)	20 (S)	23 (H)	25 (H)
Likely	4	3 (M)	12 (M)	17 (S)	21 (H)	24 (H)
Possible	3	4 (L)	8 (M)	13 (S)	18 (S)	22 (H)
Unlikely	2	2 (L)	5 (L)	9 (M)	14 (S)	19 (S)
Rate	1	1 (L)	3 (L)	6 (M)	10 (M)	15 (S)

5.2 Outcomes of the risk assessment

Table 5-2 includes the risks that were identified as well as the risk ranking.

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 gulley's.
- PM_{10} fallout.
- Water quality of both the surface and groundwater resources that are predicted to be impacted on by the activities by DBAP.
- 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 5-2: Outcome of risk assessment

							Consequence (should the event happen)								
Ref no.	**Hazard / Risk Source Description**	**Description of Unwanted Event**	**Cause of Hazard**	**Resulting Hazards**	**Current Controls**	**Likelihood**	**(S)**	**(H)**	**(E)**	**(C)**	**(L & R)**	**(F)**	**Max Risk Rank**	**Possible Improvements or Additional Controls**	**Residual Risk Rating**
DB 1	Post closure Mining/Processing Infrastructure	People injuring themselves while accessing the post closure infrastructure and other infrastructure associated with the expansion	Compromised structural integrity due to lack of maintenance of infrastructure as a result of limited resources post closure	Safety and health issues due to exposure to unknown environment with specialised equipment and chemicals; Financial consequences due to theft of equipment.	Routine inspection and maintenance is carried out during operational phase	3: Possible	4: High						18 (S)	**Closure Action:** Ensure routine inspection and maintenance of the existing infrastructure post closure. In addition, decommission unsafe infrastructure immediately after the operation ceases.	6(M)
DB 2	WRD Impoundment and N pit	The water associated with the WRD Impoundment as well as any water accumulating in the base of the pit being an attractive nuisance with community members accessing the water and potentially drowning	Uncontrolled access to water bodies	Reputational damage associated with potential community harm after closure	Access control	4. Likely	4. High						21 (H)	**Closure Action:** Ensure routine inspection and maintenance of the existing infrastructure post closure. In addition, decommission unsafe infrastructure immediately after the operation ceases.	
DB 3	DMS Stockpile	Not achieving the success criteria for rehabilitation	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.	Dust issues etc	Continue with long term rehabilitation trials	4: Likely					4: High	5: Maj	24 (H)	**Operational Management:** 1. Undertake DMS 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 DMS placement should be undertaken in a way that enables adequate concurrent rehabilitation opportunities at the DMS side slopes.	14(S)
DB 4	Biodiversity	Degradation of land capability due to deteriorated biodiversity during operational phase	Long term mining pollution and construction activities	Loss of biodiversity,	Implementation of an Alien species management plan.	3: Possible			4: High				18 (S)	**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	8(M)
DB 5	Surface Water (SW)/Ground Water (GW)	Contamination of SW/GW during operational phase	Discharges from operational areas	Environmental and health consequences	Control are under development for the management of potential contamination associated with the DMS dam	4: Likely			4: High			3: Mod	21 (H)	**Operational Management:** 1. Understand and address the GW/SW contamination 2. Cost the remediation plan as liability and make financial provision for.	8(M)
DB 6	Air Quality	Dust pollution from uncovered residue (overburden at North Pit and DMS)	Lack of sustainable vegetation on rehabilitation areas	Surrounding soil contamination and nuisance to surrounding community	Wet suppression techniques as per authorisation	3: Possible			3: Mod		3: Mod		13 (S)	**Closure Action:** Soon after closure, vegetate surfaces sustainably	8(M)
DB 7	Social Issues	People injuring themselves while accessing the post closure infrastructure and mining area especially open pits and concentrators	Value of unreclaimed material in the mining area	Reputation, legal obligations	Adequate access control in place during operational life	5: Almost Certain	4: High			3: Mod		1: Ins	23 (H)	**Closure Action:** 1. Ensure adequate access control around the openpits 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.	14(S)
DB 8	Social Issues	Loss of livelihood of surrounding communities	Dependency of surrounding community and businesses created by mining operations	Loss of living and basic services to people, unrealistic expectations from communities - resulting in unrest	None	5: Almost Certain				4: High			23 (H)	**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	13(S)

