SIBANYE GOLD LTD: EZULWINI MINING COMPANY (PTY) LTD

CESSATION OF PUMPING OPERATIONS AT EZULWINI AND CLOSURE OF UNDERGROUND MINE WORKINGS
PARTIAL CLOSURE PLAN

Report No.: JW043/17/F925 - Rev 3

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Jones & Wagener
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SYNOPSIS

Introduction

Ezulwini Mining Company (Pty) Ltd (EMC), now a subsidiary of Sibanye Gold Limited, trading as Sibanye-Stillwater (Sibanye), owns and operated a gold and uranium mine located approximately 8 km south-east from the town Westonaria, in the Gauteng Province. The EMC operation (also known as Cooke 4) is an underground mine which mined mostly gold ore and some uranium deposits.

History

Mining activities commenced in the 1960's under the control of the Western Areas Gold Mining Company Limited. The mine was subsequently acquired and further sold-on by various mining companies until Sibanye took ownership in 2013.

In 1986 a permit was obtained to dewater the Gemsbokfontein West Dolomitic Compartment (Gemsbokfontein West sub-compartment). Water pumped from the mine was then discharged into the Leeuspruit and into the Kleinwes Rietspruit via the Peter Wright Dam, which flows to the Vaal River.

The Placer Dome Western Areas Joint Venture (PDWAJV) took over the pumping operations in March 2003 to allow the completion of the construction of plugs between the two mines and to verify the competency of the barrier pillar. The purpose being that once the dewatering of the Ezulwini mining operations stopped, the necessary measures would be in place to ensure the safety and health of the South Deep Mine, where mining occurs at a lower elevation than at the Ezulwini Workings. The work was completed and the PDWAJV gave notice to Harmony that pumping operations would cease on 8 February 2005. All indications are that the plug and pillar design were accepted by the parties at that date. Please refer to Section 3d of the Final Basic Assessment Report (FBAR) and Appendix B.1 of the F for further details.

Current Situation and Project Scope

The current dewatering programme, or even a decelerated or phased dewatering programme, is not economically nor environmentally beneficial. Continued pumping of underground water from the workings has contributed to financial losses to the mine at an average cost of approximately R 13 million per month and with losses amounting to R 350 million for the period of January 2015 to March 2016 alone, and in circumstances where mining is no longer profitable in any event.

EMC therefore intends to cease pumping and close the underground workings of Ezulwini. The result of the termination of the underground mining activities and the cessation of pumping water from underground (approximately 68 Mℓ/day) is that the water levels in the mine workings and above-lying dolomitic compartment will recover over time. As a result of this, it is expected that the Gemsbokfontein Eye, located to the north of Ezulwini on the banks of the Wonderfonteinspruit, will receive aquifer flow water after approximately 7 years, which will discharge at this point into the 1.0 meter diameter pipeline. This pipeline conveys the Wonderfonteinspruit and discharges to the west of Carletonville, upstream of the Abe Bailey nature reserve.

Jones & Wagener (Pty) Ltd Engineering & Environmental Consultants (J&W) have been appointed by Sibanye to undertake the required environmental authorisation and licensing processes for the cessation of pumping at the Sibanye Gold: EMC operations.

Environmental Authorisation and Licensing Processes

This document serves as the Closure Plan for partial closure of the EMC operations, i.e., the closure (decommissioning) of the underground operations, to be lodged with the Department of Mineral Resources (DMR) in terms of the National Environmental Management Act 107 of 1998 (NEMA) and Government Notice (GN) Regulations 982 to 985, as amended (4 December 2014).

This Partial Closure Plan will accompany the FBAR and Environmental Management Programme (EMPr) which have also been lodged with the DMR in terms of the NEMA and GN Regulations 982 to 985, as amended (4 December 2014) for the cessation of pumping and resultant termination of underground operations at Sibanye Gold: EMC operations. It is important to note that Harmony previously obtained authorisation to close and re-water the underground workings.

Please note that this Partial Closure Plan only covers the closure activities associated with the underground workings at Sibanye Gold: EMC operations, as the surface operations are proposed to continue. A full Closure Plan for mine closure must be submitted to the DMR before the entire operations undergo closure, which must include the closure plans for surface infrastructure demolishing, decommissioning or re-use and the rehabilitation of the land. A concurrent rehabilitation plan is being compiled by Golder Associates for EMC, in line with the requirements of the Financial Provisioning Regulations of 2015 (GNR 1147), as amended.

In addition to this, EMC must submit a partial mine closure application to the DMR in terms of Section 43(3)(d) of the Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA) for the termination of underground workings at Sibanye Gold: EMC operations. Section 43(3)(d) states that a mining right holder must apply for closure on "*completion of the prescribed closing plan to which a right, permit or permission relate*" (MPRDA). EMC's existing mining right number for the Sibanye Gold: EMC operations is **GP 30/5/1/2/2(38) MR**. This is the mining right to which this application regarding the cessation of pumping and termination of underground workings applies.

As this project consists of an integrated process, a Water Use Licence Amendment Application (WULAA) for the changes to the existing Water Use Licence (WUL) (Licence Number 08/C23D/ABEFGJ/2836) associated with the cessation of pumping, is also being prepared in terms of the National Water Act 36 of 1998 (NWA) and will be assessed by the Department of Water and Sanitation (DWS).

The BAR, EMPr and Partial Closure Plan were submitted for authority and public review from 3 April 2017 to 7 May 2017. At the request of an Interested and Affected Party (I&AP), the public participation process was extended to 21 May 2017. Substantial changes were made to the reports and to the specialist studies mainly due to comments from I&APs. A request for a 50 day extension of the BA process in terms of Regulation 19(1)(b) of GN R 982 of the 2014 EIA Regulations (as amended) was applied for on 13 June 2017, to allow for new information to be added and for amendments to be made to the CBAR, EMPr and Closure Plan. The DMR granted this extension in a letter dated 28 June 2017. The updated reports were made available for a second public review period from 16 August 2017 to 15 September 2017. On 17 July 2017, further extension of the Basic Assessment process of two months in terms of Regulation 3(7) of GN R 982 (as amended) of the 2014 EIA Regulations was applied for. This extension was approved by the DMR on 7 August 2017, stating that the FBAR must be submitted by 20 October 2017.

Specialist Investigations/Studies – Recommendations

Specialist investigations were conducted as part of the Basic Assessment process. These investigations studied existing information and the potential impacts that may occur with the re-watering of the underground operations. The specialists have made recommendations on mitigation and management measures to be implemented in the event of potential impacts.

*Geohydrology (*Jones & Wagener (Pty) Ltd, 2017, *Ezulwini Partial Closure Geohydrological and Geotechnical Assessment*, Report Number: JW243/16/F925*)*

The geohydrological assessment of potential impacts due to the cessation of pumping from Sibanye Gold: EMC operations recommends the following:

- To our knowledge, the re-watering of a dolomitic groundwater compartment has not happened anywhere in South Africa before and due to the many uncertainties, it is recommended that a dynamic groundwater monitoring programme is implemented.
- The aim of the monitoring is to verify the model predictions and to make adjustments were necessary. The monitoring network will provide an early warning system that will alert the mine to the following:
  - Unexpected changes in the groundwater levels, specifically in areas with a risk of sinkhole formation;
  - Unexpected changes in groundwater quality; and
  - Changes in the level of the ground surface.
- The groundwater levels in the revised borehole network should be monitored as follows:
  - Monthly during the lead-up to the cessation of pumping;
  - Twice a month during the re-watering process; and
  - Monthly after the Gemsbokfontein Eye starts flowing for a period of three years.
- It is also important that the flow meter in the pipeline be repaired and a surface water flow measuring system is in place prior to the eye starting to flow. Flow from the Gemsbokfontein Eye is likely to be diffuse and measuring the difference between water exiting the 0.75 m pipeline from Donaldson Dam and entering the 1 m pipeline, may be a way of accounting for the flow volume at the eye.
- Groundwater quality in the revised monitoring network (only new boreholes BH1-6) should be monitored as follows:
  - Twice a year during the lead-up to the cessation of pumping;
  - Twice a year during the re-watering of the mine;
  - Quarterly during the recovery of the dolomite aquifer and during the first three years after the eye starts flowing.

*Dolomitic Stability (*Jones & Wagener (Pty) Ltd, 2017, *Ezulwini Partial Closure Geohydrological and Geotechnical Assessment*, Report Number: JW243/16/F925*)*
Due to the concern of renewed sinkhole activity in the Gemsbokfontein West Sub-compartment as a result of the onset of re-watering, a dolomite stability assessment was undertaken, the recommendations of the assessment are as follows:

- As it is possible that new sinkholes/subsidence could develop during re-watering of the Gemsbokfontein West sub-compartment, such events may create a variety of safety and financial impacts for EMC and various affected parties.
- Historically the mines involved in the dewatering of this, and neighbouring compartments, recorded, investigated and compensated affected parties where necessary for any adverse impacts. Such activities were managed by the FWRDWA.
- A strategy, related now to re-watering, to mitigate any potential effects to affected parties, known as a Dolomite Risk Management Strategy is required, and detailed in **Appendix C.2**. This strategy mirrors the process undertaken by the mines during dewatering. This must be implemented until the re-watering cycle is complete.

*Surface Water (*Jones & Wagener (Pty) Ltd, 2017, *Specialist Surface Water Report as Input to the Environmental Authorisation Process for the Closure of the Ezulwini Underground Workings*, Report Number: JW241/16/F925*)*

Based on the assessment of the impacts on surface water from the cessation of pumping from Sibanye Gold: EMC operations the following recommendations can be made:

- After pumping at Ezulwini ceases the mine should continue to monitor the water quality at the existing monitoring points along the Leeuspruit and Kleinwes Rietspruit to assess the impact of the remaining mine related infrastructure on the surface water regimes associated with the mine. The current water quality monitoring programme has been evaluated and it is recommended that this be continued after pumping stops. This is currently being conducted on a monthly basis and it is recommended that a full chemical suite of variables be analysed at the current frequency. This monitoring should continue for a period of three years after the cessation of pumping, subject to reassessment at the time.
- The abstraction of water from the Peter Wright Dam will need to continue, such that the dam does not overtop more than once in 50 years, until such time as the wetland upstream of the dam is rehabilitated and it can be shown that the water quality in the dam is in line with the in-stream water quality objectives. If water is abstracted from the dam at a rate of 2 000 m^3/day then the dam would not be expected to spill more than once in fifty years and therefore would comply with the regulations, as stipulated in GNR 704. The effluent from the external sewage treatment plant could be diverted around the Peter Wright Dam and subsequently be made to report directly into the Kleinwes Rietspruit, then the required abstraction rate could be reduced to 1 000 m^3/day. This is provided the sewage plant effluent is of an adequate quality, in line with in-stream water quality objectives.
- At the Gemsbokfontein Eye it is recommended that the location of the flow point be monitored and the water quality of the flow water be sampled, together with groundwater monitoring. These water qualities should be assessed to ensure compliance with the Resource Water Quality Objectives for the catchment and to assess the impact of the flow water on the surface water qualities in the Wonderfonteinspruit catchment. This monitoring should continue for three years after the Eye begins to flow, subject to reassessment at the time. In addition, the flow in the 1 m pipeline should be continuously monitored in relation to its capacity within the context of the associated catchment in which it falls.

*Wetlands and Ecology (*Natural Scientific Services cc, 2017, *Closure of Sibanye Gold Ezulwini Operations: Ecological Assessment*, Report Number: 2321*)*
The following recommendations have been made based on the assessment of the impacts on wetlands and ecology, from the proposed cessation of pumping from Sibanye Gold: EMC operations:

- It is recommended that the Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) and ecosystem services of the systems continue to be monitored annually for a period of 3 years at select sampling points on the Kleinwes Rietspruit. The monitoring of the Wonderfonteinspruit will need to continue for 3 years after flow from the Eye commences. Sampling points need to be established and assessed prior to pumping ceasing.
- Biomonitoring is currently undertaken along the Leeuspruit East by EMC, it is recommended that bio-monitoring on this system continues. Biomonitoring has been undertaken by the EMC since 2016 along the Kleinwes Rietpsruit (Sibanye Gold, 2016; Sibanye Gold, 2017). NSS recommends that the bi-annual monitoring continues. In addition to the current monitoring measures, NSS recommends that a taxa list of the macroinvertebrates sampled be included in the monitoring reports. The taxa list could provide valuable information on changes after the pumping ceases; and is therefore vital to include in the baseline information for future monitoring reports.

- In addition to water quality monitoring it is recommended that sediment samples be taken and assessed. The sediment in the Kleinwes Rietspruit, downstream of the Peter Wright Dam needs to be assessed to determine the contamination levels. If contaminated, it is important that the existing vegetation is monitored as this vegetation is stabilising the sediment. If the vegetation dies back, alternative mitigation measures may need to be investigated to prevent the sediment from being transported further downstream (such as phytoremediation, bioremediation or soil washing). Tailings are to be removed and placed on existing tailings facilities. The Uranium level is likely to remain the same or increase due to lack of dilution effect if tailings are not removed. Settling ponds downstream of all contaminated areas are to be installed to prevent contaminated sludge entering the wetland systems. These settling ponds are to be cleaned on a regular basis in order to maintain capacity, with the contaminated material disposed of in an appropriate manner. An application to rehabilitate these wetlands was submitted by EMC to the DWS in 2016, however no response has been received to date. The same vegetation monitoring must take place in the Leeuspruit where it is known that the sediment samples taken by NSS (NSS, 2014) were contaminated and are currently being held *in situ* by the *Phragmites* reed beds.
- Implementation of the rehabilitation plan submitted by EMC (2016) for the wetland areas upstream of the Peter Wright Dam. Without the removal of the tailings from these wetlands it is likely that the uranium level will remain the same or increase as the pumped water will no longer create a dilution effect.
- Erosion was present along both the Leeuspruit and Kleinwes Rietspruit. As the hydrology of the system changes, the vegetation structure and composition is expected to change. This change in vegetation structure may result in times where vegetation cover is scarce and the system is more prone to erosion. Selected photographic sampling points, along both systems should be identified, prior to pumping stopping. Photographs should be taken quarterly, for a period of 3 years. Should evidence of erosion increase, the cause should be investigated and mitigation measures implemented if required. Mitigation measures could include seeding or the planting of vegetation sods to speed up the vegetation succession, or if more severe, the use of gabion structures could be investigated.

*Socio-Economic (*Southern Economic Development, 2017, *Socio-Economic Impact Assessment of the Proposed Closure of the Underground Workings of the Ezulwini Mining Company (Pty) Ltd, Subsidiary of Sibanye Gold Limited)*
Based on the assessment of the impacts on the socio-economic factors from the proposed cessation of pumping from Sibanye Gold: EMC operations the following recommendations have been made:

- Prioritise affected workers for future employment in Sibanye projects.
- Keep affected suppliers informed of future contracts at Sibanye.
- The partial mining closure motivation is the result of the need to decrease the current operation losses. This is recommended to be achieved by complete cessation of pumping underground water from Sibanye Gold: EMC operations.
- A clear communication strategy to communicate socio-economic impacts of closure to the local community should be established.
- The Emergency Response Plans for Cooke 3 shaft and South Deep (Appendix H.4 and H.5 of the BAR) must be maintained to include safety measures relating to the re-watering of Sibanye Gold: EMC operations.
- The shaft entry points must be barricaded and appropriate security measures built around the surface infrastructure to prevent illegal miners from entering the mine.

- Sibanye must continue engaging in forums in collaboration with local development agents to discuss potential impacts and mitigation measures regarding income losses for farmers and agricultural workers in the agricultural sector.
- Discussions must be held with South Deep and the Waterpan Golf Club (as well as any other affected stakeholders) to discuss ways to reduce the potential impact of the activity on these stakeholders.
- A transparent communication strategy must be developed to inform the local community of seismic impact risks and events.
- The highest potential socio-economic risks (although negligible likelihood (SRK Consulting, 2017)) for the proposed closure of the underground workings of the Sibanye Gold: EMC operations are related to potential loss of life and the closure of South Deep due to seismic instability and the flooding of South Deep. The highly negative consequences, in the unlikely event of the above, underscore the need to mitigate these potential impacts effectively. This must be mitigated in terms of the recommendations from the stability findings and monitoring of existing plugs and still to be constructed plugs. It is recommended that the DMR require the recommended monitoring be undertaken by the establishment and operation of a Command and Control Monitoring Centre, as described below.

<u>*Plug Integrity, Boundary Pillar water flow monitoring and seismic monitoring (*</u>SRK Consulting, 2017, *Assessment of the water barrier pillar and the water plugs placed between Ezulwini Shaft and South Deep shaft*, Report Number: 507589/1; SRK Consulting, 2017, *Assessment of the water barrier pillar and positioning of future plugs between Cooke 3 and Ezulwini shafts*, Report Number: 507589/2; SRK Consulting, 2017, *Design of Ezulwini / Cooke 3 Plugs – Phase 3*, Report Number: 507569/3*)*
It is recommended that the DMR require the establishment and operation of a Command and Control Monitoring Centre, as a regional centre to monitor, record and respond effectively to all environmental and geomechanics safety data, including the below with regards to each mine's plug integrity, boundary pillar water flow and seismic monitoring. The centre is proposed to be located near to South Deep mine so that access to the underground workings is feasible. This centre will be run 24/7 by an independent monitoring response team and will provide real-time linkage to South Deep, EMC and the DMR. The design of this centre must be submitted to the DMR and South Deep for approval within 30 days of authorisation for the cessation of pumping.
<u>South Deep</u>

Monitoring of plugs
The following is required:

- The plug sites are inspected via CCTV cameras on a daily basis.
- All pressure gauges be read on a two-weekly basis and that graphs of pressures versus time be maintained. Records should be kept of both plug back-head pressures and piezometer pressures. Any sudden changes in pressure readings should be investigated.
- The flow rates of the drips from the pipe at Level 58 – 2 West plug and from the bolt at Level 58 – East plug be measured, on a two-weekly basis, using a measuring jug and a stop watch.
- Graphs of flow rate versus time should be measured. Any sudden increase in flow rate should be investigated.
- With the expected rise in water level behind the plugs, a specialist contractor is to be called in to do condition monitoring of the plugs and rock condition around the plugs when necessary.

Maintenance of Equipment at 58 Level Plugs

It is recommended that:

- The CCTV cameras must be maintained.
- The pressure gauges be maintained or replaced. It is not possible to tell whether the piezometer gauges are malfunctioning or whether there is no piezometric pressure. Dual piezometric gauges should be installed so that readings can be cross-referenced. All gauge casings should be engraved with a unique number for recording purposes. All gauges should have a maximum range of 2 MPa so that the indicator needle has a reasonable deflection under pressure.
- The outside closure valve on the lower pipe at 2 West Plug be checked for corrosion. This outlet is the only one carrying acidic water in the pumping operation.

Installation of Equipment at 50 Level Plugs

It is recommended that:

- Dual closure valves be installed on both the piezometer pipes and the 200 mm bore outlet pipes as a contingency against valve failure.
- Dual pressure gauges be fitted to all piezometer pipes and single pressure gauges be fitted to two of the 200 mm bore outlet pipes. All gauge casings should be engraved with a unique number for recording purposes. Gauge maintenance and calibration must be undertaken when necessary.
- CCTV cameras be installed at the two 50 Level plug sites

Seismic Activity

South Deep should maintain a seismic activity monitoring network. Updated catalogues of seismic data recorded by the South Deep network should be analysed to check if events larger than the 2012 value of Mmax = 3.4 have been recorded.

As the Ezulwini mine re-waters, the flows across the water barrier pillar need to be monitored, and mitigation measures such as additional pumping capacity may need to be considered.

The bolts, valve handles and pressure gauges at the plugs between South Deep and Ezulwini should be replaced. The pipes should also be grouted if necessary.