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:

- Constitution of the Republic of South Africa (Act 108 of 1996) (Constitution).
- National Environmental Management Act (Act 107 of 1998) (NEMA).
- National Environmental Management Amendment Act (Act 62 of 2008) (NEMAA).
- National Environmental Management Act: Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations (GN 1147) which replaces the Mineral and Petroleum Resources Development Act (Act 68 of 2002) (MPRDA) – closure and financial provision elements repealed.
- Environmental Impacts Assessment Regulations 2014, as amended in 2017.
- Mineral and Petroleum Resources Development Act (Act 68 of 2002) (MPRDA) as it pertains to the social and labour plan.
- National Environmental Management: Waste Act (Act 59 of 2008) (NEM:WA) and supporting regulations.
- Waste Classification and Management Regulations.
- National Environmental Management: Air Quality Act (Act 39 of 2004) (NEM:AQA).
- National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEM:BA).
- National Environmental Management: Protected Areas Act (Act 57 of 2003) (NEM:PA).
- National Water Act (Act 36 of 1998) (NWA).
- The Nuclear Energy Act (Act 131 of 1999) and National Nuclear Regulatory Act (Act 47 of 1999).
- The National Radioactive Waste Disposal Institute Act (Act 53 of 2008).
- Mine Health and Safety Act (Act 29 of 1996).

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

Legislation	Implications for Closure
The Constitution In terms of Section 24 of the Constitution "Everyone has the right to: • An environment that is not harmful to their health or well-being. • Have the environment protected, for the benefit of present and future generations."	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.
National Environment Management Act (107 of 1998) 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 considered in considering any aspects of potential environmental degradation. 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.	The measures required in terms of subsection (1) may include measures to: • Investigate, assess and evaluate the impact on the environment. • Inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed to avoid causing significant pollution or degradation of the environment. • Cease, modify or control any act, activity or process causing the pollution or degradation. • Contain or prevent the movement of pollutants or the causes of degradation. • Eliminate any source of the pollution or degradation. • Remedy the effects of the pollution or degradation.
Environmental Impacts Assessment Regulations, 2014 as amended in 2017 These regulations were developed for the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations.	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.
National Environment Management: Waste Act (59 of 2008) 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.	Contamination resulting from operational activities will require remediation, with the final soil quality meeting requirements as specified in the Acts Regulations.
Waste Classification and Management Regulations The Waste Classification and Management Regulations 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.	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.

Legislation	Implications for Closure
Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits 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.	
Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations 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: • Annual rehabilitation plan. • Final rehabilitation, decommissioning and mine closure plan. • Environmental risk assessment report. • Care and maintenance plan.	Closure planning process will need to be expanded to include: • Annual rehabilitation plan. • Final rehabilitation, decommissioning and mine closure plan. • Environmental risk assessment report. • Care and maintenance plan.
The National Environment Management: Air Quality Act (39 of 2004) 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	Other aspects of the NEM:AQA such as monitoring, and application of management/mitigation measures may apply during closure.

Legislation	Implications for Closure
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.	
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.	If relevant species or threatened ecosystems are presence on the mine concession, a management plan must be developed in alignment with these norms and standards.
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.

Legislation	Implications for Closure
• 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. 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.	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.
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 EMPr and WUL conditions dealing specifically with rehabilitation of the existing operation are presented in the 2014 Der Brochen authorisations (SRK 469113). These have informed the requirements for the DBAP where relevant.

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 Housing Water and Sanitation (DHWS) (formerly known as the Department of Water and Sanitation (DWS) and Department of Water Affairs and Forestry (DWAF)) – has a particular interest in the water management aspects associated with mine closure. Recognising the potential mining impact on water, DHWS 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 that 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 (AA TS 701 001)

This Group Technical Standard defines the minimum requirements for mine closure to ensure that all Anglo American projects and managed operations pro-actively plan for closure to manage risks and opportunities.

The Standard incorporates the following requirements:

Planning and design:

- Develop a closure plan that is fundamentally aligned with the Mine Closure Toolbox.
- A closure vision shall be established and maintained with associated specific closure objectives and land-use plans
- A risk assessment and gap analysis aligned with the MCT shall be undertaken in all updates of the closure plan.
- Closure plans shall consider and address regulatory conditions and community and stakeholder commitments.
- Where appropriate, closure liabilities shall be minimised through proactive integrated planning throughout the operational life cycle, involving formal opportunities analysis.
- Closure requirements shall be integrated into the Business Planning and Life of Mine (LoM) planning processes.
- Sites shall have at least a five year concurrent rehabilitation plan with clearly defined targets.

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.
- Concurrent rehabilitation shall be planned based on the availability of disturbed areas no longer required for ongoing operations.
- 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 (minimum of 10 years post the decommissioning phase unless otherwise agreed with the Group closure team).

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 Der Brochen is intended to inform the closure objectives. The vision for the mine is adopted for the DBAP.

The vision is underpinned by the objectives listed below:

VISION

The overall closure goal for the De Brochen project area is to progressively re-instate an area that is safe, stable and non-polluting with the final landform not adversely affecting water resources.

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

- Decommissioning all surface infrastructure that has no beneficial post-closure use;
- Identify potential post-closure uses of the land occupied by mine infrastructure in consultation with the surrounding land owners and land users. Should a suitable use for mine infrastructure not be found, it will be removed;
- Rehabilitate all disturbed land to a state that is suitable for its post-closure uses;
- Rehabilitate all disturbed land to a state that facilitates compliance with applicable environmental quality objectives (air quality objectives and water quality guidelines);
- Reduce the visual impact of the site through rehabilitation of all disturbed land and residue deposits;
- Rehabilitation that results in landforms that emulate the surroundings and would facilitate drainage and ensuring that all other remaining embankments are shaped and trimmed and that these are free draining; and
- Rehabilitate all disturbed land and residue deposits to a state where post-closure management is minimised.

8 Alternatives

A number of potential alternatives for closure of the DBAP can and are likely to be considered as the operation progresses. These alternatives include:

- Rehabilitation methods on the DMS embankments. Given that the soils are limited, growth medium covers are likely to require a combination of in situ soils and other materials that have similar water retention characteristics as the growth media. This could include utilising a combination of stockpiled soil and possibly tailings material.
- There may be opportunities to have multiple slope angles on the DMS, 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 underground workings, albeit that recovery would take approximately 77 years after mining ceases. Although the mine floor elevation of workings is below surface, decant will be driven by the elevation of the portals. Should the rebounding groundwater level in the underground area rise above the elevations of these portals, decant can occur. The shaft portals should be sealed-off to avoid any direct surface decant from the workings. However, if required, post closure treatment requirements will be considered and where practical and feasible, implemented.
- A number of structures may have the potential to be utilised in closure for a variety of activities. These may include medical, educational facilities or light and heavy industry. These opportunities will be explored as the mine develops 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 of the aspects considered in the BDAP, will be implemented over a 2-year period.

Once the closure activities have been completed, the DBAP aspects 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 DBAP) to develop proposed closure actions. As additional information is collected during operations, these assumptions will be reviewed and revised as appropriate.

General assumptions used

- A detailed closure material balance has not yet been undertaken for the existing operation or the new aspects considered for the DBAP. 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, security will be withdrawn from the site.

DMS Dumps and North Pit backfill

- SRK assumes there is no potential to generate acidity or leach significant metals from the DMS dump or from the backfill replaced in the north pit. 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.

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.

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 be 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 DBAP, nor has it been undertaken for the large mining rights area, for purposes of current planning and liability costing for the DBAP various assumptions relating to closure have been developed.

Some structures will remain permanently in the landscape (DMS and the TSF) with these unlikely to have associated closure alternatives that could be utilised sustainably by the community. However, where infrastructure is demolished (South Decline Shaft, stockpiles, roads, conveyors and upgrades at the Mototolo Concentrator), 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.

As the demographics of the areas surrounding the mine may change at closure as communities potentially move out to seek other livelihoods, pressures on the land may change. 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 DBAP are described below, with these based on the closure actions for the remainder of the operation as described in SRK 469113/RCP. 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 DMS Stockpile

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°.