Cooke 3

A monitoring and maintenance programme must be developed for the Cooke 3 – EMC operations plugs once constructed. A seismicity monitoring programme must also be implemented.

The installed support at the potential Cooke 3 plug sites was found to be corroded. This support needs to be replaced in the excavations used to access the proposed plug positions, to prevent injury to the persons working at the plug sites. The support in the area where the plugs are to be placed must be removed and barring must be done to expose the intact rock mass. Temporary support must be placed in this area as per the requirements of the miner responsible for this area.

Way Forward

- The FBAR, EMPr and Partial Closure Plan are being submitted to the DMR for decision making. Stakeholders and commenting authorities will be notified of the documents availability and can also request final documents from J&W – see below:

Electronic copies		
Ms Anelle Lötter (public participation office)	(www.jaws.co.za) under public documents, alternatively phone and request a CD copy.	012 667 4865 or email: anelle@jaws.co.za

- Stakeholders may submit any comments they may have directly to the DMR, copying in the public participation office.

- Stakeholders will be notified of the outcome of the DMR decision with regards to the application for an Environmental Authorisation. This will be done in accordance to the NEMA requirements and the notification received from the DMR.

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APPENDIXES

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Acronyms and Abbreviations

BAR	Basic Assessment Report
CSIR	Council for Scientific and Industrial Research
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIS	Ecological Importance and Sensitivity
EMC	Ezulwini Mining Company (Pty) Ltd
EMPr	Environmental Management Programme
EMPR	Environmental Management Programme Report
FBAR	Final Basic Assessment Report
FUL	First Uranium Limited
FWRDWA	Far West Rand Dolomitic Water Association
GAAP	Gold Alliance Agricultural Project
GDARD	Gauteng Department of Agriculture and Rural Development
GN	Government Notice
Harmony	Harmony Gold Mine Limited
J&W	Jones & Wagener (Pty) Ltd Engineering & Environmental Consultants
m^3	Cubic metres
mamsl	Mean average metres above sea level
Mℓ	Megalitres
Mℓ/day	Megalitres per day
MPRDDA	Mineral and Petroleum Resources Development Act
MPRDR	Mineral and Petroleum Resources Development Regulations
NEMA	National Environmental Management Act
NNR	National Nuclear Regulator
NSS	Natural Scientific Services
NWA	National Water Act
PES	Present Ecological State
REL	Randfontein Estates Limited
RWCLM	Rand West City Local Municipality
SACNASP	South African Council for Natural Scientific Professionals
SANS	South African National Standards
Sibanye	Sibanye Gold Limited, trading as Sibanye-Stillwater
Simmers	Simmer and Jack (Pty) Ltd
SLP	Social and Labour Plan
South Deep	South Deep Joint Venture
TVET	Technical, Vocational Education and Training
WAGMC	Western Areas Gold Mining Company Limited
WMA	Water Management Area
WRDM	West Rand District Municipality
WRTRP	West Rand Tailings Retreatment Project
WUL	Water Use Licence
WULAA	Water Use Licence Amendment Application
WWTW	Waste Water Treatment Works

NATIONAL ENVIRONMENTAL MANAGEMENT ACT -2014 REGULATIONS – CLOSURE PLAN CHECKLIST (GNR 982, as amended)

Regulation 982 December 2014	Description	Reference in report
Closure Plan		
Appendix 5.1 (a)	A closure plan must include details of i. the EAP who prepared the closure plan; and ii. the expertise of the EAP;	Section 1.1.3
Appendix 5.1 (b)	closure objectives;	Section 3.2
Appendix 5.1 (c)	proposed mechanisms for monitoring compliance with and performance assessment against the closure plan and reporting thereon;	Section 5
Appendix 5.1 (d)	measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity and associated closure to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including a handover report, where applicable;	Section 4.3
Appendix 5.1 (e)	information on any proposed avoidance, management and mitigation measures that will be taken to address the environmental impacts resulting from the undertaking of the closure activity;	Section 4.4 and 5
Appendix 5.1 (f)	A description of the manner in which it intends to- i. modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation during closure; ii. remedy the cause of pollution or degradation and migration of pollutants during closure; iii. comply with any prescribed environmental management standards or practices; and iv. comply with any applicable provisions of the Act regarding closure;	Section 4.4
Appendix 5.1 (g)	time periods within which the measures contemplated in the closure plan must be implemented;	Section 4.2
Appendix 5.1 (h)	The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of closure; and	Section 4.4
Appendix 5.1 (i)	details of all public participation processes conducted in terms of regulation 41 of the Regulations, including- i. copies of any representations and comments received from registered interested and affected parties; ii. a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; iii. the minutes of any meetings held by the EAP with interested and affected parties and other role players which record the views of the participants; iv. where applicable, an indication of the amendments made to the plan as a result of public participation processes conducted in terms of regulation 41 of these Regulations; and	Section 2
Appendix 5.1 (j)	where applicable, details of any financial provisions for the rehabilitation, closure and on-going post decommissioning management of negative environmental impacts	Section 6

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50 YEARS EST. 1966

SIBANYE GOLD LTD: EZULWINI MINING COMPANY (PTY) LTD

CESSATION OF PUMPING OPERATIONS AT EZULWINI AND CLOSURE OF UNDERGROUND MINE WORKINGS
PARTIAL CLOSURE PLAN REPORT NO: JW043/17/F925 - Rev 3

1. BACKGROUND AND SCOPE

1.1 Background

1.1.1 Mine Description and Location

Ezulwini Mining Company (Pty) Ltd (EMC), now a subsidiary of Sibanye Gold Limited, trading as Sibanye-Stillwater (Sibanye), owns and operated a gold and uranium mine located to the South East of Westonaria in the Gauteng Province. The EMC operation is an underground mine with separate tabular ore bodies, approximately 400 m apart. The Upper Elsburg ore body, where most of the mining has taken place to date, is a gold only deposit..

Mining activities commenced in the 1960's under the control of the Western Areas Gold Mining Company Limited (WAGMC), at the Ezulwini area, then referred to as North Shaft. The mine was subsequently acquired by Randfontein Estates Limited (REL). Harmony Gold Mine Limited (Harmony) acquired REL in January 2000. In April 2001 Harmony gave notification in terms of the sale agreement between REL and WAGMC for the cessation of mining and pumping activities. Normal operations were stopped in July 2001. The shaft was put on care and maintenance, allowing for pumping purposes only. Simmer and Jack (Pty) Ltd (Simmers) acquired the operation from Harmony in 2005. First Uranium Limited (FUL) acquired the operation in 2006, changing the company name to Ezulwini Mining Company (Pty) Ltd. In 2013, Sibanye Gold Limited then acquired the Cooke 4 Shaft, which is now known as the Sibanye Gold: EMC operations.

The Sibanye Gold: EMC operation is located approximately 8 km south-east from the town Westonaria, in the Gauteng Province. The operation falls within the jurisdiction of ward 6 of the Rand West City Local Municipality (RWCLM), within the West Rand District Municipality (WRDM).

The surrounding towns include:

- Krugersdorp: 30 km north;
- Randfontein: 20 km north;
- Roodepoort: 28 km north-east; and
- Vereeniging: 30 km south.

The N12 runs approximately 4 km north of the site passing through Johannesburg and Potchefstroom. The R28, a provincial route that connects Krugersdorp with Vereeniging via Randfontein, runs approximately 4 km west of the site. The regional R559 runs immediately south of the site.

Eskom has numerous power lines traversing the area, including the Westgate/Hera line. The main servitudes traversing the mine are the provincial and regional roads, various Eskom lines, Rand Water pipelines, a Sasol gas pipeline and Telkom networks.

The site is located in three quaternary catchments (C23D, C22H and C22J) in the Upper Vaal Water Management Area (WMA) 8, on a natural surface divide referred to as the Gatsrand. The WMA is located upstream of the confluence of the Vaal and Mooi rivers, and extends to the headwaters of the Vaal, Klip, Wilge and Liebenbergsvlei rivers. The northern part of the Ezulwini Operations, which lies in catchment C23D, drains into the 1.0 meter pipeline which discharges to the west of Carletonville into the Wonderfonteinspruit just upstream of the Abe Bailey nature reserve. The south-east and south-west regions of the site, which lie in catchments C22J and C22H, are drained by a tributary of the Leeuspruit and a tributary of the Rietspruit, respectively.

General drainage from the site flows in a south-eastern direction into the Kleinwes Rietspruit and Leeuspruit and ultimately into the Vaal River.

1.1.2 Project Overview

Initially water was pumped from the Ezulwini workings and recharged back into the dolomite aquifer that overlies the mine. In 1986 a permit was obtained to dewater the Gemsbokfontein West Dolomitic Compartment (Gemsbokfontein West sub-compartment). Water pumped from the mine was then discharged into the Leeuspruit and Kleinwes Rietspruit via the Peter Wright Dam, which flows to the Vaal River. It is estimated that the pre-mining dolomite water volume in the Gemsbokfontein West sub-compartment was 1.1M Megalitres (Mℓ). Based on the historical pumping records an estimated 0.30M Mℓ was effectively abstracted from the aquifer since 1986 (this volume is the difference between the actual pumping volumes and the estimated natural recharge volume). The aquifer is therefore only 29% dewatered and to achieve complete dewatering will take approximately 65 – 70 years at the current rate of approximately 68 Megalitres per day (Mℓ/day).

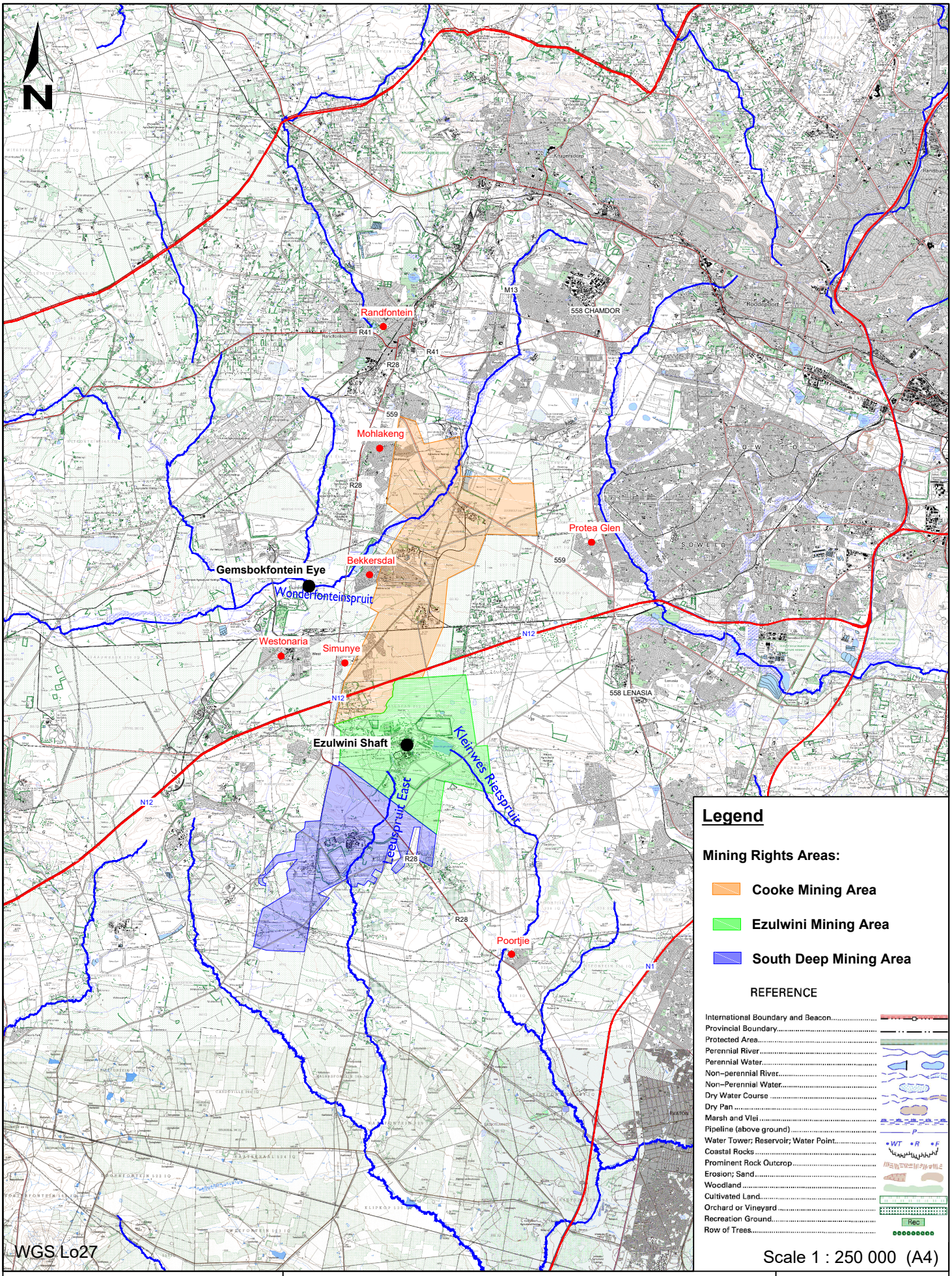
The current dewatering programme, or even an accelerated dewatering programme, is not economically nor environmentally beneficial. Continued pumping of this water from the workings has contributed to financial losses on the mine to the point where mining is no longer profitable.

EMC therefore intends to cease pumping and close the underground workings of Ezulwini. The result of the terminations of the underground workings and the cessation of pumping water from underground (approximately 68 Mℓ/day) is that the water levels in the mine workings and above-lying dolomitic compartment will recover over time. After approximately 7 years[1], it is expected that the Gemsbokfontein Eye, located to the north of Ezulwini on the banks of the Wonderfonteinspruit will receive aquifer flow water, which will discharge directly upstream from the 1.0 m diameter pipeline. The pipeline was originally constructed to reduce surface water flow across the dewatered dolomitic area, which exacerbated the formation of sinkholes. The Wonderfonteinspruit flows through this pipeline and discharges to the west of Carletonville, upstream of the Abe Bailey nature reserve. Water flowing from the Eye will enter the existing man-made sump before the pipeline and then enter the 1.0 m pipeline. When the man-made sump overflows during peak storm conditions, a portion of this water will report via the sinkholes in the riverbed to the underground mine workings of Kloof, from where it would be pumped to surface. Rainwater generated outside the catchment of the Donaldson Dam and the man-made sump will flow in the

[1] An assessment of the potential water inflow into neighbouring mines, concluded that South Deep may experience an increased flow through the boundary pillar to an estimated 7 Mℓ/day when full hydraulic head is reached. If this flow realises the re-watering time will increase to 13 years as opposed to the approximately 7 years if no seepage occurs.

Wonderfonteinspruit of which a portion will report via the sinkholes to the underground mine workings (**Figure 1-1**).

Jones & Wagener (Pty) Ltd Engineering & Environmental Consultants (J&W) have been appointed by Sibanye to undertake the required environmental authorisation and licensing processes for the cessation of pumping at the Sibanye Gold: EMC operations.



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SIBANYE GOLD: EZULWINI MINING COMPANY (PTY) LTD
Cessation of Pumping Operations at Ezulwini (Closure Plan)
Regional Locality Plan

Job No F925-160

Figure 1-1

1.1.3 Project Team

The contact details of the project team for this project are provided in **Table 1-1** below.

Table 1-1: Contact details.

Environmental consultant:	Jones & Wagener (Pty) Ltd Engineering & Environmental Consultants				
Contact person:	Marius van Zyl				
Postal address:	PO Box 1434, Rivonia, 2128				
E-mail:	vanzyl@jaws.co.za	**Tel:**	+27115190200	**Fax:**	+27115190201

Table 1-2 below summarises the expertise of the main project team members associated with this project.

Table 1-2: Project team members.

Name	Organisation	Highest Qualifications	Experience	Professional Registrations
Marius van Zyl	Jones & Wagener (Pty) Ltd	BSc (Hons)	33 years	SACNASP
Gina Martin	Jones & Wagener (Pty) Ltd	BSc (Hons)	4 years	-

1.2 Scope and Purpose

1.2.1 Legislative Requirements

The Constitution of the Republic of South Africa, 1996 provides the legal basis for the development of environmental law in South Africa. Section 24 of the Bill of Rights provides that "*everyone has the right to an environment that is not harmful to their health or well being; and to have the environment protected for the benefit of present and future generations, **through reasonable legislative** and other measures that-*

(i) prevent pollution and ecological degradation;

(ii) promote conservation; and

(iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

The Constitution therefore places a mandate on the government to give effect to people's environmental rights and places the government under a legal duty to act as a responsible custodian of the nation's environment. Section 24 of the Bill of Rights also compels the government to promulgate legislation to protect the environment, to prevent pollution and ecological degradation, promote conservation and secure sustainable development. The government has endeavoured to fulfil this mandate by promulgating environmental legislation such as the National Environmental Management Act 107 of 1998 ("the NEMA") and other specific environmental management acts ("SEMAs").

It must be noted that the previous environmental provisions contained in the Mineral and Petroleum Resources Development Act 28 of 2002 ("the MPRDA") regarding environmental

management (formerly dealt with in sections 38 – 42 of the MPRDA) have been repealed and are now dealt with in Chapter 5 of NEMA, as well as, in the 2014 EIA Regulations published under GN R982 on 4 December 2014 (as amended). Furthermore, the environmental authorisation provisions of NEMA and the 2014 EIA Regulations have become expressly applicable within the context of mining operations, and in particular to mine closure.

In the context of the planned closure of the underground workings of Ezulwini, the key provisions on environmental remediation and management are provided for in section 43 of the MPRDA, read together with section 24 of NEMA. These environmental legal provisions contained in the NEMA and the MPRDA are relevant when dealing with mine closure and must be complied with. Set out below is a brief summary of these key environmental legal provisions in the NEMA and the MPRDA.

1.2.1.1 Environmental Legal Closure Provisions in the NEMA:

Section 24R of the NEMA deals with mine closure and includes references to section 24P of the NEMA, which covers the financial provision required for mine closure.

In terms of section 24R (1) of the NEMA, the holder of a mining right[2] remains responsible for any environmental liability, pollution or ecological degradation, the pumping and treatment of polluted or extraneous water, the management and **sustainable closure** thereof, **notwithstanding**, **the issuing of a closure certificate by the Minister of Mineral Resources in terms of section 43 of the MPRDA**. In this regard, section 24R (3) of the NEMA requires the holder of a mining right to plan, manage and implement such procedures and requirements in respect of the closure of a mine (or a portion thereof) as may be prescribed.

In light of the above, the decommissioning of the underground workings requires a closure certificate in terms of section 43 of the MPRDA, and triggers listed activity 22 of Listing Notice 1 (published in GN R983 on 4 December 2014, as amended) of the 2014 EIA Regulations. The 2014 Environmental Impact Assessment Regulations specifically require in terms of regulation 19 (5), that a closure plan is required where the application for an environmental authorisation relates to the decommissioning or closure of a facility. Regulation 19 (6) stipulates that a closure plan must contain the information set out in Appendix 5 to these Regulations. The content of a closure plan may be combined with the content of an Environmental Management Programme ("EMPr") on condition that the requirements of both Appendices 5 and 4 of the 2014 EIA Regulations, respectively, are complied with.

With reference to the above, a Basic Assessment process is being undertaken in terms of the NEMA and the 2014 EIA Regulations. This is in order to determine any possible impacts on the environment and to propose sufficient mitigation measures in order to minimise harm to the environment. The prescribed public participation process in Chapter 6 of the 2014 EIA Regulations (GN R982, as amended) is being followed to ensure that stakeholders are adequately consulted and their views are taken into account in this process.