During operations, trials will be conducted to determine whether there is a blend of tailings and soil 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. 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.
- 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 tails and soil with appropriate ameliorants will support a vegetation population on these surfaces.
- Access ramps to the top of the stockpile will remain while the top is being reclaimed. Once complete, ramps will be reshaped to a profile similar to the rest of the stockpile.

As the DMS will consist of material with a uniform grading, the material in the stockpile may be suitable for use in construction. If there are opportunities to use this material during construction, these will be explored to ensure that reuse can be undertaken without resulting in additional or cumulative impacts. Should these opportunities exist post closure, the DMS stockpiles will remain for use by third parties. In the event that all DMS is removed from the stockpile, the following measures will apply to footprint on which the stockpile was constructed:

- Any residual material in the footprint will be collected and disposed of on an adjacent TSF
- Construction materials used in the footprint below the stockpile will be characterised and disposed of in a manner consistent with the geochemical characteristics of the material;
- The area will be deep ripped to reduce compaction;
- Growth medium will be placed and vegetation established;
- AAP does not anticipate that there will be any residual groundwater contamination associated with the stockpile. However, should contamination exist, remedial measures consistent with the nature of the risk that the contamination presents will be developed.

10.2 South Decline Shaft & footprint associated with the concentrator upgrades

All infrastructure for which there is no approved third party post closure 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 openpit.
- 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 associated with 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.

10.3 WRD Impoundment

The WRD Impoundment will be required during the life of the operation to assist with the management of the operational water balance. However, once closure commences it is likely that the water management capacity provided by the WRD Impoundment will not be required and this facility can be decommissioned. The following closure activities are anticipated for closure of this of facility:

- Any residual inventory in the dams will be either pumped into remaining water management infrastructure or will be allowed to evaporate;
- Sediments collecting in the impoundments will be characterised and disposed of according to their geochemical properties;
- Geotextiles or geosynthetic material included in the containment barrier for the various waters, will be removed and disposed of at commercial landfills, with the landfill selected based on the landfills capability to handle the material;
- Rock in the impoundment walls will be backfilled into the north pit. If a material imbalance exists with the result that there is insufficient backfill to limit rainfall collecting on the backfilled pit, AAP will consider utilising some of the DMS in the stockpile to supplement the backfill. The need for this will be determined once a material balance is developed and the risk assessment is updated.
- Growth medium will be placed over the backfill and vegetation will be established.

10.4 Roads and conveyor servitudes

Roads and servitudes that are not needed for closure and post closure uses at the site (e.g. security and monitoring) will be closed. 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 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 loosened by ripping and the footprint revegetated as per the VMP.

10.6 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.

10.7 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.

10.8 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 analogues reference plot.

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

A number of assumptions 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

	Opportunities	Threats
Biophysical	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.	The low rainfall may hinder vegetation establishment and sustainability. Future regional mining developments may result in significant cumulative impacts occurring if closure occurs simultaneously.
Economic	The DMS available can potentially be utilised as construction aggregate.	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.
Social	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.	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.
Other		Legislation changes may result in unrealistic closure requirements.
Uncertainty	Stakeholder requirements at closure.	

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 two-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

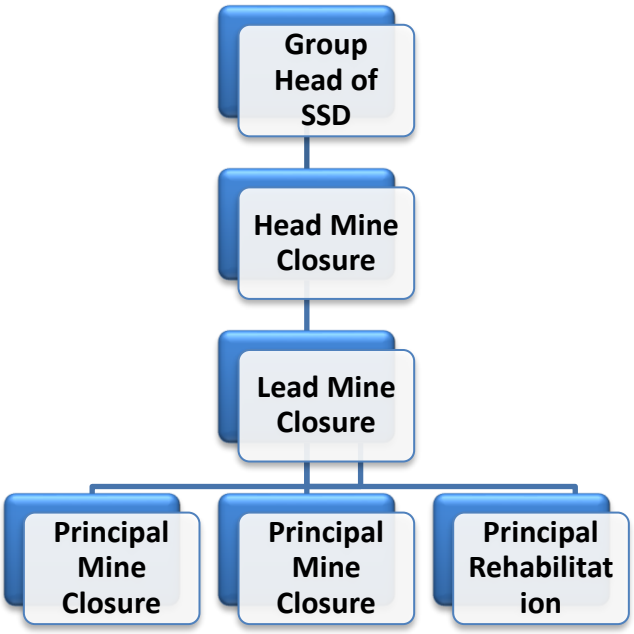
AAP has the in-house capacity to undertake mine closure activities or will ensure that the personnel with the correct capacity and experience will be employed. There is therefore unlikely a need for internal capacity building.