The Basic Assessment process undertaken for this project includes a Basic Assessment Report (BAR) and an EMPr in terms of section 24N of NEMA. Please note that there is an already existing EMPR in terms of the MPRDA for the Sibanye Gold: EMC operations. Therefore, the EMPr prepared in terms of section 24N of the NEMA, will serve as an addendum to the existing EMPR, by making provision for the cessation of the pumping and resultant re-watering and closure of the underground workings. This partial Closure Plan

[2] Sibanye's existing mining right number for the Sibanye Gold: EMC operations is **GP 30/5/1/2/2(38) MR**. This is the mining right to which this application regarding the cessation of pumping and termination of underground workings applies.

has been drafted in terms of Appendix 5 of the 2014 EIA Regulations (GN R982 of 4 December 2014, as amended).

1.2.1.2 Closure Provisions in the MPRDA:

In terms of section 43 (1) of the MPRDA, the holder of a mining right remains responsible for any environmental liability, pollution, ecological degradation, the pumping and treatment of extraneous water, compliance with the conditions of the environmental authorisation and the management and sustainable closure thereof, **until the Minister has issued a closure certificate in terms of the MPRDA to the holder or owner concerned**. Since section 24R of the NEMA deals with the provisions after a closure certificate has already been issued by the Minister of Mineral Resources, as set out above, section 43 (1) of the MPRDA deals with the provisions until the closure certificate is issued by the Minister of Mineral Resources.

In this regard, it is noted that EMC is in the process of submitting an application for partial mine closure in terms of section 43(3)(d) of the MPRDA. Section 43 (4) of the MPRDA provides that an application for a closure certificate must be made to the Regional Manager, in whose region the land in question is situated, within 180 days of the completion of the prescribed closure plan and must be accompanied by the required information, programmes, plans and reports prescribed in terms of the NEMA, as highlighted above.

It is further noted that a closure certificate may not be issued unless the Chief Inspector, which is defined in section 1 of the MPRDA, **as the Chief Inspector of Mines appointed in terms of section 48 (1) of the Mine Health and Safety Act 29 of 1996**, and each government department, charged with the administration of any law which relates to any matter affecting the environment, have in writing confirmed that the provisions pertaining to the management of pollution to water resources, the pumping and treatment of extraneous water and compliance with the conditions of the environmental authorisation have been addressed. Section 43 (5) of the MPRDA is the principal mechanism for covering mine health and safety issues in the closure process.

Section 43 (6) of the MPRDA further provides that when the Minister of Mineral Resources issues a closure certificate, he or she must return such portion of the financial provision as the Minister may deem appropriate to EMC, the holder of the mining right, but may retain any portion of such financial provision for latent and residual safety, health or environmental impacts which may become known in the future.

1.2.1.3 The National Water Act 36 of 1998 ("the NWA")

The NWA aims to regulate the use of water and activities which may impact on water resources through the categorisation of 'listed water uses' encompassing *inter alia* water extraction, flow attenuation within catchments, as well as, the potential contamination of water resources. Should activities trigger a water use listed in section 21 of the NWA, a Water Use Licence (WUL) is required.

Section 21 of the NWA provides a list of water uses that have the potential to have a significant impact on a water resource and requires a WUL. The water uses listed in section 21 of the NWA include the following:

21 (a) taking water from a water resource;

(b) storing water;

(c) impeding or diverting the flow of water in a watercourse;

(d) engaging in a stream flow reduction activity contemplated in section 36;

(e) engaging in a controlled activity identified as such in Section 37(1) or declared under Section 38(1);

(f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;

(g) disposing of waste in a manner which may detrimentally impact on a water resource;

(h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;

(i) altering the bed, banks, course or characteristics of a watercourse;

(j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and

(k) using water for recreational purposes.

In terms of Section 22(1) a person may only undertake the abovementioned water uses if it is appropriately authorised:

22 (1) A person may only use water

(a) without a licence

(i) if that water use is permissible under Schedule 1;

(ii) if that water use is permissible as a continuation of an existing lawful use; or

(iii) if that water use is permissible in terms of a general authorisation issued under Section 39;

(b) if the water use is authorised by a licence under this Act; or

(c) if the responsible authority has dispensed with a licence requirement under subsection (3).

It is noted that no additional water uses are required for the cessation of pumping at the Sibanye Gold: EMC operations in terms of section 21 of the NWA, however some water uses need to be removed from the WUL (Licence Number 08/C23D/ABEFGJ/2836), as they are no longer required. This requires an amendment of the existing WUL to exclude these additional uses. This is being undertaken as a Water Use Licence Amendment Application (WULAA) . This partial Closure Plan will be a supporting document to the WULAA, which will be assessed by the Department of Water and Sanitation ("the DWS").

1.2.1.4 Other potential statutory obligations applicable to Mine Closure

In addition to the above environmental legal obligations provided for in the NEMA and the MPRDA relating to the planned closure of the underground workings of Ezulwini, there may be other potential statutory obligations which may be relevant and include *inter alia*:

- The Mine Health and Safety Act 29 of 1996;
- The Regulations on use of water for mining and related activities aimed at the protection of water resources published in terms of GN R704 on 4 June 1999 under the NWA;
- The National Heritage Resources Act 25 of 1999;
- The National Building Regulations and Building Standards Act 103 of 1977;
- The National Nuclear Regulator Act 47 of 1999; and
- The Labour Relations Act 66 of 1995.

1.2.2 Other Legal Obligations

Legal obligations relating to the closure of the entire mining operation are contained in the existing 2015 EMPR for Sibanye Gold: EMC operations. This partial Closure Plan, only

pertains to the cessation of pumping and termination of underground workings at Sibanye Gold: EMC operations. Accordingly, the list of applicable legislation highlighted above only relates to the environmental application and associated processes required and is by no means an exhaustive list of all the legislative aspects associated with this project.

Additional regulatory requirements regarding dolomitic stability and plug construction are detailed in the specialist reports (Appendix C.1 and C.2 of the BAR).

1.2.2.1 Contractual Agreements

- There is an agreement between Sibanye Gold Limited and South Deep Joint Venture (South Deep) for the neighbouring South Deep mine, and is referred to as the *Discharge and Uptake of Underground Water Agreement*. Through this agreement, South Deep may abstract up to 10 000 m^3 per day of water from Sibanye Gold: EMC operations, which is pumped underground water and is discharged to the Leeuspruit River, in terms of the South Deep WUL. EMC is required to dispense 10 000 m^3 of underground water per day to the Leeuspruit River indefinitely, until such a date that they notify South Deep in writing of their intention to cease pumping, subject to a notice period of 10 (ten) business days or, at the election of South Deep, subject to a notice period of 24 (twenty-four) hours. Discharge to South Deep was terminated in 2013, with the exception of occasional discharges, when requested by South Deep.

1.2.2.2 General Authorisations

- A General Authorisation for the water use listed in section 21(e) of the NWA exists for Afrigrow Development NPC for Portion 7 of Farm Kalbaasfontien 365 IQ to irrigate land with 730 000 m^3 per annum with the extraneous underground mine water from Ezulwini gold mine for crop production. This General Authorisation is valid until 01 January 2021 unless the validity period applicable to the General Authorisation is amended by notice in the Government Gazette; is replaced with a General Authorisation in relation to a specific water resource or within a specific area; or the water user is required to apply for a licence in terms of Section 40 of the NWA. Termination of pumping will result in no extraneous water being available for crop production. **Note: There is no binding agreement that EMC operations have to make water available for this agricultural undertaking.**
- A General Authorisation for the water use listed in section 21(e) of the NWA exists for Servigraph 42 cc for Portion 23 of Farm Waterpan 292 IQ to irrigate land with 730 000 m^3 per annum with the extraneous underground mine water from Ezulwini gold mine for crop production. This General Authorisation is valid until 01 January 2021 unless the validity period of the applicable General Authorisation is amended by notice in the Government Gazette; is replaced with a General Authorisation in relation to a specific water resource or within a specific area; or the water user is required to apply for a licence in terms of Section 40 of the NWA. Termination of pumping will result in no extraneous water being available for crop production. **Note: There is no binding agreement that EMC operations have to make water available for this agricultural undertaking.**

1.2.2.3 Certificate of Registration in terms of the NNR

EMC has been granted a certificate of registration from the NNR for the Sibanye Gold: EMC operations, in terms of Section 22 of the NNR Act (**Appendix 1**). The authorisations contained herein must be adhered to by EMC for all activities carried out at the EMC site.

1.2.2.4 Community Commitments

Sibanye has implemented a number of social development programmes mainly in the RWCLM, as well as in the labour sending region of the Eastern Cape as per their Social and Labour Plan (SLP) for 2012 – 2016 (Appendix H.1 of the BAR). Social projects could

result in communities becoming dependent on grants with negative consequences for the local community when a proper exit strategy is not in place from the benefactor's side. The different programmes, their progress and exit strategies are listed in **Table 1-3**.

Table 1-3: Social programmes of Sibanye Gold: EMC operations and exit strategies.

Programme	Area	Value	Target group	Period	Progress and exit strategy
JS Skenjana Senior Secondary School	Mbhashe LM (Eastern Cape)	R 1 million	1 612 learners	2014 - 2016	All Sibanye operations contribute towards the funding. The funding is proportional to the number of employees from labour sending areas of a particular operation and its financial performance. Sibanye Gold: EMC operations' contribution was directed towards the planning phases and this will be completed at the end of the 2016 financial year. The memorandum of agreement has not been signed as it was delayed by a land claim. With the land claim issue resolved the memorandum of agreement will proceed with Sibanye Gold: EMC operations' historic proportional contribution still committed for the project. Sibanye Gold: EMC operations partial closure will therefore, not impact the project since the funding structure includes all Sibanye's operations.
Livestock Development and Improvement Project	Chris Hani and Alfred Nzo LM (Eastern Cape)	R 100 000	80 villages and 1000 farmers	2012 - 2016	Sibanye Gold: EMC operations partial closure will not impact the project since the funding structure includes all Sibanye's operations.
Aredirisaneng Agriculture Project	RWCLM	R 4.2 million	Up to 10 farmers	2012 - 2016	The project is funded up until December 2016. Thereafter it will benefit from the market spin-offs that will accrue from the farmer Outgrower scheme that is currently being implemented as part of the Gold Alliance Agriculture Project (Gold Fields and Sibanye joint agriculture project currently being piloted in the West Wits region). The project will be incorporated in both companies' new SLPs that will commence in 2017. Sibanye Gold: EMC operations partial closure will not impact the project significantly since the funding structure includes all Sibanye's operations in the West Wits region.
Goldwest Township Establishment (Toekomsrus Extension 4 - Landfill Site)	RWCLM	R 1 million	Rand West City LM community members	2013 - 2016	While approval had been received from the then Randfontein LM to formalise the township, the memorandum of agreement formalising the partnership between Rand West City LM and Sibanye is still pending. The Sibanye team is also searching for partners who would be willing to provide funding. The project shares the same municipal area as Cooke 1, 2 and 3 as well as Kloof. As

Programme	Area	Value	Target group	Period	Progress and exit strategy
					a result, the same community that would have benefited from this project forms part of the communities of the other two mines and could be included in the other SLPs of Sibanye for 2017.
Alien Invader Beneficiation and Nursery Project	RWCLM	R 1 million	Rand West City LM community members	2012 - 2016	The project is sustainable and beneficiaries are currently establishing woodlots that will be used as input to the project. The project will have an off-take from a charcoal plant which is in the process of being established. The charcoal plant is funded by all the Cooke operations in the West Wits region and therefore the project will not be affected by the partial closure of the Sibanye Gold: EMC operations mine.

South Deep Gold Mine is also collaborating with Sibanye's Kloof operation to construct a campus of Westcol, a Technical, Vocational Education and Training (TVET) College in Westonaria. Other partners include the Gauteng Department of Education and Rand West City Local Municipality.

The Gold Alliance Agricultural Project (GAAP) is a programme resulting from an alliance between Sibanye Gold and Gold Fields to implement community based development programmes in Westonaria. The project has 53 beneficiaries who are currently seasonal workers who receive a monthly stipend of R 2 200 per month, i.e. receiving in total an annual income of R 2 640 000. As is the case with the Aredirisaneng project, the objective of the GAAP project is to develop half of the beneficiaries under an Outgrowers Scheme. This programme should continue despite closure of the underground workings and the cessation of pumping at EMC.

Table 1-3 above clearly shows that all Sibanye's operations contribute towards the funding of the different projects with Sibanye Gold: EMC operations' contributions concluded by the end of 2016. The proposed partial closure of Sibanye Gold: EMC operations' underground workings will therefore have no impact on the continuation of the social programmes that formed part of its SLP. However, the funding of these social programmes will be lower in future due to Sibanye Gold: EMC operations' proportional contribution (around R 7 million per annum) falling away.

1.2.3 Sibanye Gold Policies and Guidelines

Sibanye undertakes its activities in a manner that strives to minimise or rectify adverse impacts and maximise positive impacts of an environmental or socio-economic nature. The company is committed to responsible stewardship of natural resources and the ecological environment for present and future generations. Sibanye is committed to:

- The assessment and meeting of the requirements of industry standards with respect to the environmental management practices;
- The implementation, maintenance and integration of internationally recognised environmental management systems that ensure continual improvement of environmental performance and the prevention of pollution through recognised practices;
- Complying with applicable legal requirements and with other requirements to which the organisation subscribes, that relate to its environmental aspects;
- Efficient use of resources and responsible management of all waste streams;

- Contributing to the conservation of biodiversity and applying integrated approaches towards closure and post mining land use planning; and
- Establishing an appropriate level of awareness and training of employees with environmental responsibilities, as required.

Employees of Sibanye play a fundamental role in achieving these objectives by:

- Taking ownership of responsible environmental management programmes and initiatives;
- Reacting and adhering to the company's environmental policy and principles; and
- Integrating environmental concerns into everyday practice.

Sibanye is committed to managing its environmental aspects, impacts and risks, as well as communicating strategies and guides for staff involvement in this management. Sibanye has developed a number of policies in this regard, which are displayed in the mine offices. Please refer to **Appendix 2** for a copy of these policy statements.

1.2.4 Context of this Report

This document serves as the Closure Plan for partial closure of the EMC operations, i.e., the closure (decommissioning) of the underground operations[3], to be lodged with the DMR in terms of the NEMA and the 2014 EIA Regulations (GN R982, as amended) and associated Listing Notices 1 (GN R983) 2 (GN R984) and 3 (GN R985), as amended. This Partial Closure Plan will accompany the BAR and EMPr for the cessation of pumping and resultant termination of underground operations at Sibanye Gold: EMC operations. Please note that this partial Closure Plan only covers the closure activities associated with the underground workings at Sibanye Gold: EMC operations, as the surface operations are proposed to continue. A full Closure Plan for mine closure must be submitted to the DMR before the entire operations undergo closure, which must include the closure plans for surface infrastructure demolishing, decommissioning or re-use and the rehabilitation of the land.

As this project consists of an integrated process, an WULAA for the changes to the existing WUL associated with the cessation of pumping, is being undertaken in terms of the NWA and will be assessed by the DWS.

2. PUBLIC PARTICIPATION

Please refer to Section 3(h) of the BAR for a description of the public participation process followed, comments from stakeholders as well as public participation related documents, correspondence and minutes (Appendix F of the BAR).

3. BASIS OF PARTIAL CLOSURE PLAN

3.1 Partial Closure Vision

The partial closure vision for the cessation of pumping and termination of underground workings at Sibanye Gold: EMC operations is to return groundwater levels to near pre-mining levels, flow volumes of the Kleinwes Rietspruit and Leeuspruit to near pre-mining flow levels and to recharge the Wonderfonteinspruit with dolomitic water from the

[3] In terms of GNR 983 (as amended) decommissioning means to take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned.

Gemsbokfontein Eye. In addition, it is the partial closure vision of this project to develop a safe post partial closure environment, which is not harmful to surrounding communities.

3.2 Partial Closure Objectives

The closure objectives for the cessation of pumping at the Sibanye Gold: EMC operations are listed below:

- To cease pumping as soon as possible and terminate underground workings efficiently and cost effectively;
- To allow the mine and overlaying dolomitic aquifer to recharge to natural, pre-mining groundwater levels;
- To return the surface water flow of the Wonderfonteinspruit and Kleinwes Rietspruit and Leeuspruit to close to pre-mining volumes;
- To provide continuous engagement and communication with stakeholders;
- To prevent and mitigate against the disturbance of stakeholders;
- To ensure the safety and health of surrounding communities and adjacent mines;
- Ensure that the mitigatory measures are implemented to avoid and/or minimise the identified negative environmental impacts and to enhance the positive impact of the project on the environment; and
- Ensure that a monitoring program is in place that tracks the effectiveness of the implemented mitigatory measures.

Please refer to the existing EMPR (Shangoni, 2015) for all closure objectives associated with the EMC activities, which will need to be adhered to when the entire Sibanye Gold: EMC operations are closed (following the approval of an application for such).

3.3 Post Partial Closure Land Use

The land use will remain the same post cessation of pumping, as only the underground workings of Sibanye Gold: EMC operations will be closed. The surface operations will continue. More specifically, EMC has decided to leave the shaft related surface infrastructure in place as it may be re-purposed and used in future Sibanye or municipal led community projects as this may have a positive impact on the surrounding community (**Figure 3-1** and **Figure 3-2**). The details of these proposed projects will be further evaluated and explained in the next EMC Social and Labour Plan update. Until further details are known on the proposed plans for the surface infrastructure at the Sibanye Gold: EMC operations, EMC must undertake to secure the site and clean-up / decontaminate any polluted areas.

The Gold Plant at the Sibanye Gold: EMC operations will continue to operate, while the Uranium Plant will be placed under care and maintenance.