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 so 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

Description	Yr 1	Yr 2	Yr 3-13
	Closure Period		Post Closure Period
DMS Stockpile	X	X	
South Decline Shaft	X		
WRD Impoundment		X	
Upgrades at Mototolo Conc.	X		
Monitoring			
Stability			X
Vegetation			X
Dust			X
Surface water			X



srk consulting	DER BROCHEN MINE GENERIC COMPOSITION OF CLOSURE TEAM	Project No. 533247

Figure 12-1: Generic composition of closure team

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 DMS 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 Der Brochen in identifying when the standard of closure achieved is sufficient to relinquish responsibility for a specific area. The site specific relinquishment criteria for Der Brochen 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

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

15 Closure cost estimation

The liability has been estimated using the approach documented in the "DMRE 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 specified in the DMRE 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 DMRE 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 DMRE 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 DBAP.

Step 3: Determine Environmental Sensitivity

The "Environmental Sensitivity" has been determined by reference to Table B.4 of the DMRE Guideline as **"High"**.

Table B.4 DMRE Sensitivity matrix

Sensitivity	Sensitivity criteria		
	Biophysical	**Social**	**Economic**
Low	Largely disturbed from natural state, Limited natural fauna and flora remains, Exotic plant species evident, Unplanned development, Water resources disturbed and impaired.	The local communities are not within sighting distance of the mining operation, Lightly inhabited area (rural).	The area is insensitive to development, The area is not a major source of income to the local communities.
Medium	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.	**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.	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.
High	**Largely in natural state,** **Vibrant fauna and flora, with species diversity and abundance matching the nature of the area,** **Well planned development,**	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.	**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

Sensitivity	Sensitivity criteria		
	Biophysical	**Social**	**Economic**
	Area forms part of an overall ecological regime of conservation value, **Water resources emulate their original state.**		

Step 4.1: Determine level of information available

The Mine has an approved EMPr 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 DMRE 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 DMRE Guideline.

Weighting Factor 1 = 1.10 (Undulating terrain).

Weighting Factor 2 = 1.10 (Remote)

The areas of disturbance were determined from the design drawings with the areas summarised in Table 15.1. Quantities for the South Decline Shaft were obtained from similar shaft layouts where SRK has determined quantities associated with similar infrastructure.

Table 15-1: Areas used in the liability assessment

Farm name and farm portion	Proposed Infrastructure	Area (Ha) estimated	Total Project area (Ha)
Helena 6 JT, Remaining Extent	Ore Conveyor Section	10.2	53.6
	Der Brochen Gate and Security house	0.2	
	Access and Haul roads	0.7	
	Buttress wall	16.1	
	Filter press plant	0.2	
	DMS plant	0.3	
	ROM stockpiles & silos	0.2	
	DMS conveyor	2.5	
	WRD impoundment	23.2	
Helena 6 JT, Portion 3	Access and Haul roads	1.0	9.23
	Explosive destruction bay	0.5	
	South Shaft Complex including offices	2.8	
	Ore Conveyor Section	5.0	
Der Brochen 7 JT, Remaining Extent	South Shaft Complex including water management infrastructure, offices and change houses	10.9	14.32
	3 x Ventilation Shafts	0.1	
	Access and Haul roads	1.0	
	Staff accommodation complex	0.6	
	Ore Conveyor Section	1.7	
Mareesburg 8 JT, Portion 1	DMS Stockpile	13.4	13.4
Mareesburg 8 JT, Portion 7	DMS Stockpile	86.6	90.6
	Section of the DMS Conveyor system (located within existing Mareesburg Tailings Pipeline corridor)	2 Km	
	PCD	4.0	
Total area utilised for the Der Brochen Amendment Project			**181.11**