Legend

- Ezulwini Shaft

Cessation of pumping activities triggered at shaft:

- GN 983, Activity 22
- GN983, Activity 34

N

Ezulwini TSF

Gold & Uranium Plant

Ezulwini Shaft

Peter Wright Dam

Shaft Areas

Rand Uranium TSF

Kleinwes Rietspruit

Leeuspruit

ELANDSFONTEIN 115

WATERPAN 292

11/292
14/292
27/292
4/292
24/292
26/292
2/292
5/292
25/292
3/292
49/292
22/292
29/292
13/292
28/292
292
23/292
6/292
24/345
4/345
43/344
41/344

Cape LO27

Scale 1 : 16 000 (A3)

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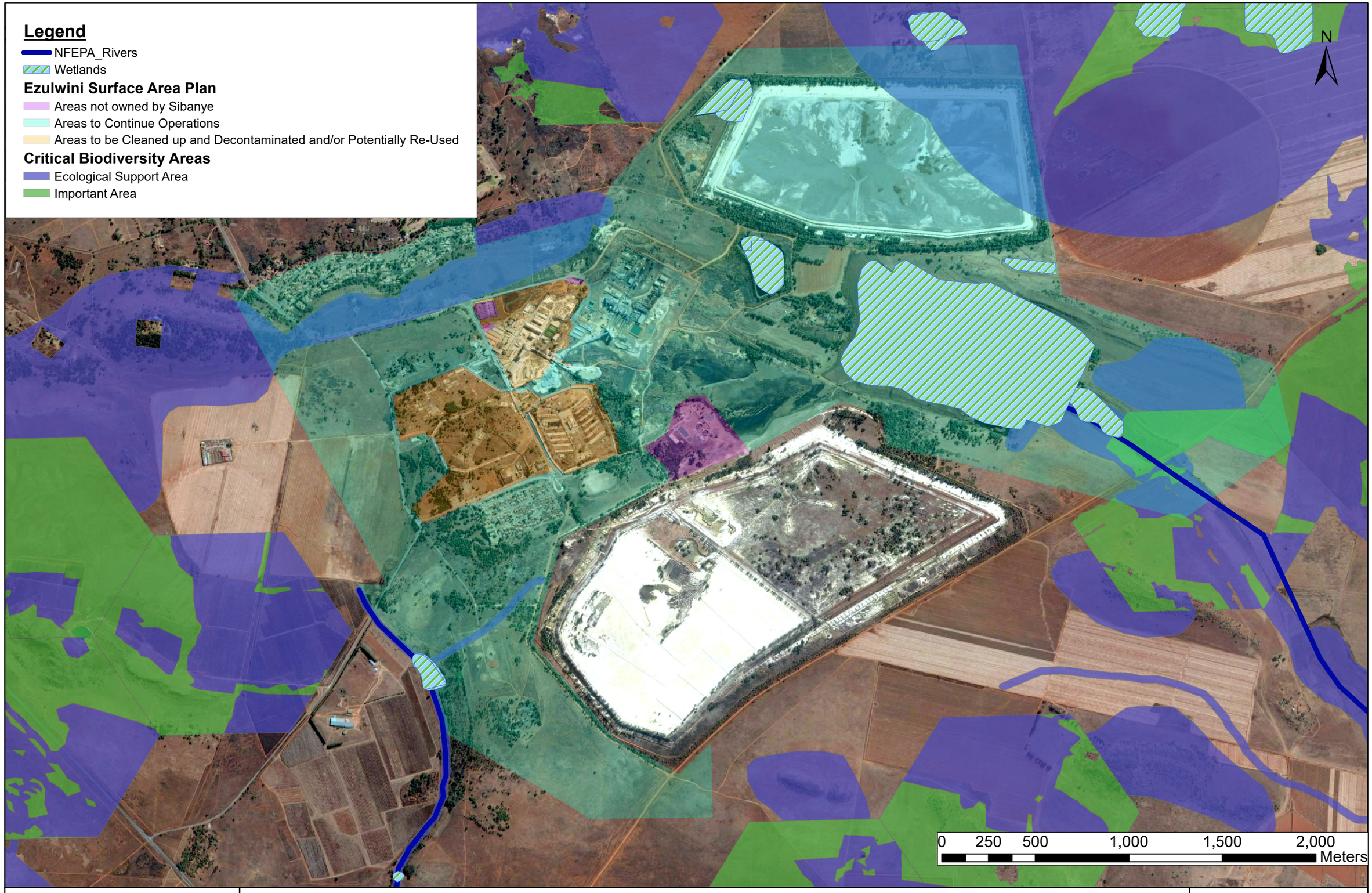
SIBANYE GOLD: EZULWINI MINING COMPANY (PTY) LTD
Cessation of Pumping Operations at Ezulwini (Closure Plan)
Ezulwini Operations Site Plan

Job No F925

Figure 3-1



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SIBANYE GOLD: EZULWINI MINING COMPANY (PTY) LTD
Cessation of Pumping Operations at Ezulwini (Closure Plan)
Ezulwini Final Site Map and Sensitivities

Job No: F925-160

Figure 3-2

3.4 Health and Safety Hazards

The highest socio-economic risks for the proposed closure of the underground workings of the Sibanye Gold: EMC operations is related to potential loss of life and the closure of South Deep due to seismic instability and the flooding of South Deep. The highly negative consequences, in the unlikely event of the above occurring, underscore the need to mitigate these potential impacts effectively.

Although the monitoring measures proposed for this project will identify changes in dolomitic stability and surface subsidence, the mitigation of these risks will be detailed in the Emergency Response Plans of Sibanye Gold: EMC operations and the adjacent mines (Cooke 3 and South Deep). It is imperative that these Emergency Response Plans are maintained to include safety measures relating to the re-watering of Sibanye Gold: EMC operations. The South Deep and Sibanye Gold: EMC operations risk assessment relating to the manner in which to handle the health and safety hazards of these partial closure actions is detailed in their updated Emergency Response Plan, are included in Appendix H.4 and H.5 of the BAR.

3.5 Gaps and Assumptions

Gaps and assumptions exist for the specialist studies, from which the recommendations and monitoring programmes were sourced for this Closure Plan. These gaps and assumptions for the respective studies are listed below.

3.5.1 Geohydrology

- The following assumptions and limitations, related to the available field data, apply to the geohydrology component:
  - The top of the aquifer is represented by the generated groundwater heads;
  - The available geological / geohydrological information is used to describe the different aquifers. The available information on the geology and field tests is considered as correct; and
  - Many aquifer parameters have not been determined in the field and therefore had to be estimated.
- In order to develop a model of an aquifer system, certain assumptions had to be made. The following assumptions were made:
  - The groundwater system is initially in equilibrium and therefore in steady state, even though natural conditions have been disturbed;
  - No abstraction boreholes were included in the initial model;
  - The boundary conditions assigned to the model are considered correct; and
  - The impacts of other activities (e.g. agriculture) have not been taken into account.

3.5.2 Surface Water

- The following assumptions and limitations, related to the Peter Wright dam water balance, apply to the surface water assessment:
  - It was assumed, based on historical pumping data, that the volume of water from Ezulwini reporting to Peter Wright dam was 61 376m^3/day. This will reduce to 0 m^3/day when pumping from the underground stops;
  - It was assumed that the volume of water from the Waste Water Treatment Works (WWTW) reporting to Peter Wright Dam equates to 960 m^3/day based on monitoring information received from EMC. It was assumed that this volume will

continue to report to Peter Wright Dam from the WWTW after pumping from Ezulwini ceases;

- It was assumed the dam was 100% full.

3.5.3 Socio-economic

- The following assumptions and limitations apply to the socio-economic impact assessment:
  - The social and economic impacts in this report were based on the alternative closure scenario where pumping activities are terminated and the shaft is allowed to return to the pre-mining water levels;
  - The potential external costs associated with the project was based on information supplied by sub-specialists for the Environmental Impact Assessment of the project, as well as information supplied by EMC;
  - The economic impact model was based on information supplied by EMC; and
  - Economic multipliers, average salaries and wages and value added as a percentage of total income were based on provincial and national averages.

The following additional assumptions, uncertainties and gaps apply:

- J&W assumes that the information provided to them by EMC is correct.
- The specialist findings and impact assessments on which this report is based, is work done by independent professionals (in some cases peer reviewed as well) and as such, the EAP has assumed this information to be correct.

4. EZULWINI PARTIAL CLOSURE PLAN

4.1 Partial Closure Methodology

Associated with the proposed cessation of pumping activities, the following activities will take place:

- All salvageable underground infrastructure and that which may cause significant pollution, such as hydrocarbons, will be removed and recycled or disposed of. The infrastructure to be removed from underground prior to the cessation of pumping includes:
  - Chemical toilets;
  - Explosives;
  - Fluorescent tubing;
  - Transformers and electrical stations;
  - Transformer oil;
  - Waste drums from workshops (decontaminate workshops);
  - Driving gear; and
  - Locomotives.
- Some infrastructure, however, is to remain underground throughout the re-watering process. This includes:

- Cage/elevator (shaft access may still be required for inspections);
- Electrical wiring;
- Supports (including timber support) and steelwork;
- Pan/hoppers (optional - if these are salvaged, they can be resold);
- Winder room rope;
- Settlers;
- Rails;
- Sub-shaft winder equipment; and
- Conveyors.

- Before the pumping cessation occurs, three additional plugs are to be constructed in the underground mine workings between Cooke 3 and the EMC operations, to ensure water and contamination leakage does not occur with adjacent mines;
  - The existing plugs and water barrier pillar between the EMC underground mining area and South Deep Joint Venture's (South Deep's) neighbouring South Deep mine have been reviewed, as well as the water barrier pillar between the EMC mining area and the Cooke 3 mining area (please refer to Appendix C.1 of the BAR for a review of the existing plugs' design reports and rock engineering aspects) in order to verify that the existing plugs comply with their 100-year design life.
  - Three plugs will be built between the EMC underground mining area and the neighbouring Cooke 3 mine (43, 45 and 140 level).
  - Below, a simplified methodology of the underground plug construction has been given. Please refer to Appendix C.1 of the BAR for the full methodology and accompanying drawings.
    - Underground site clearance will occur with the dismantling and demolition of non-essential items and dismantling and removal of pipelines, electricity transmission lines and cables.
    - Barring (the removal of loose rock from the walls and rock face of underground mines) will be undertaken on the rock and the rock will be cleaned to provide a rough surface for plug location and segment bonding.
    - A water control wall will be constructed to prevent mine water flowing via the work site.
    - Aggregate voids to be tightly packed and then voids to be filled.
    - Water tightness to be ensured where pipes penetrate mine water control walls with pressure testing. Appropriate sealant to be installed on interface.
    - Plug to be constructed in horizontal layers, in five segments. Additional segments to be offset of preceding segment, preventing preferential seepage path.
    - Timber shuttering holes required for mortar intrusion and TAM grout pipes, drainage pipe, tie bars/couplings, thermocouples and piezometer casings. Timber joints and pipe surrounds hand plastered with cement paste preventing mortar leakage.
    - All intrusion and grout pipes to be filled and sealed before abandonment.
- The last infrastructure to be removed from underground includes:

- Pumps; and
- Substations on pumping levels.

- The pumping of water from the underground workings will cease and the dolomitic aquifer will be allowed to recharge. The result of the cessation of pumping water from underground (approximately 68 Mℓ/day) is that the water levels in the mine workings and overlaying dolomitic compartment will recover over time (re-water). After approximately 7 years, it is expected that the Gemsbokfontein Eye, located to the north of Ezulwini on the banks of the Wonderfonteinspruit, will receive water again from the recharged dolomitic aquifer, which will discharge at this point into the 1.0 m pipeline which discharges to the west of Carletonville into the Wonderfonteinspruit just upstream of the Abe Bailey nature reserve.
- A engineering closure plan and programme must be developed to cater for emergencies and to allow for montoring and management of the re-watering process.
- Monitoring of the water levels, water quality and dolomitic stability will continue after the dolomitic aquifer has recharged, for a period of 3 years after the Gemsbokfontein begins to flow (six new boreholes have been drilled to improve the current monitoring systems and to aid in determining the extent of the dewatering cone as well as the groundwater in the dolomite aquifer).
- Surface monitoring to detect settlement of ground will continue as before, including some expansion.

It is important to note that this Closure Plan is only with regards to the cessation of pumping and termination of the underground workings. The surface infrastructure will remain in place until further notice and the Gold Plant will continue to operate. No surface infrastructure demolition and rehabilitation is proposed for this authorisation process.

4.2 Partial Closure Schedule

Table 4-1: Ezulwini underground workings partial closure schedule.

Planned Activity	Planned Timeframe
Remove infrastructure and materials from underground	February 2017 – March 2018
Conduct pre-pumping cessation monitoring programmes related to seismic activity, groundwater levels and quality, ground movement.	February 2017 – April 2018
Construct plugs between EMC and Cooke 3	Completed by end April 2018
Install monitoring systems (CCTV) on all plugs	August 2017-April 2018
Remove pumps and sub-stations from underground	March-April 2018
Cessation of pumping (re-watering begins)	1 May 2018
Conduct post pumping cessation monitoring programmes	May 2018 until specified in the monitoring programmes

4.3 Rehabilitation and Remediation

Below follows the rehabilitation and remediation activities as determined by the specifically undertaken specialist studies.

4.3.1 Geohydrology

The geohydrological assessment of potential impacts due to the cessation of pumping from Sibanye Gold: EMC operations recommends the following:

- To our knowledge, the re-watering of a dolomitic groundwater compartment has not happened anywhere in South Africa before and due to the many uncertainties, it is recommended that a dynamic groundwater monitoring programme is implemented.
- The aim of the monitoring is to verify the model predictions and to make adjustments were necessary. The monitoring network will provide an early warning system that will alert the mine to the following:
  - Unexpected changes in the groundwater levels, specifically in areas with a risk of sinkhole formation;
  - Unexpected changes in groundwater quality; and
  - Changes in the level of the ground surface.
- The groundwater levels in the revised borehole network should be monitored as follows:
  - Monthly during the lead-up to the cessation of pumping;
  - Twice a month during the re-watering process; and
  - Monthly after the Gemsbokfontein Eye starts flowing for a period of three years.
- It is also important that the flow meter in the pipe will be repaired and a surface water flow measuring system is in place prior to the eye starting to flow. Flow from the Gemsbokfontein Eye is likely to be diffuse and measuring the difference between water exiting the 0.75 m pipeline from Donaldson Dam and entering the 1 m pipeline, may be a way of accounting for the flow volume at the eye.
- Groundwater quality in the revised monitoring network (only new boreholes BH1-6) should be monitored as follows:
  - Twice a year during the lead-up to the cessation of pumping;
  - Twice a year during the re-watering of the mine;
  - Quarterly during the recovery of the dolomite aquifer and for the first three years after the eye starts flowing.

4.3.2 Dolomitic Stability

Due to the perception of potential renewed sinkhole activity in the Gemsbokfontein West Sub-compartment as a result of the onset of re-watering, a dolomite stability assessment was undertaken, the recommendations of the assessment are as follows:

- As it is possible that new sinkholes/subsidence could develop during re-watering of the Gemsbokfontein West sub-compartment, such events may create a variety of safety and financial impacts for EMC and various affected parties.
- Historically the mines involved in the dewatering of this, and neighbouring compartments, recorded, investigated and compensated affected parties where necessary for any adverse impacts. Such activities were managed by the FWRDWA.
- A strategy, related now to re-watering, to mitigate any potential effects to affected parties, known as a Dolomite Risk Management Strategy is required, and detailed in Appendix C.2 of the BAR. This strategy mirrors the process undertaken by the mines during dewatering. This must be implemented until the re-watering cycle is complete.

4.3.3 Surface Water

Based on the assessment of the impacts on surface water from the cessation of pumping from Sibanye Gold: EMC operations the following recommendations can be made:

- After pumping at Ezulwini ceases the mine should continue to monitor the water quality at the existing monitoring points along the Leeuspruit and Kleinwes Rietspruit to assess the impact of the remaining mine related infrastructure on the surface water regimes associated with the mine. The current water quality monitoring programme has been evaluated and it is recommended that this be continued after pumping stops. This is currently being conducted on a monthly basis and it is recommended that a full chemical suite of variables be analysed at the current frequency. This monitoring should continue for a period of three years after the cessation of pumping, subject to reassessment at the time.
- The abstraction of water from the Peter Wright Dam will need to continue, such that the dam does not overtop more than once in 50 years, until such time as the wetland upstream of the dam is rehabilitated and it can be shown that the water quality in the dam is in line with the in-stream water quality objectives. If water is abstracted from the dam at a rate of 2 000 m^3/day then the dam would not be expected to spill more than once in fifty years and therefore would comply with the regulations, as stipulated in GNR 704. The effluent from the external sewage treatment plant could be diverted around the Peter Wright Dam and subsequently be made to report directly into the Kleinwes Rietspruit, then the required abstraction rate could be reduced to 1 000 m^3/day. This is provided the sewage plant effluent is of an adequate quality, in line with in-stream water quality objectives.
- At the Gemsbokfontein Eye it is recommended that the location of the flow point be monitored and the water quality of the flow water be sampled, together with groundwater monitoring. These water qualities should be assessed to ensure compliance with the Resource Water Quality Objectives for the catchment and to assess the impact of the flow water on the surface water qualities in the Wonderfonteinspruit catchment. This monitoring should continue for three years after the Eye begins to flow, subject to reassessment at the time. In addition, the flow in the 1 m pipeline should be continuously monitored in relation to its capacity within the context of the associated catchment in which it falls.

4.3.4 Wetlands and Ecology

The following recommendations have been made based on the assessment of the impacts on wetlands and ecology, from the cessation of pumping from Sibanye Gold: EMC operations:

- It is recommended that the Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) and ecosystem services of the systems continue to be monitored annually for a period of 3 years at select sampling points on the Kleinwes Rietspruit. The monitoring of the Wonderfonteinspruit will need to continue for 3 years after flow from the Eye commences. Sampling points need to be established and assessed prior to pumping ceasing.
- Biomonitoring is currently undertaken along the Leeuspruit East by EMC, it is recommended that bio-monitoring on this system continues. Biomonitoring has been undertaken by the EMC since 2016 along the Kleinwes Rietpsruit (Sibanye Gold, 2016; Sibanye Gold, 2017). NSS recommends that the bi-annual monitoring continues. In addition to the current monitoring measures, NSS recommends that a taxa list of the macroinvertebrates sampled be included in the monitoring reports. The taxa list could provide valuable information on changes after the pumping ceases; and is therefore vital to include in the baseline information for future monitoring reports.

- In addition to water quality monitoring it is recommended that sediment samples be taken and assessed. The sediment in the Kleinwes Rietspruit, downstream of the Peter Wright Dam needs to be assessed to determine the contamination levels. If contaminated, it is important that the existing vegetation is monitored as this vegetation is stabilising the sediment. If the vegetation dies back, alternative mitigation measures may need to be investigated to prevent the sediment from being transported further downstream (such as phytoremediation, bioremediation or soil washing). Tailings are to be removed and placed on existing tailings facilities. The Uranium level is likely to remain the same or increase due to lack of dilution effect if tailings are not removed. Settling ponds downstream of all contaminated areas are to be installed to prevent contaminated sludge entering the wetland systems. These settling ponds are to be cleaned on a regular basis in order to maintain capacity, with the contaminated material disposed of in an appropriate manner. An application to rehabilitate these wetlands was submitted by EMC to the DWS in 2016, however no response has been received to date. The same vegetation monitoring must take place in the Leeuspruit[4]where it is known that the sediment samples taken by NSS (NSS, 2014) were contaminated and are currently being held *in situ* by the *Phragmites* reed beds.
- Implementation of the rehabilitation plan submitted by EMC (2016) for the wetland areas upstream of the Peter Wright Dam. Without the removal of the tailings from these wetlands it is likely that the uranium level will remain the same or increase as the pumped water will no longer create a dilution effect.
- Erosion was present along both the Leeuspruit and Kleinwes Rietspruit. As the hydrology of the system changes, the vegetation structure and composition is expected to change. This change in vegetation structure may result in times where vegetation cover is scarce and the system is more prone to erosion. Selected photographic sampling points, along both systems should be identified, prior to pumping stopping. Photographs should be taken quarterly, for a period of 3 years. Should evidence of erosion increase, the cause should be investigated and mitigation measures implemented if required. Mitigation measures could include seeding or the planting of vegetation sods to speed up the vegetation succession, or if more severe, the use of gabion structures could be investigated.

4.3.5 Socio-Economic

Based on the assessment of the impacts on the socio-economic factors from the cessation of pumping from Sibanye Gold: EMC operations the following recommendations have been made:

- Prioritise affected workers for future employment in Sibanye projects.
- Keep affected suppliers informed of future contracts at Sibanye.
- The partial mining closure motivation is the result of the need to decrease the current operation losses. This is recommended to be achieved by complete cessation of pumping underground water from Sibanye Gold: EMC operations.
- A clear communication strategy to communicate socio-economic impacts of closure to the local community should be established.
- The Emergency Response Plans for Cooke 3 shaft and South Deep (Appendix H.4 and H.5 of the BAR) must be maintained to include safety measures relating to the re-watering of Sibanye Gold: EMC operations.

[4] Referred to as Leeuspruit East in specialist Wetlands and Ecology Report.

- The shaft entry points must be barricaded and appropriate security measures built around the surface infrastructure to prevent illegal miners from entering the mine.
- Sibanye must continue to engage in forums in collaboration with local development agents to discuss potential impacts and mitigation measures regarding income losses for farmers and agricultural workers in the agricultural sector.
- Discussions must be held with South Deep and the Waterpan Golf Club (as well as any other affected stakeholders) to discuss ways to reduce the potential impact of the activity on these stakeholders.
- A transparent communication strategy must be developed to inform the local community of seismic impact risks and events.
- The highest potential socio-economic risks (although negligible likelihood (SRK Consulting, 2017)) for the proposed closure of the underground workings of the Sibanye Gold: EMC operations is related to potential loss of life and the closure of South Deep due to seismic instability and the flooding of South Deep. The highly negative consequences, in the unlikely event of the above, underscore the need to mitigate these potential impacts effectively. This must be mitigated in terms of the recommendations from the stability findings and monitoring of existing plugs and still to be constructed plugs. It is recommended that the DMR require the recommended monitoring be undertaken by the establishment and operation of a Command and Control Monitoring Centre.

4.3.6 Plug Integrity, Boundary Pillar water flow monitoring and seismic monitoring

It is recommended that the DMR require the establishment and operation of a Command and Control Monitoring Centre, as a regional centre to monitor, record and respond effectively to all environmental and geomechanics safety data, including the below with regards to each mine's plug integrity, boundary pillar water flow and seismic monitoring. The centre is proposed to be located near to South Deep mine so that access to the underground workings is feasible. This centre will be run 24/7 by an independent monitoring response team and will provide real-time linkage to South Deep, EMC and the DMR. The design of this centre must be submitted to the DMR and South Deep for approval within 30 days of authorisation for the cessation of pumping.

4.3.6.1 South Deep

Monitoring of plugs

The following is required:

- The plug sites are inspected via CCTV cameras on a daily basis.
- All pressure gauges be read on a two-weekly basis and that graphs of pressures versus time be maintained. Records should be kept of both plug back-head pressures and piezometer pressures. Any sudden changes in pressure readings should be investigated.
- The flow rates of the drips from the pipe at Level 58 – 2 West plug and from the bolt at Level 58 – East plug be measured, on a two-weekly basis, using a measuring jug and a stop watch.
- Graphs of flow rate versus time should be measured. Any sudden increase in flow rate should be investigated.
- With the expected rise in water level behind the plugs, a specialist to be called in to do condition monitoring of the plugs and rock condition around the plugs when necessary.

Maintenance of Equipment at 58 Level Plugs

It is recommended that:

- The CCTV cameras must be maintained.
- The pressure gauges be maintained or replaced. It is not possible to tell whether the piezometer gauges are malfunctioning or whether there is no piezometric pressure. Dual piezometric gauges should be installed so that readings can be cross-referenced. All gauge casings should be engraved with a unique number for recording purposes. All gauges should have a maximum range of 2 MPa so that the indicator needle has a reasonable deflection under pressure.
- The outside closure valve on the lower pipe at 2 West Plug be checked for corrosion. This outlet is the only one carrying acidic water in the pumping operation.

Installation of Equipment at 50 Level Plugs

It is recommended that:

- Dual closure valves be installed on both the piezometer pipes and the 200 mm bore outlet pipes as a contingency against valve failure.
- Dual pressure gauges be fitted to all piezometer pipes and single pressure gauges be fitted to two of the 200 mm bore outlet pipes. All gauge casings should be engraved with a unique number for recording purposes. Gauge maintenance and calibration must be undertaken when necessary.
- CCTV cameras be installed at the two 50 Level plug sites

Seismic Activity

The seismic activity monitoring network must be maintained by the proposed Command and Control Monitoring Centre. Updated catalogues of seismic data recorded by the South Deep network should be analysed to check if events larger than the 2012 value of Mmax = 3.4 have been recorded.

As the Ezulwini mine re-waters, the flows across the water barrier pillar need to be monitored, and mitigation measures such as additional pumping capacity may need to be considered.

The bolts, valve handles and pressure gauges at the plugs between South Deep and Ezulwini should be replaced. The pipes should also be grouted if necessary.

4.3.6.2 Cooke 3

A monitoring and maintenance programme must be developed for the Cooke 3 – EMC operations plugs once constructed. A seismicity monitoring programme must also be implemented.

The installed support at the potential Cooke 3 plug sites was found to be corroded. This support needs to be replaced in the excavations used to access the proposed plug positions, to prevent injury to the persons working at the plug sites. The support in the area where the plugs are to be placed must be removed and barring must be done to expose the intact rock mass. Temporary support must be placed in this area as per the requirements of the miner responsible for this area.

4.4 Relinquishment Criteria

Please refer to **Table 4-2** for the relinquishment criteria associated with the cessation of pumping at Sibanye Gold: EMC operations.

Table 4-2: Relinquishment criteria for Ezulwini underground workings.

Issue	Anticipated Impact	Summary of Impact Management Measures	Implementation Timeframe	Performance Indicators / Relinquishment Criteria	Reporting Requirements
Cessation of pumping to the Kleinwes Rietspruit	**NEGATIVE IMPACT** Reduction in streamflow which has an impact on surface water users	▪ There are no proposed mitigation measures for this activity to reduce the negative impact on surface water quantity.	N/A	N/A	N/A
Cessation of pumping to the Kleinwes Rietspruit	**POSITIVE IMPACT** Reduction in salt loads entering the Kleinwes Rietspruit.	▪ There are no proposed mitigation measures for this activity to reduce the impact on surface water quality.	N/A	N/A	N/A
Cessation of pumping to the Kleinwes Rietspruit	**NEGATIVE IMPACT** Decrease in water quality in Peter Wright Dam due to due to the artificial wetland area and possible seepage from the adjacent dormant slimes dams, combined with the decreased dilution effect from the cessation of underground discharge water.	▪ The artificial wetland area can be rehabilitated to minimise the uranium concentration in the runoff water emanating from the area. ▪ Water should be abstracted from Peter Wright until the wetland has been rehabilitated and the water quality within the dam is in line with the in-stream water quality objectives.	N/A	N/A	N/A
Cessation of pumping to the Kleinwes Rietspruit	**NEGATIVE IMPACT** Decrease in dilution effect in the stream, resulting in a reduction in water quality.	▪ There are no proposed mitigation measures for the decreased dilution effect due to external influences (e.g. anthropogenic influences and urbanisation) to reduce the impact on surface water quality	N/A	N/A	N/A

Issue	Anticipated Impact	Summary of Impact Management Measures	Implementation Timeframe	Performance Indicators / Relinquishment Criteria	Reporting Requirements
Flow from Gemsbokfontein Eye increasing flow to the Wonderfonteinspruit	**POSITVE IMPACT** Increase in streamflow	▪ There are no proposed mitigation measures for this activity.	N/A	N/A	N/A
Flowing of aquifer at the Gemsbokfontein Eye	**NEGATIVE IMPACT** Exceedance of the 1 m pipeline capacity.	▪ Do detailed hydrological study on the catchment to assess the pipeline's capacity. ▪ If required and feasible restore pipeline to design capacity ▪ Once water is abstracted from Cooke 1 and Kloof 10 for the WRTRP operations, flow to Donaldson Dam will reduce by approx. 39 Mℓ/day	Post cessation of pumping and prior to flow of dolomitic water at the Gemsbokfontein Eye	▪ Study on pipeline capacity ▪ Pipeline restored to design capacity ▪ No ponding at 1.0 m pipeline entrance	Evidence in performance assessment report/audits that the appropriate management measures have been implemented. Reports/Audits to be submitted to the DMR
Flow from Gemsbokfontein Eye increasing flow to the Wonderfonteinspruit	**POSITVE IMPACT** Improvement of water quality	▪ There are no proposed mitigation measures for this activity to reduce the impact on surface water quality.	N/A	N/A	N/A
Flowing of aquifer at the Gemsbokfontein Eye	**POSITIVE IMPACT** Water flowing again as opposed to the Gemsbokfontein Eye being dry	▪ N/A	Upon flow of water from the Gemsbokfontein Eye	▪ Water flowing at Gemsbokfontein Eye after approximately 7 years	Surface water monitoring report. Report to be submitted to the DWS
Flowing of aquifer at the Gemsbokfontein Eye	**NEGATIVE IMPACT** Contamination of the water flowing from the eye	▪ Monitor water quality at the eye. ▪ Identify potential pollution sources other than mining.	Upon flow of water from the Gemsbokfontein Eye	▪ Water quality standards are compliant with the Resource Quality Objectives for the catchment.	Surface water monitoring report. Report to be submitted to the DWS

Issue	Anticipated Impact	Summary of Impact Management Measures	Implementation Timeframe	Performance Indicators / Relinquishment Criteria	Reporting Requirements
		▪ Treat water– only to be considered if significant contamination is observed.			
Dolomitic groundwater flow into the mine void	**NEGATIVE IMPACT** Contamination of clean groundwater within the mining void	▪ Remove as many sources of contaminations from the underground workings as possible ▪ Shaft concrete lined and collar above potential decant elevation (contained) ▪ Implement monitoring programme to assess changes to the groundwater table	N/A	N/A	N/A
Cessation of pumping to the Kleinwes Rietspruit	**NEGATIVE IMPACT** Change in extent and wetness regime of downstream wetlands – potential loss of wetlands	▪ No mitigation in terms of flow ▪ Annual monitoring of the PES, EIS and Ecosystem Services of downstream wetlands	N/A	N/A	N/A
Cessation of pumping to the Kleinwes Rietspruit	**NEGATIVE IMPACT** Change from perennial and fast flowing to non-perennial with periods of no flow – Change in aquatic species composition	▪ No mitigation in terms of flow ▪ Bi-Annual Aquatic Bio-Monitoring	N/A	N/A	N/A
Cessation of pumping to the Kleinwes Rietspruit	**NEGATIVE IMPACT** Change in vegetation structure and composition (secondary impacts	▪ No mitigation in terms of flow. ▪ Quarterly Photographic sampling at select points downstream for a	N/A	▪ Monitor Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) and ecosystem services of the systems continue to be monitored annually for a period of	Biomonitoring report. Report to be submitted to the DMR

Issue	Anticipated Impact	Summary of Impact Management Measures	Implementation Timeframe	Performance Indicators / Relinquishment Criteria	Reporting Requirements
	discussed under geomorphology and water quality)	change in vegetation and erosion features– Implement the required management measures if required		3 years at select sampling points on the Leeuspruit, Kleinwes Rietspruit and Wonderfonteinspruit. Sampling points need to be established and assessed prior to pumping ceasing ▪ Contaminated sediments removed if recommended by biodiversity specialist and approved by the authorities	
Cessation of pumping to the Kleinwes Rietspruit	**POSITIVE IMPACT** Change in flow conditions could have a negative impact on the alien fish species present in the system	▪ No mitigation required ▪ Bi-Annual Aquatic Bio-Monitoring	N/A	N/A	N/A
Cessation of pumping to the Kleinwes Rietspruit	**NEGATIVE IMPACT** Change in plant species composition and structure may lead to exposed areas and a resultant increase in erosion and release of contaminated sediment stabilised by vegetation. This would result in a number of secondary impacts on the wetland geometry and the organisms utilising the wetland.	▪ No mitigation in terms of flow ▪ Analyse the sediments downstream of the Peter Wight Dam, specifically for Uranium ▪ Monitor the quality of the uranium in the downstream sediments ▪ Quarterly Photographic sampling at select points downstream for a change in vegetation and erosion features – Implement the required management measures if required ▪ Implementation of alternative measures, for example alternative phytoremediation	Post partial closure	▪ Water quality within limits as listed in the existing WUL (08/C23D/ABEFGJ/2836) and the Resource Quality Objectives. ▪ Monitor Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) and ecosystem services of the systems continue to be monitored annually for a period of 3 years at select sampling points on the Leeuspruit, Kleinwes Rietspruit and Wonderfonteinspruit. Sampling points need to be established and assessed prior to pumping ceasing ▪ Contaminated sediments removed if recommended by biodiversity specialist and approved by the authorities	Biomonitoring report. Report to be submitted to the DMR

Issue	Anticipated Impact	Summary of Impact Management Measures	Implementation Timeframe	Performance Indicators / Relinquishment Criteria	Reporting Requirements
		options, bioremediation, soil washing etc. ▪ Rehabilitation of the Uranium contaminated wetlands (Sibanye has submitted an application to relevant authorities)			
Cessation of pumping to the Kleinwes Rietspruit	**NEGATIVE IMPACT** Increase in the Uranium concentration due to decreased dilution effect	▪ No mitigation in terms of flow ▪ Surface water quality monitoring (J&W, 2017) ▪ Rehabilitation of the Uranium contaminated wetlands (Sibanye has submitted an application to relevant authorities)	At cessation pf pumping and post partial closure	▪ Water quality within limits as listed in the existing WUL (08/C23D/ABEFGJ/2836) and the Resource Quality Objectives. ▪ Monitor Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) and ecosystem services of the systems continue to be monitored annually for a period of 3 years at select sampling points on the Leeuspruit, Kleinwes Rietspruit and Wonderfonteinspruit. Sampling points need to be established and assessed prior to pumping ceasing ▪ Contaminated sediments removed if recommended by biodiversity specialist and approved by the authorities	Biomonitoring report. Report to be submitted to the DMR
Flow at the Wonderfonteinspruit from the Gemsbokfontein Eye	**POSITIVE IMPACT** Increase in flow – returning flow from the Gemsbokfontein Eye to the Wonderfonteinspruit	▪ No mitigation in terms of flow ▪ Annual monitoring of the PES, EIS and Ecosystem Services of downstream wetlands for a period of 3 years after steady state is reached ▪ Quarterly Photographic sampling at select points downstream for a	N/A	▪ Monitor Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) and ecosystem services of the systems continue to be monitored annually for a period of 3 years at select sampling points on the Leeuspruit, Kleinwes Rietspruit and Wonderfonteinspruit. Sampling points need to be established and assessed prior to pumping ceasing	Biomonitoring report. Report to be submitted to the DMR

Issue	Anticipated Impact	Summary of Impact Management Measures	Implementation Timeframe	Performance Indicators / Relinquishment Criteria	Reporting Requirements
		change in erosion features– Implement the required management measures if required			
Flow at the Wonderfonteinspruit from the Gemsbokfontein Eye	**NEGATIVE IMPACT** Change in aquatic species composition due to change in flow	▪ No mitigation in terms of flow ▪ Bi-Annual Aquatic Bio-Monitoring	N/A	Monitor Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) and ecosystem services of the systems continue to be monitored annually for a period of 3 years at select sampling points on the Leeuspruit, Kleinwes Rietspruit and Wonderfonteinspruit. Sampling points need to be established and assessed prior to pumping ceasing	Biomonitoring report. Report to be submitted to the DMR
Flow at the Wonderfonteinspruit from the Gemsbokfontein Eye	**POSITIVE IMPACT** Improvement in water quality due to the increased dilution effect – assuming predicted water qualities are accurate	▪ No mitigation required ▪ Surface water quality monitoring (J&W, 2017)	Upon flow of water from the Gemsbokfontein Eye	▪ Water quality within limits as listed in the existing WUL (08/C23D/ABEFGJ/2836) and the Resource Quality Objectives.	Surface water monitoring report. Report to be submitted to the DWS
Re-watering of EMC	**NEGATIVE IMPACT** Flow to adjacent mines (South Deep) through plugs resulting in increased pumping rates for the receiving mines, potential damage to infrastructure and risk to human life	▪ Grouting of the rock formations around the plugs and pipes though the plugs ▪ Maintenance of the valves and pressure gauges. ▪ Continuous plug monitoring (as per the proposed Command Control Monitoring Centre) ▪ South Deep Ensure Emergency Response Plan is in place and updated to cater for the	Prior to mine re-watering and post partial closure	▪ Continued maintenance of monitoring equipment. ▪ No water seepage through plugs. ▪ Any seepage observed addressed immediately. ▪ Updated Emergency Response Plans in place for adjacent mines.	Evidence in performance assessment report/audits that the appropriate management measures have been implemented. Reports/Audits to be submitted to the DMR

Issue	Anticipated Impact	Summary of Impact Management Measures	Implementation Timeframe	Performance Indicators / Relinquishment Criteria	Reporting Requirements
		re-watering related impacts			
Re-watering of EMC	**NEGATIVE IMPACT** Flow to adjacent mines (Cooke 3) through plugs resulting in increased pumping rates for the receiving mines, potential damage to infrastructure and risk to human life	▪ Grouting of the rock formations around the plugs ▪ Plug construction according to design for Cooke 3 and strict quality control systems must be in place ▪ Maintenance of the valves and pressure gauges. ▪ Continuous plug monitoring (as per the proposed Command Control Monitoring Centre) ▪ Ensure Emergency Response Plan is in place and updated to cater for the re-watering related impacts	Prior to mine re-watering and post partial closure	▪ Plugs constructed according to design and in line with standards and best practice. ▪ Continued maintenance of monitoring equipment. ▪ No water seepage through plugs. ▪ Any seepage observed addressed immediately. ▪ Updated Emergency Response Plans in place for adjacent mines.	Evidence in performance assessment report/audits that the appropriate management measures have been implemented. Reports/Audits to be submitted to the DMR
Re-watering of EMC	**NEGATIVE IMPACT** Seepage to adjacent mines (South Deep) through geological features resulting in increased pumping rates for the receiving mine	▪ Mapping and identification of potential water conduits (faults, dykes) ▪ Grouting conduits of groundwater ingress between mines in cases where monitoring shows significant ingress ▪ Have standby pumps in the event of excess seepage, so that re-	Prior to mine re-watering and post partial closure	▪ No water seepage through pillar. ▪ Any seepage observed addressed immediately.	Evidence in performance assessment report/audits that the appropriate management measures have been implemented. Reports/Audits to be submitted to the DMR

Issue	Anticipated Impact	Summary of Impact Management Measures	Implementation Timeframe	Performance Indicators / Relinquishment Criteria	Reporting Requirements
		watering can be controlled ▪ South Deep Ensure Emergency Response Plan is in place and updated to cater for the re-watering related impacts			
Re-watering of EMC	**NEGATIVE IMPACT** Seepage to adjacent mines (Cooke 3) through geological features resulting in increased pumping rates for the receiving mines	▪ Mapping and identification of potential water conduits (faults, dykes) ▪ Grouting conduits of groundwater ingress between mines in cases where monitoring shows significant ingress. ▪ Have standby pumps in the event of excess seepage, so that re-watering can be controlled ▪ Ensure Emergency Response Plan is in place and updated to cater for the re-watering related impacts	Prior to mine re-watering and post partial closure	▪ No water seepage through pillar. ▪ Any seepage observed addressed immediately.	Evidence in performance assessment report/audits that the appropriate management measures have been implemented. Reports/Audits to be submitted to the DMR
Seismicity during re-watering of EMC	**NEGATIVE IMPACT** Damage to plugs and/or boundary pillar at Cooke 3 which results in a significant inrush of water	▪ Continuous monitoring (as per the proposed Command Control Monitoring Centre) ▪ Ensure Emergency Response Plans are in place and updated to	Post partial closure	▪ Monitoring and detection of seismicity risks. ▪ Updated Emergency Response Plans in place for adjacent mines. ▪ Compliance with risk management aspects of Mine Health & Safety Act (Act 29 of 1996), National Building	Evidence in performance assessment report/audits that the appropriate management measures have been implemented.