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 include:

- Decommissioning all surface infrastructure that has no beneficial post-closure use;
- Identify potential post-closure uses of the land occupied by mine infrastructure in consultation with the surrounding land owners and land users. Should a suitable use for mine infrastructure not be found, it will be removed;
- Rehabilitate all disturbed land to a state that is suitable for its post-closure uses;
- Rehabilitate all disturbed land to a state that facilitates compliance with applicable environmental quality objectives (air quality objectives and water quality guidelines);
- Reduce the visual impact of the site through rehabilitation of all disturbed land and residue deposits;
- Rehabilitation that results in landforms that emulate the surroundings and would facilitate drainage and ensuring that all other remaining embankments are shaped and trimmed and that these are free draining; and
- Rehabilitate all disturbed land and residue deposits to a state where post-closure management is minimised.

Table 15-2: Closure quantum

No.	DMR Description	Unit	A	B	C	D	E=A*B*C*D
	DBAP		Quantity	Master rate	Multiplication factor	Weighting factor 1	Amount (Rands)
1	Dismantling of **processing plant and related structures** (including overland conveyors and powerlines)	m^3	12 411	16.14	1.00	1.10	220 344
2(A)	Demolition of **steel buildings and structures**	m^2	2 922	224.79	1.00	1.10	722 520
2(B)	Demolition of **reinforced concrete buildings and structures**	m^2	8 067	331.21	1.00	1.10	2 939 032
3	Rehabilitation of **access roads**	m^2	34 440	40.25	1.00	1.10	1 524 831
4(A)	Demolition and rehabilitation of **electrified railway lines**	m	n/a	390.40	1.00	1.10	0
4(B)	Demolition and rehabilitation of **non-electrified railway lines**	m	n/a	212.95	1.00	1.10	0
5	Demolition of **housing and/or administration facilities**	m^2	1 148	449.56	1.00	1.10	567 902
6	**Opencast rehabilitation** including final voids and ramps	ha	31	228 795.71	1.00	1.10	7 801 934
7	Sealing of **shafts, adits and inclines**	m^3	60	120.66	1.00	1.10	7 964
8(A)	Rehabilitation of **overburden and spoils**	ha	119	157 104.79	1.00	1.10	20 637 029
8(B)	Rehabilitation of processing waste **deposits and evaporation ponds (basic salt-producing waste)**	ha	12	195 671.17	1.00	1.10	2 671 107
8(C)	Rehabilitation of processing waste **deposits and evaporation ponds (acidic, metal-rich waste)**	ha	n/a	568 321.86	0.90	1.10	0
9	Rehabilitation of **subsided areas**	ha	n/a	131 551.60	1.00	1.10	0
10	**General surface rehabilitation**	ha	22	124 453.52	1.00	1.10	2 957 016
11	**River diversions**	ha	n/a	124 453.52	1.00	1.10	0
12	**Fencing**	m	4 000	142.00	1.00	1.10	624 800
13	**Water management**	ha	184	47 320.72	0.67	1.10	6 431 950
14	**Maintenance and aftercare**	ha	184	16 562.25	1.00	1.10	3 359 973
					Sub Total 1		**50 466 401**
					Weighting factor 2	1.10	55 513 041
1	Preliminary and General				6.0% of Subtotal 1 > 100 000 000		6 055 968
					12.0% of Subtotal 1 < 100 000 000		
2	Contingency				10.0% of Subtotal 1		5 046 640
					Sub Total 2		**66 615 649**
					Add Vat (15%)		9 992 347
					GRAND TOTAL		**76 607 997**

The closure quantum for operational aspects is assessed on an annual basis and provision is made by AAP for any shortfall, between the current quantum and existing provisions. Aspects are assessed and provisions are made for the following operational infrastructure:

- The current infrastructure associated with the Mototolo Concentrator, with the last assessment including the filter press plant constructed to support the construction of the Mareesburg TSF;
- The existing Helena TSF and the buttress placed to stabilise the TSF;
- The existing disturbance at the Mareesburg TSF.