Issue	Anticipated Impact	Summary of Impact Management Measures	Implementation Timeframe	Performance Indicators / Relinquishment Criteria	Reporting Requirements
		cater for the re-watering related impacts		Standards and Building Regulations Act (Act 103 of 1997, as amended).	Reports/Audits to be submitted to the DMR. Seismic Activity Report to be submitted to DMR.
Seismicity during re-watering of EMC	**NEGATIVE IMPACT** Damage to plugs and/or boundary pillar at South Deep which results in a significant inrush of water	▪ Continuous monitoring (as per the proposed Command Control Monitoring Centre) ▪ Ensure Emergency Response Plans are in place and updated to cater for the re-watering related impacts	Post partial closure	▪ Monitoring and detection of seismicity risks. ▪ Updated Emergency Response Plans in place for adjacent mines. ▪ Compliance with risk management aspects of Mine Health & Safety Act (Act 29 of 1996), National Building Standards and Building Regulations Act (Act 103 of 1997, as amended).	Evidence in performance assessment report/audits that the appropriate management measures have been implemented. Reports/Audits to be submitted to the DMR. Seismic Activity Report to be submitted to DMR.
Aquifer re-watering	**POSITIVE IMPACT** Groundwater level rises and groundwater becomes more accessible again to farmers	▪ No mitigation required, but groundwater level monitoring is ongoing	Post cessation of pumping	▪ Groundwater level reinstated to pre-mining levels	Groundwater monitoring report. Report to be submitted to the DWS
Aquifer re-watering	**NEGATIVE IMPACT** Seepage from the underground workings into the natural environment Seepage from the EMC TSF into the groundwater	▪ Detailed monitoring. ▪ Implementation of mitigation measures at the TSF to contain plume migration.	At cessation of pumping, post cessation of pumping	▪ Groundwater quality within limits as listed in the existing WUL (08/C23D/ABEFGJ/2836).	Groundwater monitoring report. Report to be submitted to the DWS
Changes in Ground Stability due to re-watering	**NEGATIVE IMPACT** Damage to infrastructure	▪ Identify areas of potential risk and limit further urban development ▪ Ongoing detailed monitoring as	Post cessation of pumping	▪ Monitoring and detection of subsidence risks. ▪ No urban development in risk areas. ▪ Compliance with risk management aspects of Mine Health & Safety Act (Act 29 of 1996), National Building	Evidence in performance assessment report/audits that the appropriate management

Issue	Anticipated Impact	Summary of Impact Management Measures	Implementation Timeframe	Performance Indicators / Relinquishment Criteria	Reporting Requirements
		subsidence is a slow process ▪ Rehabilitation of subsided area or purchase of property as per FWRDWA requirements		Standards and Building Regulations Act (Act 103 of 1997, as amended). ▪ Rehabilitation of subsided areas or purchase of property as per FWRDWA requirements.	measures have been implemented. Reports/Audits to be submitted to the DMR. Stability monitoring report to be submitted to the DMR.
Changes in Ground Stability due to re-watering	**NEGATIVE IMPACT** Damage to infrastructure Loss of life	▪ Identify areas of potential risk and limit further urban development ▪ Current high residential areas developed in safe areas. Most sinkholes occurred in open field ▪ Ongoing detailed monitoring ▪ Rehabilitation of sinkholes or purchase of property as per FWRDWA requirements	Post cessation of pumping	▪ Monitoring and detection of sinkhole risks. ▪ Updated Emergency Response Plans in place for adjacent mines. ▪ Compliance with risk management aspects of Mine Health & Safety Act (Act 29 of 1996), National Building Standards and Building Regulations Act (Act 103 of 1997, as amended).	Evidence in performance assessment report/audits that the appropriate management measures have been implemented. Reports/Audits to be submitted to the DMR. Stability monitoring report to be submitted to the DMR.
Cessation of pumping and termination of underground mining	**NEGATIVE IMPACT** Direct job and income losses for former employees	▪ Prioritise affected workers for future employment in Sibanye projects. (although most have been redeployed already)	At cessation of pumping	▪ No long-term income losses for former EMC workers. ▪ Meet objectives of Sibanye's Social & Labour Plan.	Evidence in performance assessment report/audits that the appropriate management measures have been implemented. Reports/Audits to be submitted to the DMR.
Cessation of pumping and termination of underground mining	**NEGATIVE IMPACT** Lower income for local suppliers	▪ Keep affected suppliers informed of future contracts at Sibanye.	At cessation of pumping	▪ No long-term income losses for former EMC suppliers. ▪ Meet objectives of Sibanye's Social & Labour Plan.	Evidence in performance assessment report/audits that the appropriate

Issue	Anticipated Impact	Summary of Impact Management Measures	Implementation Timeframe	Performance Indicators / Relinquishment Criteria	Reporting Requirements
					management measures have been implemented. Reports/Audits to be submitted to the DMR.
Cessation of pumping and termination of underground mining	**POSITIVE IMPACT** Lower financial losses for Sibanye Gold	▪ None – assume complete cessation of pumping underground water from Cooke shaft 4.	At cessation of pumping	▪ Partial closure of Sibanye Gold: EMC operations (underground workings)	Section 43(3)(d) application for closure after completion of the prescribed closing plan to be submitted to the DMR.
Cessation of pumping and termination of underground mining	**NEGATIVE IMPACT** Impacts on community safety (due to illegal miners attempting to enter the mine)	▪ A clear communication strategy to communicate socio-economic impacts of closure to the local community. ▪ Update of the Emergency Response Plan (Cooke 3 and South Deep) ▪ Barricade access to shaft entry points.	At cessation of pumping	▪ Meet objectives of Sibanye's Social & Labour Plans in the West Wits region. ▪ Updated Emergency Response Plans in place for adjacent mines. ▪ Compliance with risk management aspects of Mine Health & Safety Act (Act 29 of 1996), National Building Standards and Building Regulations Act (Act 103 of 1997, as amended).	Evidence in performance assessment report/audits that the appropriate management measures have been implemented. Reports/Audits to be submitted to the DMR.
Cessation of pumping and termination of underground mining	**NEGATIVE IMPACT** Direct income losses for adjacent farmers abstracting water from Kleinwes Rietspruit/Leeuspruit or being supplied water by EMC, due to water availability	▪ Continue participating in an inclusive forum for potentially affected farmers. Assist farmers where ground water levels decreased during operations and they are not able to obtain water from the pipeline anymore until the groundwater levels have recovered.	At cessation of pumping	▪ Meet objectives of Sibanye's Social & Labour Plans in the West Wits region. ▪ No long-term income losses for adjacent farmers due to water availability. ▪ Forum established in collaboration with local development agents to discuss potential impacts and mitigation measures regarding income losses for farmers and agricultural workers in the agricultural sector	Evidence in performance assessment report/audits that the appropriate management measures have been implemented. Reports/Audits to be submitted to the DMR.

Issue	Anticipated Impact	Summary of Impact Management Measures	Implementation Timeframe	Performance Indicators / Relinquishment Criteria	Reporting Requirements
Cessation of pumping and termination of underground mining	**NEGATIVE IMPACT** Direct loss of income for workers in the agricultural sector	▪ Continue participating in an inclusive forum for potentially affected farmers. Assist farmers where ground water levels decreased during operations and they are not able to obtain water from the pipeline anymore until the groundwater levels have recovered.	At cessation of pumping	▪ Meet objectives of Sibanye's Social & Labour Plans in the West Wits region. ▪ No long-term income losses for workers in the agricultural sector. ▪ Forum established in collaboration with local development agents to discuss potential impacts and mitigation measures regarding income losses for farmers and agricultural workers in the agricultural sector	Evidence in performance assessment report/audits that the appropriate management measures have been implemented. Reports/Audits to be submitted to the DMR.
Cessation of pumping and termination of underground mining	**NEGATIVE IMPACT** Income loss for workers at Waterpan Golf Club	▪ Find a feasible resolution through interaction with the respective parties that could ensure the continuation of the activities of the Golf Club ▪ Possibility for Waterpan Golf Club to apply for a WUL to pump water from boreholes (3-4km away)	Prior to cessation of pumping, at cessation of pumping	▪ Meet objectives of Sibanye's Social & Labour Plans in the West Wits region ▪ Waterpan Golf Club receives a WUL to pump water from boreholes.	Evidence in performance assessment report/audits that the appropriate management measures have been implemented. Reports/Audits to be submitted to the DMR.
Cessation of pumping and termination of underground mining	**NEGATIVE IMPACT** Potential flooding of adjacent mines	▪ Monitoring of plug integrity and water level at EMC until completely re-watered ▪ Ongoing monitoring at Cooke 3 and South Deep plugs and boundary pillars by CCTV. ▪ Emergency Response Plans developed for	At cessation of pumping and post cessation of pumping	▪ Meet objectives of Sibanye's Social & Labour Plans in the West Wits region. ▪ Updated Emergency Response Plans in place for adjacent mines. ▪ Compliance with risk management aspects of Mine Health & Safety Act (Act 29 of 1996), National Building Standards and Building Regulations Act (Act 103 of 1997, as amended).	Evidence in performance assessment report/audits that the appropriate management measures have been implemented. Reports/Audits to be submitted to the DMR.

Issue	Anticipated Impact	Summary of Impact Management Measures	Implementation Timeframe	Performance Indicators / Relinquishment Criteria	Reporting Requirements
		South Deep and Cooke 3.			
Cessation of pumping and termination of underground mining	**NEGATIVE IMPACT** Risks related to dolomitic instability	▪ Sibanye to develop transparent communication strategy to inform local community and municipality of risks and events ▪ As per groundwater and seismic impact specialist's reports - . o Identify areas of potential risk and limit further urban development o Ongoing detailed monitoring as subsidence is a slow process	Prior to cessation of pumping, at cessation of pumping, post cessation of pumping	▪ Meet objectives of Sibanye's Social & Labour Plans in the West Wits region. ▪ Updated Emergency Response Plans in place for adjacent mines. ▪ Compliance with risk management aspects of Mine Health & Safety Act (Act 29 of 1996), National Building Standards and Building Regulations Act (Act 103 of 1997, as amended).	Evidence in performance assessment report/audits that the appropriate management measures have been implemented. Reports/Audits to be submitted to the DMR.
Cessation of pumping and termination of underground mining	**POSITIVE IMPACT** Lower external costs due to reduced electricity consumption	▪ Ensure water consumption is accurately monitored and ensure that pipe bursts and leaks are repaired timeously	Prior to cessation of pumping, at cessation of pumping, post cessation of pumping	▪ Lower external costs reported by the mine.	Evidence in financial reports

5. POST PARTIAL CLOSURE MONITORING AND MAINTENANCE

It is recommended that the DMR require the establishment and operation of a Command and Control Monitoring Centre, as a regional centre to monitor, record and respond effectively to all environmental and geomechanics safety monitoring and management, included in this report and as per the below table, including:

- Surface water quality and quantity;
- Groundwater quality and quantity;
- Stability monitoring;
- Ground settlement and sinkhole monitoring;
- Plug integrity and boundary pillar monitoring;
- Biomonitoring;
- Seismic monitoring;
- Stream sediment monitoring; and
- Erosion monitoring.

The centre is proposed to be located near to South Deep mine so that access to the underground workings is feasible. This centre will be run 24/7 by an independent monitoring response team and will provide real-time linkage to South Deep, EMC and the DMR. The design of this centre must be submitted to the DMR and South Deep for approval within 30 days of authorisation for the cessation of pumping.

EMC envisages that a Command and Control Monitoring Centre be established near the South Deep mine, as a regional holistic monitoring centre. The centre is proposed to be located near to South Deep mine so that access to the underground workings is feasible. This centre will be run by an independent monitoring response team and will cover all monitoring and management aspects as recommended in this report and as per the below table, including:

The cost of the installation of such a centre has not been listed in the financial provisioning table as further discussions on the logistics around such a centre need to be held.

Please refer to **Table 5-1** for a summary of the recommended monitoring and maintenance programme.

Table 5-1: Post partial closure monitoring requirements.

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS[5]
Lead up to cessation of pumping	Groundwater levels	Groundwater levels at all boreholes in network (including new boreholes BH1-6) (see **Figure 5-1**).	Water Management Department	Monthly
During re-watering			Water Management Department	Twice a month
After aquifer flow at Gemsbokfontein Eye			Water Management Department	Monthly for a period of 3 years after the Eye starts flowing
Lead up to cessation of pumping	Groundwater quality	Full chemical suite at new boreholes BH1-6 (see **Figure 5-1**).	Water Management Department	Bi-annual
During re-watering			Water Management Department	Bi-annual
After flow at Gemsbokfontein Eye			Water Management Department	Quarterly during the recovery of the dolomite aquifer and for a period of 3 years after the Eye starts flowing
Lead up to cessation of pumping	Surface Water quality	Continue with current chemical suite at current sampling points on the Kleinwes Rietspruit, Leeuspruit and Wonderfonteinspruit (see **Figure 5-2**)	Water Management Department	Ongoing as per existing schedule (i.e. monthly)
During re-watering			Water Management Department	
After aquifer flow at Gemsbokfontein Eye			Water Management Department	
Lead up to cessation of pumping	Stability	Ongoing as per existing schedule (**Figure 5-3** and **Table 5-2**) and as per Dolomite Risk Management Strategy (Appendix C.2 of the BAR). Lidar, aerial drones and ground surveys to monitor surface subsidence.	Ground Stability Department	Ongoing as per existing schedule and for a period of 3 years after the Eye starts flowing
During re-watering			Ground Stability Department	
After aquifer flow at Gemsbokfontein Eye			Ground Stability Department	
For a period of at least 3 years	Wetlands and Ecology	PES, EIS and ecosystem services of the systems at Sampling points on	Water Management Department	Annually

[5] All timeframes for implementing management actions will be determined by the independent ECO undertaking the environmental audits, if not specified by the competent authority.

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS[5]
following cessation of pumping (10 years for Wonderfonteinspruit)		the Leeuspruit, Kleinwes Rietspruit and Wonderfonteinspruit.		
For a period of 3 years following cessation of pumping	Wetlands and Ecology	Biomonitoring, including: • *Habitat Integrity*: using the Index of Habitat Integrity (IHI) derived by Kleynhans (2008) and the methods employed within the River EcoStatus Monitoring Programme; • *Water quality data*: Site assessments must be performed when the required weekly water sampling takes place. • Aquatic macro-invertebrate assemblage assessment: using the South African Scoring System version 5 (SASS5) methodologies, according to Dickens and Graham (2002), as well as the Macro-Invertebrate Response Assessment Index (MIRAI) methodology (Thirion, 2007); • *Fish assemblage assessment*: using standardised methodologies	Water Management Department	Bi-annually (Low and High Flow)

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS[5]
		to determining the PES for the fish assemblages as per the Fish Response Assessment Index (FRAI), (Kleynhans, 2007). • *Diatom Analysis:* To be assessed with the water quality results. At downstream sites along the Kleinwes Rietspruit and Leeuspruit (immediately downstream of EMC).		
For a period of 3 years following cessation of pumping	Wetlands and Ecology	Sedimentation levels at Kleinwes Rietspruit, downstream of the Peter Wright Dam and Leeuspruit (A qualified pedologist must investigate the sediments and wetlands of the Kleinwes Rietspruit and based on his findings must develop a sediment and wetlands soil quality monitoring protocol. The soils and sediments must then be sampled as per the monitoring protocol. If it is found that the sediments and soils poses a significant threat to the aquatic environment, such as continuous release of heavy metals, including radioactive metals, such as uranium, a sediment and soil remediation methodology and plan must be developed and implemented.)	Water Management Department	Quarterly

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS[5]
For a period of 3 years following cessation of pumping	Wetlands and Ecology	Erosion (photographic comparison) at select sampling points along the Leeuspruit and Kleinwes Rietspruit. Should erosion be present, erosion management actions must be taken, such as the installation of structures to slow the flow velocity upon discharge into the Kleinwes Rietspruit and within the stream. Authorisations and licences for such work must be obtained prior to the work commencing	Water Management Department	Quarterly
Prior to re-watering	Plug Integrity and Boundary Pillar water flow	South Deep: Grouting of the rock formations around the plugs and pipes though the plugs. Ensure South Deep pipe through plug is closed prior to re-watering. As the Ezulwini mine re-waters, the flows across the water barrier pillar need to be monitored, and mitigation measures such as additional pumping capacity may need to be considered. The bolts, valve handles and pressure gauges at the plugs between South Deep and Ezulwini should be replaced. The pipes should also be grouted if necessary. Cooke 3:	South Deep Cooke 3	Once-off

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS[5]
		A monitoring and maintenance programme must be developed for the Cooke 3 – EMC operations plugs once constructed. A seismicity monitoring programme must also be implemented. The installed support at the potential Cooke 3 plug sites was found to be corroded. This support needs to be replaced in the excavations used to access the proposed plug positions, to prevent injury to the persons working at the plug sites. The support in the area where the plugs are to be placed must be removed and barring must be done to expose the intact rock mass. Temporary support must be placed in this area as per the requirements of the miner responsible for this area.		
During re-watering and after		Submersible pumps should be available or on standby, should re-watering need to be halted. CCTV monitoring from South Deep side at all plug sites. South Deep 58 and 50 level: CCTV cameras to be maintained. Cooke 3: A monitoring and maintenance programme must be developed for the Cooke 3 – EMC operations plugs once constructed.	South Deep and Sibanye Cooke 3	Daily - until closure/re-watering of adjacent mines

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS[5]
During re-watering and after		Pressure gauge/piezometer readings. South Deep 58 level: Pressure gauges (max. 2 MPa) to be maintained and replaced when necessary. Dual gauges with unique numbers to be installed so that readings can be cross-referenced. South Deep 50 level: Dual pressure gauges be fitted to all piezometer pipes and single pressure gauges be fitted to two of the 200 mm bore outlet pipes. All gauge casings should be engraved with a unique number for recording purposes. Dual closure valves be installed on both the piezometer pipes and the 200 mm bore outlet pipes as a contingency against valve failure. Cooke 3: A monitoring and maintenance programme must be developed for the Cooke 3 – EMC operations plugs once constructed.	South Deep and Sibanye Cooke 3	Two-weekly - until closure/re-watering of adjacent mines
During re-watering and after		Flow rates of the drips from the pipe at Level 58 – 2 West plug and from the bolt at Level 58 – East plug. Graphs of flow rates vs time to be maintained and sudden changes to be investigated.	South Deep and Sibanye Cooke 3	Two-weekly- until closure/re-watering of adjacent mines

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS[5]
		South Deep 58 level: Outside closure valve on the lower pipe at 2 West Plug be checked for corrosion. Cooke 3: A monitoring and maintenance programme must be developed for the Cooke 3 – EMC operations plugs once constructed.		
During re-watering and after		Condition monitoring - Specialist to monitor plug sites. Cooke 3: A monitoring and maintenance programme must be developed for the Cooke 3 – EMC operations plugs once constructed.	South Deep and Sibanye Cooke 3	Annually - until closure/re-watering of adjacent mines
During re-watering and after	Seismic Activity	Geophone monitoring. South Deep: The seismic activity monitoring network must be maintained by the proposed Command and Control Monitoring Centre. Updated catalogues of seismic data recorded by the South Deep network should be analysed to check if events larger than the 2012 value of Mmax = 3.4 have been recorded. Cooke 3: A seismicity monitoring programme must be developed for the Cooke 3 – EMC operations plugs once constructed.	South Deep and Sibanye Cooke 3	Daily - until closure/re-watering of adjacent mines
Lead up to cessation of pumping	Structural and surface monitoring	Develop photographic record of cracks in structures in surrounding areas	Corporate Affairs Department	Once-off

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS[5]
Lead up to cessation of pumping and during re-watering	Illegal mining	Sibanye to develop measures to monitor and prevent illegal mining.	Sibanye	Ongoing
During re-watering and after	Radiation	The ongoing surface operations at Ezulwini will continue to monitor radioactivity levels in line with current operational requirements. It is also recommended that Alpha and Beta radioactivity levels to be monitored in the dolomites.	Sibanye	Quarterly during the recovery of the dolomite aquifer and for a period of 3 years after the Eye starts flowing

The Gauteng Department of Agriculture and Rural Development (GDARD) has requested that the following conditions be included in the EMPr:

- It should be confirmed and certified that mitigation and precautionary measures contained in the Environmental Management Programme for the protection of the sensitivities found on site and mitigation measures prescribed were undertaken.
- Records of monitoring and auditing of activities must be made available for official inspection purposes.
- Apart from environmental aspects, conditions relating to health and safety for officials involved in the closure activities should be adhered to.
- It should be verified that measures to deal with dust, noise, pollution as well as water and soil contamination were applied in accordance with the prescribed legislation.
- Should any farming activities have been affected, produce and harvest resulting therefrom should be certified as being fit and safe for human consumption.
- Although as rightly indicated in the report, the applicant cannot be held accountable for the detrimental influences by third parties further downstream due to the reduced water flows, the applicant should still act in a responsible manner and collaborate with the authorities and other stakeholders to make information available in a timeous manner as to his intentions or actions, so as to enable effective and appropriate downstream actions and mitigation measures.
- The monitoring and evaluation programme should have an early detection method in respect of any contamination threats particularly radiation threats and other radiological hazards.

- Public mediums such as the Wonderfontein - Loopspruit forum or its successor should be kept informed of development so that it can disseminate information to its members and wider audience.

The City of Johannesburg has requested that the following recommendations be included in the EMPr:

- Structures to slow the flow velocity upon discharge into the Klein Wes Rietspruit must be green infrastructure (please not that this recommendation is not applicable to this specific BA process, which deals with the closure of the underground workings only).
- Structures used to attenuate flow within the Klein Wes Rietspruit must be green infrastructure. Gabions or riprap may be utilised however green infrastructure designs must be applied (please not that this recommendation is not applicable to this specific BA process, which deals with the closure of the underground workings only).
- The polluted wetland to the north-west of the Peter Wright Dam must be remediated and the source of uranium pollution be removed. This wetland must form part of the rehabilitation strategy.

Additional recommendations include:

- A specific case of communication with Mr De Andrade of Lucky Farms refers. J&W suggests that the communication established by Mr Hira (who has since left EMC), must be continued by EMC. EMC has stated that Ms Ethne Makgasane-Lefakane has taken over this portfolio from Mr Hira and will continue to engage with Mr de Andrade on his proposal and queries.
- The Council for Geoscience has suggested and J&W agrees that new developments within the affected area (compartment), especially during the first 7 years should be restricted until the full extent of the impact of re-watering has been experienced (approximately 7 years) and a steady state situation has been reached.

Label	Latitude	Longitude
L1	S26 21 59.67258	E027 42 13.17335
L2	S26 23 46.18706	E027 41 59.96351
L3	S26 25 21.78328	E027 40 53.10271
Kwr 2	S26 24 15.94571	E027 46 39.42539
Kwr 1	S26 24 06.84281	E027 46 12.21338
N9	S26 22 03.77159	E027 44 19.89860
Peter Wright Dam	S26 21 47.73161	E027 43 47.24113
W18	S26 16 51.52491	E027 40 59.75028
WS001	S26 17 19.57508	E027 40 09.36853

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SIBANYE GOLD: EZULWINI MINING COMPANY (PTY) LTD
Cessation of Pumping Operations at Ezulwini (Closure Plan)
Surface Water Quality Points

Job No: F925-160

Figure 5-2

Monitoring Point	Latitude	Longitude
BH1	S26 20 24.59994	E027 43 53.70597
BH2	S26 20 51.98154	E027 42 18.28438
BH3	S26 20 04.42555	E027 42 19.69199
BH4	S26 19 30.97794	E027 41 11.92916
BH5	S26 18 33.68755	E027 42 59.30637
BH6	S26 17 29.99996	E027 40 28.40156
C2N0011	S26 18 31.39076	E027 39 55.43997
C2N0012	S26 17 37.67874	E027 39 56.69998
C2N0322	S26 16 51.67073	E027 43 08.39998
C2N06	S26 20 07.33075	E027 47 51.43197
C2N249	S26 18 28.36675	E027 44 12.47996
C2N33	S26 20 42.82676	E027 46 23.69997
G1104A	S26 20 18.23876	E027 41 03.29998
G1111	S26 18 40.85876	E027 40 21.35998
G1111A	S26 18 40.85875	E027 40 20.63996
G1120	S26 19 57.17874	E027 48 37.79997
LENZ2	S26 19 35.39875	E027 49 04.33196
LENZ3	S26 18 19.00676	E027 48 55.97996
NORTH OF TRAINING CENTRE	S26 17 50.27876	E027 43 36.58798
OLD COROBRICK FARM	S26 21 02.62674	E027 49 18.58799
RC5	S26 20 28.49873	E027 46 21.35997
RWB1	S26 18 04.03074	E027 48 49.03198
SY13A	S26 20 57.58674	E027 46 56.45998
SY2 (C2N625)	S26 20 52.15074	E027 45 51.58796
ZM32A	S26 18 56.08673	E027 47 05.38798
ZM36 (C2N606)	S26 18 22.39074	E027 46 30.97196
ZM45	S26 19 35.93876	E027 47 02.03998
ZM47	S26 19 13.33076	E027 47 24.64798

N

C2N0322
BH6
C2N0012
NORTH OF TRAINING CENTRE
RWB1
LENZ3
ZM36 (C2N606)
C2N249
BH5
C2N0011
G1111
G1111A
ZM32A
ZM47
BH4
ZM45
LENZ2
G1120
BH3
C2N06
G1104A
BH1
RC5
C2N33
BH2
SY2 (C2N625)
SY13A
OLD COROBRICK FARM

Legend

- Gemsbokfontein Eye
- Existing Boreholes
- New Boreholes
- Dyke

0 0.5 1 2 3 4 Kilometers

Jones & Wagener
Engineering & Environmental Consultants
59 Bevan Road PO Box 1434 Rivonia 2128 South Africa
tel: 0027 11 519 0200 www.jaws.co.za email: post@jaws.co.za

SIBANYE GOLD: EZULWINI MINING COMPANY (PTY) LTD
Cessation of Pumping Operations at Ezulwini (Closure Plan)
Groundwater Monitoring Network

Job No: F925-160

Figure 5-1

Groundwater chemical suite to be monitored:

- pH.
- Electrical Conductivity (EC).
- Total Dissolved Solids (TDS).
- Suspended Solids (SS).
- Chloride (Cl).
- Sodium (Na).
- Sulfate (SO4).
- Ammonium (NH4 as N).
- Nitrate (NO3 as N).
- Phosphate (PO4 as P).
- Calcium (Ca).
- Magnesium (Mg).
- Aluminium (Al).
- Iron (Fe).
- Cadmium (Cd).
- Copper (Cu).
- Fluoride (F).
- Manganese (Mn).
- Nickel (Ni).
- Lead (Pb).
- Boron (B).
- Zinc (Zn).
- Uranium (U).
- Total Cyanide (CN).
- Chemical Oxygen Demand (COD).
- Gross Alpha and Beta radioactivity analysis.

Surface water chemical suite to be monitored:

- pH (including field measurement).
- EC (including field measurement).
- Total Dissolved Solids (TDS).
- Suspended Solids (SS).
- Calcium (Ca).
- Magnesium (Mg).
- Sodium (Na).

- Potassium (K).
- Calcium hardhardness.
- Magnesium hardhardness.
- Total hardhardness.
- Ammonium (NH4 as N).
- Nitrate (NO3 as N).
- Phosphate (PO4 as P).
- Sulphates (SO_4)
- Chloride (Cl).
- Uranium (U).
- Chemical Oxygen Demand (COD).
- M Alk.
- P Alk.
- Aluminium (Al).
- Iron (Fe).
- Cadmium (Cd).
- Copper (Cu).
- Fluoride (F).
- Manganese (Mn).
- Nickel (Ni).
- Lead (Pb).
- Boron (B).
- Zinc (Zn).
- Total Cyanide (CN).
- Gross Alpha and Beta radioactivity analysis.

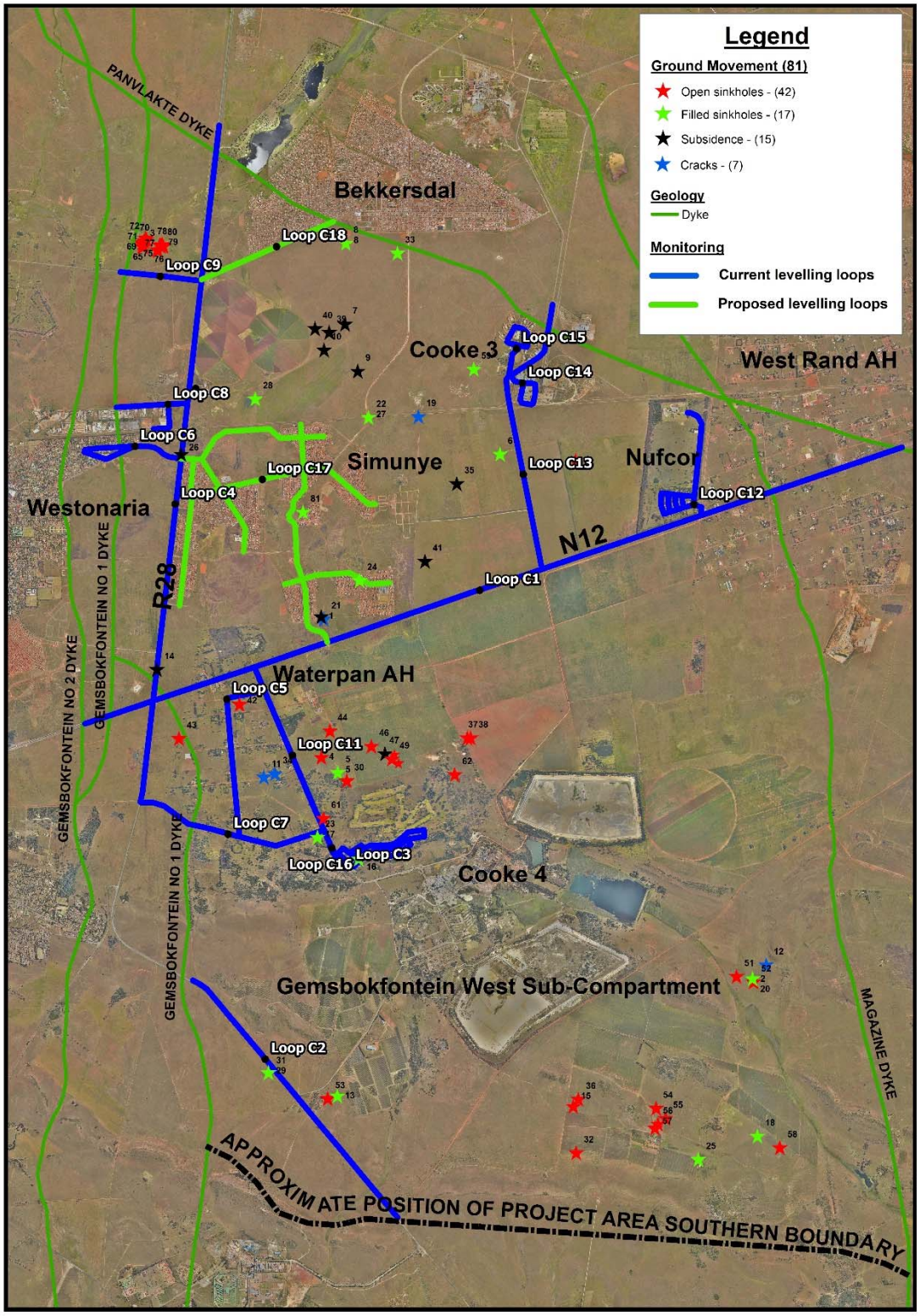


Figure 5-3: Location of Dolomitic Stability Monitoring Loops.

Table 5-2: Original levelling routes / ground movement monitoring loops.

Original Routes No.	Current Route No.	Name of Area	Peg Numbering	No. of Pegs	Major Movement
2	C10	D_ANDRADE	GP	11	
3		Backfill Doline	BF	18	
5	C9	Bdal_Vpost_road	B1, VP	62	
8		Instant Lawns	IL	17	
9	C1	Jhb Road P3_6	J	195	J/21 - 25mm
9a		Potch Road _P3_6	P2	19	
10	C4	Rftn Road P45	R	182	R/137 - 30mm
10a		Rftn Road P45 RANDRDDP	A; B; C; D; F	30	
10b		Rftn Road P45 RANDRD2	R 2	31	RP/M - 150mm
14	C12	Nufcor Road	NUF	56	
15		Nufcor Industry	P	42	
17		RWB Pipe Bekkersdal	BP	37	
18		RWB Pipeline	WP; STD; RW	54	
18b		RWB Pipeline Ext	RW	8	
19		Railway Line (Dept.)	P13/4 - P15/4	32	P13/15 - 520mm; P14/5 - 320mm
19a		Railway line	BMX/6 - P18/3	128	
20	C4	Vereeniging Road P118_1 (N)	V/1 - V/25	26	
20a		Vereeniging Road P118_1 (S)	V/60 - V/96	39	
21	C6	Westonaria & Industry	GMS; CA etc.	191	WIN/14 - 18mm
22		Waterpan Village Dirtroad	WAG 80 - 62	18	
22a	C3	Waterpan Village Roads	WP25 - WAG 62	81	WAG/30 - 56mm; WAG/62 400mm; WAG/92 600mm; WAG/93 - ±500mm
23		Waterpan Village East-DRD			
24		Witbrick Shops	J; PTN	19	
25	C5, C11 & C16	Waterpan Agricultural Holdings	AC; AL etc.	358	EL/16 - 198mm; EL/6 - 187; AL/14 - 128mm; AC/18 - 300mm; UR/21 - 187mm
25a	C7	Waterpan Agricultural Holdings (WAH)	PA10 - PA37	73	PA/28-110mm
26	C5	Waterpan Agricultural Holdings (WAH)	AD; BR etc.	210	
27		Waterpan Agricultural Holdings (E)			
28		North South Mine Road	NS	31	
29	C2	Leeuspruit Inlier Road	LS	55	
31		ex Bloem's House	BL	7	
32		Jachtfontein Burger	JA	9	
33	C13	RE Road	RE	74	
34	C14	RE Shaft	RS	21	
35	C15	RE Hostel	RH	24	
36		RE Vent	RV	9	
37		Tavland Crack	TV	4	

6. PARTIAL CLOSURE LIABILITY

This financial provision is only for the amount required to close the underground workings (including post closure activities) and the monitoring programmes associated therewith and suggested by specialists. The amount was calculated by gathering current monitoring costs from EMC and specialists and adding a 6% annual increase per item. All costs exclude VAT.

As extracted from EMC's letter regarding financial provision "As per the requirements of the MPRDA, 2002 EMC is legally obliged to make financial provision for environmental liabilities associated with any premature/unscheduled closure of the mine and associated operations. Golder Associates (Golder) has been historically involved in updating and revising the closure costs for Ezulwini on an ongoing basis. The conceptualised closure measures utilised for the purposes of the detailed closure cost as at 31st December 2016, has determined the **unscheduled closure liability for Ezulwini Mine to be R142.5 million**. The closure provision is aligned with the measures from the corresponding Environmental Management Plans for the Ezulwini operation, which has been agreed to by the DMR. The J&W assessment of the partial closure scenario has identified a closure liability of R14,9 million. This provision is sufficiently covered within the unscheduled closure liability of **~R142.5 million** (2015: R126 million) which has been provided for through a number of Guardrisk insurance guarantees with the DMR as guarantor. This will be reviewed and confirmed in the 2017 Ezulwini closure assessment by Golder.

EMC is in the process of aligning the closure liability assessment processes and associated financial provisions, to the November 2015 Financial Provisioning Regulations (Regulation 1147).

In summary:

(i) The current financial provision for Ezulwini's closure liabilities totaling R142.5 million is adequate as per the stated liability of 31st December 2016, and is fully-funded for all intents and purposes;

(ii) J&W assessment of the partial closure scenario has identified a closure liability of R14,9 million which excludes the plugs that will be implemented between the Cooke 3 shaft and Cooke 4 shaft as well as between the Cooke 4 shaft and the South Deep shaft;

(iii) The R14.9 million closure liability is sufficiently covered in the 31st December 2016 closure liability for Ezulwini of R142.5 million which will be reviewed as part of the Golder annual assessment;

(iv) The 2017 Ezulwini closure assessment by Golder is currently underway;

(v) The financial provision relating to the closure of the Ezulwini shaft includes inter alia:

a. The dismantling of steel structures, reinforced concrete structures including the shaft headgear and conveyors

b. Demolition of winder houses and related equipment, the demolition of the plinths and associated heavy duty flooring in all winder houses

c. Plug vertical and ventilation shafts according to DMR standards. The cap consists of a reinforced concrete plug, rock anchors, suspended shuttering and steel beams covering the shaft opening with final infilling to ground level

d. Post closure aspects of surface and ground water monitoring

e. Allowances of 12% for P&Gs of the total for infrastructural and related aspects

f. Allowances for 10% for contingencies of the total for infrastructural and related aspects

EMC are of the opinion that the 31st December 2016 **unscheduled closure liability for Ezulwini Mine of R142.5 million** externally assessed by Golder adequately covers the partial closure scenario. This assumption however will be interrogated as part of the Golder review of the closure liability assessments. As per the regulations, this is an ongoing annual assessment review."

Existing financial guarantees and EMC's letter regarding financial provision have been included in Appendix G of the BAR.

Please refer to **Table 6-1** for the financial provision required for the cessation of pumping.

Table 6-1: Partial Closure Costs for cessation of pumping at EMC.

	Pre-pumping cessation and mine re-watering		Aquifer Recovery							Gemsbokfontein Eye Flowing			
	COST/YEAR (6% annual escalation)												
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	TOTAL COST
Developing photographic record of existing cracks in structures in surrounding areas	R 10 000												R 10 000
Sinkhole and subsidence monitoring (LIDAR 10cm)	R 262 170	R 262 170	R 262 170	R 262 170	R 262 170	R 262 170	R 262 170	R 262 170	R 262 170	R 262 170	R 262 170	R 262 170	**R 3 146 040**
Sinkhole and subsidence damage - rehabilitation			R 228 571	R 271 429	R 301 555	R 470 455	R 600 090	R 928 571	R 928 571				**R 3 729 242**
Groundwater quality and quantity monitoring	R 32 782	R 49 262	R 66 926	R 70 942	R 75 198	R 79 710	R 84 493	R 89 562	R 94 936	R 100 632	R 59 782	R 63 369	**R 867 594**
Surface water quality and quantity monitoring	R 224 564	R 259 678	R 275 258	R 291 774	R 309 280	R 327 837	R 347 507	R 368 358	R 390 459	R 415 914	R 440 869	R 467 321	**R 4 118 819**
Wetlands, biomonitoring and aquatics monitoring	R 120 000	R 127 200	R 134 832	R 142 922	R 151 497	R 160 587	R 170 222	R 180 436	R 191 262	R 202 737	R 214 902	R 227 796	**R 2 024 393**
TOTAL	**R 649 516**	**R 698 310**	**R 967 757**	**R 1 039 237**	**R 1 099 700**	**R 1 300 759**	**R 1 464 482**	**R 1 829 097**	**R 1 867 398**	**R 1 293 674**	**R 1 307 177**	**R 1 368 378**	**R 14 885 485**

As the surface operations will continue, certain monitoring activities will be made provision for under the operational budgets and/or provided for under ongoing liability assessments and financial provisions. Please refer to the letter in Appendix G of the BAR.

Gina Martin
Environmental Scientist

Marius van Zyl
Project Manager

for Jones & Wagener

References[6]

Bruce, D.A., Wells, M.F. and Venter, J., 2006, Construction of permanent intruded plugs at South Deep Gold Mine, *The Journal of the South African Institute of Mining and Metallurgy*, Volume 106.

Department of Environmental Affairs, 2014, *National Environmental Management Act, 1998 (Act 107 of 1998), Environmental Impact Assessment Regulations, 2014,* Government Gazette 38282, Government Notice 982 of 4 December 2014 (as amended), Government Printer, Pretoria.

Department of Environmental Affairs, 2014, *National Environmental Management Act, 1998 (Act 107 of 1998), Listing Notice 1: List of activities and competent authorities identified in terms of Section 24(2) and 24D,* Government Gazette 38282, Government Notice 983 of 4 December 2014 (as amended), Government Printer, Pretoria.