The quantum presented in Table 15-2, replaces the quantum calculated in 2014 (SRK 469113/RCP) for the proposed mining activities associated with the Der Brochen Mine for the scenario that included mining north and south openpit with and without the proposed co-disposal facility.

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 to 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/EMPr 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 16-1: Schedule of planned audits

Audit	Internal Responsibility	Frequency	Likely date
Internal	Environmental manager / Closure manager	Annual	Q3
External	Financial manager	Annual	Q4
Legislated	Mine manager	Annual	Q1 of following year

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 Der Brochen 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 DMRE following authorisation of the project.

Prepared by

James Lake

Principal Scientist

Reviewed by

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

Anglo American Platinum, 2016, Mogalakwena Mine SEAT Report Update.

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SRK Consulting, 2014: Rustenburg Platinum Mines Der Brochen Section – Der Brochen EMP Amendment and Alignment. Rehabilitation and Closure. (Report No. 469113/RCP).

SRK Consulting, 2014: Rustenburg Platinum Mines Der Brochen Section – Der Brochen EMP Amendment and Alignment. Final Environmental Impact Assessment and Environmental Management Programme. (Report No. 469113).

Appendices

Appendix A: Risk Assessment Criteria

	Consequence				
	1	2	3	4	5
	Insignificant	Minor	Moderate	High	Major
Safety / Health	First aid case / Exposure to health hazard resulting in temporary discomfort	Medical treatment case / Exposure to health hazard resulting in temporary alterations/limitations (no lost time)	Lost time/ Exposure to health hazards/ agents (over the OEL) resulting in reversible impact on health (with lost time)	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 or single fatality	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
Environment	Lasting days or less; limited to small area (metres); receptor of low significance/ sensitivity (industrial area)	Lasting weeks; reduced area (hundreds of metres); no environmentally sensitive species/ habitat)	Lasting months; impact on an extended area (kilometres); area with some environmental sensitivity (scarce/ valuable environment).	Lasting years; impact on sub-basin; environmentally sensitive environment/ receptor (endangered species/ habitats)	Permanent impact; affects a whole basin or region; highly sensitive environment (endangered species, wetlands, protected habitats)
Financial	No disruption to operation/ 5% of current liability estimate - R7million	Brief disruption to operation/10% of current liability estimate - R13million	Partial shutdown /15% of current liability estimate - R20million	Partial loss of operation/20% of current liability estimate – R26 million	Substantial or total loss of operation / 25% of current liability estimate - R29 million
Legal & Regulatory	Technical non-compliance. No warning received; no regulatory reporting required	Breach of regulatory requirements; report/involvement of authority. Attracts administrative fine	Minor breach of law; report/investigation by authority. Attracts compensation/ penalties/ enforcement action	Breach of the law; may attract criminal prosecution, penalties/ enforcement action. Individual licence temporarily revoked	Significant breach of the law. Individual or company law suits; permit to operate substantially modified or withdrawn
Reputation / Social / Community	Minor impact; awareness/ concern from specific individuals/ Minor disturbance of culture/ social structures	Limited impact; concern/ complaints from certain groups/ organizations (e.g. NGOs) / Some impacts on local population, mostly repairable. Single stakeholder complaint in reporting period	Local impact; public concern/ adverse publicity localised within neighbouring communities / On-going social issues. Isolated complaints from community members/ stakeholders	Suspected reputational damage; local/ regional public concern and reactions / Significant social impacts. Organized community protests threatening continuity of operations	Noticeable reputational damage; national/ international public attention and repercussions/ Major widespread social impacts. Community reaction affecting business continuity. “License to operate” under jeopardy

Probability		
ALMOST CERTAIN	5	The unwanted event has occurred frequently: occurs in order of one or more times per year & is likely to reoccur within 1 year
LIKELY	4	The unwanted event has occurred infrequently: occurs in order of less than once per year & is likely to reoccur within 5 years
POSSIBLE	3	The unwanted event has happened in the business at some time: or could happen within 10 years
UNLIKELY	2	The unwanted event has happened in the business at some time: or could happen within 20 years
RARE	1	The unwanted event has never been known to occur in the business: or it is highly unlikely that it will occur within 20 years

SRK Report Distribution Record

Report No.	533247 DB Closure
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