Department of Mineral Resources, 2016, *Approval of an Amended Environmental Management Programme in support of the mining right issued in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA), on the Farms Jachtfontein 344 IQ, Modderfontein 345 IQ, situated in the Magesterial District of Westonaria*, Reference Number: GP 30/5/1/2/2 (38) MR.

Department of Water Affairs and Forestry, 2008, *Best Practice Guideline G4: Impact Prediction*.

Department of Water Affairs and Forestry, 2008, *Best Practice Guideline G5: Water Management Aspects for Mine Closure*.

Ezulwini Mining Company (Pty) Ltd, 2013, *Amended Mining Work Programme*, Reference Number: GP (38) MR; GP (307) PR amended to GP 10151 RPR.

Far West Rand Dolomitic Water Association, 1986, *Constitution: Far West Rand Dolomitic Water Association*.

Golder Associates, 2015, *Update and Revise the Closure Costs for Randfontein Mining Areas including Cooke, Ezulwini and RUSO*, as at December 2015, Report Number: 1530599-299837-5.

Jones & Wagener (Pty) Ltd, 2017, *Ezulwini Partial Closure Geohydrological and Geotechnical Assessment*, Report Number: JW243/16/F925.

Jones & Wagener (Pty) Ltd, 2017, *Specialist Surface Water Report as Input to the Environmental Authorisation Process for the Closure of the Ezulwini Underground Workings*, Report Number: JW241/16/F925.

National Nuclear Regulator, 2008, *Ezulwini Mining Company (Pty) Ltd Certificate of Registration*, Numner COR-190.

Natural Scientific Services cc, 2017, *Closure of Sibanye Gold Ezulwini Operations: Ecological Assessment*, Report Number: 2321.

Oliver, L.J., Swart, A.H. and Brawner, C.O., 2006, In-service monitoring of water barrier project at South Deep Gold Mine, *The Journal of the South African Institute of Mining and Metallurgy*, Volume 106.

[6] Other references referred to in this report are cited in the specialist studies.

Ortlepp, W.D. and Stacey, T.R., 2006, Assessment of the risk of plug or water barrier failure due to seismicity at South Deep Mine, *The Journal of the South African Institute of Mining and Metallurgy*, Volume 106.

Shangoni Management Services (Pty) Ltd, 2015, *Sibanye Gold: Ezulwini Mining Company (Pty) Ltd – Cooke 4 Operation, Amended Environmental Management Programme*, Project Number: EZU-COO-14-09-25.

Shangoni Management Services (Pty) Ltd, 2015(2), *Sibanye Gold: Ezulwini Mining Company (Pty) Ltd – Cooke 4 Operation, Underground Mining Extension, Environmental Management Programme Addendum (in support of a Section 102 Application)*, Project Number: EZU-COO-14-09-25.

Sibanye Gold: Cooke 4 Mining Operations, 2014, *Social and Labour Plan, 2012 to 2016*.

Sibanye Gold, 2017, *Cooke Operations: Mandatory Code of Practice for Emergency Preparedness and Response – Cooke 3# to Ezulwini (Cooke 4#) Water Plug Failure*.

Sibanye Gold Limited, 2017, *Report on the evaluation of options and alternatives to the closure of the underground workings at Ezulwini Mine*.

South Africa, Republic, 1995, *Labour Relations Act, Act No. 66 of 1995,* Government Printer, Pretoria.

South Africa, Republic, 1998, *National Water Act, Act No. 36 of 1998,* Government Gazette 19182, Government Printer, Pretoria.

South Africa, Republic, 1998, *National Environmental Management Act, Act No. 107 of 1998,* Government Gazette 19519, Government Printer, Pretoria.

South Africa, Republic, 1999, *National Nuclear Regulator Act, Act 47 of 1999*, Government Printer, Pretoria.

South Africa, Republic, 2002, *Mineral and Petroleum Resources Development Act, Act No. 28 of 2002,* Government Gazette 23922, Government Printer, Pretoria.

South Deep, 2017, *Flood Evacuation Procedure*, Document Number: SD-SAF-GEN-PRC-009.

Southern Economic Development, 2017, *Socio-Economic Impact Assessment of the Proposed Cessation of Pumping and Associated Closure of the Underground Workings of the Ezulwini Operations of Sibanye Gold, Gauteng Province*.

SRK Consulting, 2017, Assessment of the *water barrier pillar and the water plugs placed between Ezulwini Shaft and South Deep shaft*, Report Number: 507589/1.

SRK Consulting, 2017, Assessment of the *water barrier pillar and positioning of future plugs between Cooke 3 and Ezulwini shafts*, Report Number: 507589/2.

SRK Consulting, 2017, *Design of Ezulwini / Cooke 3 Plugs - Phase 3*, Report Number: 507569/3.

SRK Consulting, 2017, *Assessment of the safety risk as result of a sudden water inrush at Cooke 3*, Report Number: 516896/1.

Western Areas Limited, 2005, *Western Areas Continues to Deliver*, media statement, Western Areas Limited, viewed 7 February 2017, from http://www.sharenet.co.za/free/sens/disp_news.phtml?tdate=20051020151101&seq

10 October 2017
Document source: D:\Alljobs\F925_EzulwiniMineClosure\Reports\Closure\FinalCP\Final\F925-00_REP_r3_gm_MvZ_ClosurePlan_20171010_.docx
Document template: Normal.dotm

APPENDIX 1

NNR CERTIFICATE

Certificate Of Registration

IN TERMS OF THE NATIONAL NUCLEAR REGULATOR ACT, 1999 (ACT NO. 47 OF 1999)

CERTIFICATE OF REGISTRATION NO. COR-190

Certificate of Registration No. COR-190 is hereby granted by the National Nuclear Regulator (hereinafter referred to as the NNR) in terms of section 22 of the above Act

to

EZULWINI MINING COMPANY (PTY) LIMITED

Registration number:	2004/028640/07
Registered address:	5 Press Avenue Selby Johannesburg 2135

(hereinafter jointly and severally referred to as the holder)

subject to the terms and conditions set out herein.

G A Clapisson
ACTING CHIEF EXECUTIVE OFFICER

AUTHORISATION CONDITIONS
PART 1: GENERAL CONDITIONS

1.1 SCOPE

1.1.1 The holder is authorised to carry out activities associated with radioactive material as set out, and on the site as identified, in section 2.1 of this Authorisation.

1.2 HAZARD ASSESSMENT

1.2.1 Assessments, approved by the NNR, shall be conducted by the holder in respect of all operations and activities involving radioactive material set out in section 2.1 of this Authorisation which could give rise to a risk of nuclear damage. The assessments must identify and quantify all potential radiation hazards:

1.2.1.1 to persons employed at or visiting the site

and

1.2.1.2 to members of the public.

1.2.2 Details of any proposed modification to existing facilities or amendment of any procedure or construction of any facility, which may have an effect on the risk of nuclear damage and which has not been addressed by the hazard assessments identified in section 2.2 of this Authorisation, together with a quantitative assessment of its impact on the risk of nuclear damage, shall be submitted to the NNR by the holder. Such proposals shall be approved by the NNR before being implemented.

1.3 OPERATIONAL LIMITATIONS

1.3.1 The limitations pertaining to normal operations and listed in section 2.3 of this Authorisation shall be adhered to.

1.3.2 No activities involving the demolition or disposal of any plant used for the processing of radioactive material shall be undertaken prior to approval by the NNR of the radiation hazard assessment and the radiation protection programme for such activities.

1.4 OPERATIONAL RADIATION PROTECTION

1.4.1 WORKFORCE

1.4.1.1 Based on the results of the assessments referred to in clause 1.2.1, programmes embodying all aspects as required by NNR documents RD-006: "Requirements for the Control of Radiation Hazards: Mining and

minerals Processing", and RD-011: "Requirements for Medical Surveillance and Control of Persons Occupationally Exposed to Radiation: Mining and Minerals Processing", in the revisions specified in section 2.4.1, must be established and be submitted to the NNR for approval. These programmes must ensure and demonstrate that radiation doses to persons employed at the site and to visitors to the site are in compliance with the radiation dose limitation system set down in the NNR document RD-010: "Requirements for Radiation Dose Limitation: Mining and Minerals Processing", in the revision specified in section 2.4.1 of this Authorisation. The programmes, as approved by the NNR, shall be implemented by the holder.

1.4.1.2 The provisions contained in the revision of documents listed in section 2.4.1 of this Authorisation and submitted in terms of condition 1.4.1.1 of this Authorisation, shall be adhered to.

1.4.2 PUBLIC

1.4.2.1 Based on the results of the assessments referred to in clause 1.2.1, programmes embodying all aspects as required by NNR document RD-007: "Requirements for Control over Radioactive Effluent Discharges and Environmental Surveillance: Mining and Minerals Processing", in the revision specified in section 2.4.2 of this Authorisation, must be established and be submitted to the NNR for approval. These must ensure and demonstrate that radiation doses to members of the public are in compliance with the radiation dose limitation system set down in the NNR document RD-010: "Requirements for Radiation Dose Limitation: Mining and Minerals Processing", in the revision specified in section 2.4.1 of this Authorisation. The programmes, as approved by the NNR, shall be implemented by the holder.

1.4.2.2 The provisions contained in the revision of documents listed in section 2.4.2 of this Authorisation and submitted in terms of condition 1.4.2.1 of this Authorisation, shall be adhered to.

1.5 RADIOACTIVE WASTE

1.5.1 A radioactive waste management programme embodying all the requirements contained in the NNR document RD-004: "Requirements for Radioactive Waste Management: Mining and Minerals Processing", in the revision specified in section 2.5 of this Authorisation, shall be established and submitted to the NNR for approval.

1.5.2 The provisions contained in the revision of documents listed in section 2.5 of this Authorisation and submitted in terms of condition 1.5.1 of this Authorisation, shall be adhered to.

1.6 TRANSPORTATION

1.6.1 Transportation of radioactive material or of any equipment or objects contaminated with radioactive material off the site or on roads which are accessible to the public must be carried out in terms of the provisions of the Regulations for the Safe Transport of Radioactive Material of the International Atomic Energy Agency in the revision specified in section 2.6 of this Authorization.

1.6.2 An annual report shall be submitted to the NNR detailing the number of consignments made during the preceding year, the radioactive content per consignment, the nature of the packaging and the names of the consignees.

1.6.3 The provisions contained in the revision of documents listed in section 2.6 of this Authorisation and submitted with regard to condition 1.6.1 of this Authorisation, shall be adhered to.

1.7 PHYSICAL SECURITY

1.7.1 A physical security system, approved by the NNR, which will prevent unauthorized access to areas containing radioactive material and which will prevent the unauthorized removal of such material, shall be in place.

1.7.2 The provisions contained in the revision of documents listed in section 2.7 of this Authorisation and submitted in terms of condition 1.7.1 of this Authorisation, shall be adhered to.

1.8 OCCURRENCES

1.8.1 An occurrence reporting mechanism, approved by the NNR, shall be established which will ensure that occurrences, including incidents and accidents as defined in the National Nuclear Regulator Act (Act No 47 of 1999), and as identified in the NNR document RD-012: "Notification Requirements for Occurrences: Mining and Minerals Processing", in the revision specified in section 2.8 of this Authorisation, are reported to the NNR by the holder in accordance with the provisions of that document and as specified by NNR document RD-009: "Verbal Emergency Communication with the National Nûclear Regulator: Mining and Minerals Processing", in the revision specified in section 2.8 of this Authorisation.

1.8.2 An emergency plan, approved by the NNR, shall be established to make provision for any occurrence involving radioactive material which gives rise to, or has the potential to give rise to, an unplanned exposure to radiation in excess of the respective annual effective dose limits for persons employed on the site, visitors to the site, and members of the public. This plan shall comply with the requirements contained in NNR document RD-008: "Requirements for Emergency Preparedness: Mining and Minerals Processing", in the revision specified in section 2.8 of this Authorisation.

1.8.3 The provisions contained in the revision of documents listed in section 2.8 of this Authorisation and submitted in terms of condition 1.8.1 and 1.8.2, shall be adhered to.

1.9 QUALITY MANAGEMENT

1.9.1 All activities carried out within the scope of this Authorisation shall be subject to the requirements contained in the NNR document RD-005: "Quality Management Requirements for Activities Involving Radioactive Material: Mining and Minerals Processing", in the revision specified in section 2.9 of this Authorisation.

1.9.2 The provisions contained in the revision of documents listed in section 2.9 of this Authorisation and submitted in terms of condition 1.9.1 of this Authorisation, shall be adhered to.

1.10 SCHEDULE

1.10.1 The programme, scheduling the achievement of compliance with the conditions of this Authorisation, as set out in section 2.10 shall be adhered to.

This Certificate of Registration is effective from the date of issue.

Issued at Centurion on the 5th day of August 2008.

G A Clapisson
ACTING CHIEF EXECUTIVE OFFICER

QUALITY MANAGEMENT POLICY

Ezulwini Mining Company (Pty) Limited is committed to meet the requirements of the National Nuclear Regulator laid down in the Certificate of Registration, COR190 and in the RD-005 issued to the Company through continual improvement of the radiation protection and quality management systems

OBJECTIVES

- Exposures of employees and affected members of the public will be minimized in accordance with the ALARA principle. Doses will be kept to the following limits:
  - Employees: 100mSv over a 5 year period but not exceeding 50mSv in a single Year
  - Members of the public: 250μSv/a
- All items leaving the mine premises will be effectively decontaminated to prevent any nuclear damage to property, persons or the environment
- Contaminated redundant operations will be decontaminated to national clearance Standards

S.T. Mthethwa
GENERAL MANAGER

APPENDIX 2

SIBANYE POLICY STATEMENTS

Sibanye GOLD
We are One

CARBON MANAGEMENT

POLICY STATEMENT

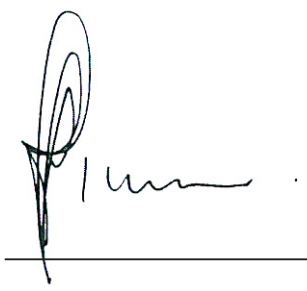
Sibanye Gold Limited recognises that global warming and associated climate change is a reality that requires global action. Considering our commitments to ensure our position as a proudly South African Gold Mining company and our vision of being the premier leader in sustainable gold mining, Sibanye Gold Limited is committed to contributing to a global solution through the deployment of responsible strategies and actions.

To attain the overall vision, the company is committed to:

- designing and implementing strategies that seek to reduce the carbon footprint of the company, improve our energy efficiency, pursue any potential opportunities and utilise carbon friendly technologies where feasible;
- determining the risks that climate change may present to the company and assigning appropriate actions to mitigate such risks;
- accurately determining our carbon footprint and providing comprehensive disclosure on carbon related issues;
- complying with applicable legal requirements and with other requirements to which the organisation subscribes, that relate to carbon management; and
- encouraging business partners and suppliers to adopt similar principles.

Sibanye Gold Limited understands that our employees and business partners play a crucial role in achieving the objectives as set out above and as a result the company commits to:

- improving awareness regarding carbon related issues;
- providing an enabling environment to achieve carbon savings and the deployment of innovations; and
- ensuring that carbon management considerations are included into the decision making process.



Neal Froneman
Chief Executive Officer

June 2013

Date

SibanyeGOLD
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ENVIRONMENTAL

POLICY STATEMENT

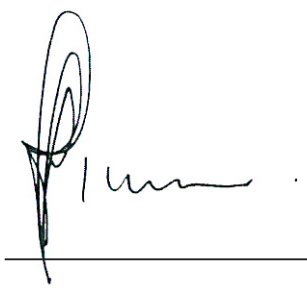
Sibanye Gold Limited undertakes its activities in a manner that strives to minimise or rectify adverse impacts and maximise positive impacts of an environmental or socio-economic nature. The company is committed to responsible stewardship of natural resources and the ecological environment for present and future generations.

Sibanye Gold Limited is committed to:

- the assessment and meeting of the requirements of industry standards with respect to the environmental management practices;
- the implementation, maintenance and integration of internationally recognised environmental management systems that ensure continual improvement of environmental performance and the prevention of pollution through recognised practices;
- complying with applicable legal requirements and with other requirements to which the organisation subscribes, that relate to its environmental aspects;
- efficient use of resources and responsible management of all waste streams;
- contributing to the conservation of biodiversity and applying integrated approaches towards closure and post mining land use planning; and
- establishing an appropriate level of awareness and training of employees with environmental responsibilities, as required.

Employees of Sibanye Gold Limited, play a fundamental role in achieving these objectives by:

- taking ownership of responsible environmental management programmes and initiatives;
- reacting and adhering to the company's environmental policy and principles; and
- integrating environmental concerns into everyday practice.



Neal Froneman
Chief Executive Officer

June 2013

Date

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MATERIAL STEWARDSHIP AND SUPPLY CHAIN MANAGEMENT

POLICY STATEMENT

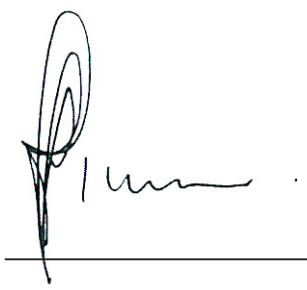
Sibanye Gold Limited strives to undertake its material stewardship and supply chain management activities in a manner that is sustainable and adheres to internationally recognised practices. To this end, we endeavour to ensure value added, cost effective and sustainable service delivery that enables our operations to achieve their strategic growth and productivity objectives.

To attain the overall vision, the company is committed to:

- integrating all aspects of material stewardship and supply chain management;
- encouraging our business partners to adopt similar practices with regards to sustainable development;
- being the "customer of choice" by securing sustainable and value driven relationships with our business partners;
- continually optimising and improving our processes to ensure on-going sustainability;
- to source, utilise, re-use and dispose of materials in a manner that is responsible with due regard to environmental, social, health and safety considerations;
- to support the economies of our host countries through the local procurement of services where practicable; and
- engaging with relevant stakeholders in an open manner regarding issues of material stewardship and supply chain management.

Employees of Sibanye Gold Limited, play a fundamental role in achieving these objectives by:

- taking ownership of responsible material stewardship and supply chain management protocol and initiatives;
- reacting and adhering to the company's material stewardship and supply chain management policy and principles; and
- integrating responsible material stewardship into everyday practice.



Neal Froneman
Chief Executive Officer

June 2013

Date

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WATER MANAGEMENT

POLICY STATEMENT

Sibanye Gold Limited values water as a key critical resource. The Company further considers its water systems infrastructure to be a strategic asset, and the effective and integrated management of water resources and systems as a key component of its business strategy.

Our vision for Water Management can be described as "effective, innovative and caring water resources and water systems management".

Sibanye Gold Limited is committed to deliver its water management vision, focusing on seven key strategic water management thrusts, or stone principles, namely:

- ensuring safe and fit-for-purpose water, including waters abstracted, used, stored and discharged;
- practicing continuous compliance by means of efficient operations, predictive compliance monitoring, incident management and, when necessary, responsive deployment of mitigating measures;
- developing and implementing studies, plans and dynamic models, including the water-management strategy water action plans, water and solids balances, a regional water model, closure plans and the required statutory plans;
- establishing and sustaining a fit-for-purpose mine water systems infrastructure, using the best available, but affordable technology, based on sound engineering management practices;
- working towards an optimal water footprint, based on the use of effective tools such as service-level agreements, water-resources/water-demand management systems, benchmarking, water-use audits, and water flow-and-load use and discharge optimisation;
- maintaining water ring-fenced water accounts and making users accountable for the use of water by means of comprehensive budgeting and costing;
- promoting water awareness and water stewardship by means of active participation and communication, by exercising duty of care and by providing local and professional communities with information, capacity building, technology assistance and related support services.

Neal Froneman
Chief Executive Officer

January 2014

Date