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Proposed Alexander Project

Preliminary Mine Closure Plan

SLR Project No.: 7YA.01080.00003

Report No.: 1

Rev 0

July 2016

Anglo American Inyosi Coal (Pty) Ltd

AngloAmerican

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EXECUTIVE SUMMARY

This preliminary closure plan has been prepared in accordance with GNR 1147 of the National Environmental Management Act (107/1998): Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations, published 20 November 2015 (Financial Provisioning Regulations, 2015).

The preliminary closure plan objectives and principles have been developed against the background of the project location in the Mpumalanga (Highveld) coalfields, and include the following:

- Environmental damage is minimised to the extent that it is acceptable to all parties involved.
- At closure, the land will be rehabilitated to achieve an end use of wilderness and grazing.
- All surface infrastructure and material stockpiles will be removed from site after rehabilitation and the shaft cavity will be completely backfilled with overburden, as well as, inert building rubble from the decommissioning activities, and then sealed.
- Contamination beyond the mine site by wind, surface run-off or groundwater movement will be prevented.
- Mine closure is achieved efficiently, cost effectively and in compliance with the law.
- The social and economic impacts resulting from mine closure are managed in such a way that negative socio-economic impacts are minimised.

Additional and more specific closure objectives may be tied to the final land use for the proposed project area, and these will be determined in collaboration with local communities and other stakeholders during the ongoing operations of the proposed mine.

The table below details the requirements of GNR 1147 and also the relevant sections in the report where these requirements are addressed.

GNR 1147 – Appendix 3, 4 and 5		**Relevant section in the report**
Annual Rehabilitation Report (Appendix 3)		
3(a)-(g)	Content of report	Section 12
Mine Closure Plan (Appendix 4)		
3(a)	Details of the specialists	Section 1
3(b)(i)	Material information	Section 2.1
3(b)(ii)	Environmental and social context	Section 2.2
3(b)(iii)	Stakeholder issues and comments	Section 2.3
3(b)(iv)	Mine plan and schedule	Section 2.4
3(c)(i)	Risk assessment methodology	Section 3.1
3(c)(ii)	Identification of indicators	Section 3.3
3(c)(iii)	Strategies to manage/mitigate risks	Section 3.2
3(c)(iv)	Reassessment of risks	Section 3.4

3(c)(v)	Changes to risk assessment results	n/a – will be identified during the ongoing operation of the mine
3(d)(i)	Legal and governance framework	Section 4.1
3(d)(ii)	Closure vision and objectives	Section 4.2
3(d)(iii)	Evaluation of alternatives	Section 4.3
3(d)(iv)	Motivation for closure option	Section 4.4
3(d)(v)	Motivation for closure period	Section 4.5
3(d)(vi)	Details of ongoing research	Section 4.6
3(d)(vii)	Assumptions made for closure	Section 4.7
3(e)(i)	Post-mining land use	Section 5
3(e)(ii)	Map of post mining land use	n/a – will be developed during the ongoing operation of the mine
3(f)(i)	Specific technical solutions	Section 6.1
3(f)(ii)	Threats and uncertainties	Section 6.2 – 6.4
3(g)(i)&(iii)	Schedule of actions	Section 7
3(g)(ii)	Assumptions and drivers	Section 7
3(h)(i)-(iii)	Organisational capacity and structure	Section 8
3(i)	Indication of gaps	Section 9
3(j)	Relinquishment criteria	Section 10
3(k)(i)	Closure cost estimate & accuracy	Section 11.1, 11.3 and Appendix C
3(k)(ii)	Closure cost estimate methodology	Section 11.2
3(k)(iii)	Annual updates	n/a – will be updated during the ongoing development of the mine
3(l)(i)-(iii)	Monitoring, auditing and reporting	Section 13, Appendix B
3(m)	Amendments to the closure plan	n/a – uncertainties and gaps will be investigated during the ongoing development of the mine, and the closure plan amended
Environmental Risk Assessment (Appendix 5)		
(a)	Details of the specialists	Section 1
(b)(i)	Risk assessment methodology	Section 3.1
(b)(ii)	Latent risk substantiation	Section 3.2, Table 3-2
(b)(iii)	Risk drivers	Section 3.2, Table 3-2
(b)(iv)	Expected timeframe	n/a – no latent risks identified
(b)(v)	Risk triggers	n/a – no latent risks identified
(b)(vi)	Risk assessment results	Section 3.2, Table 3-2
(b)(vii)	Changes to risk assessment results	n/a – can only be identified during the ongoing operation of the mine
(c)(i)	Monitoring to inform management	Section 3.4 (see Section 30 of EIA/EMP report)
(c)(ii)-(iv)	Alternative mitigation measures following impacts	n/a – can only be identified during the ongoing operation of the mine, and where current proposed mitigation measures prove inadequate
(d)(i)-(iii)	Cost estimation and accuracy	Overall cost estimate included in Section 11 and Appendix C. No latent risks costed.
(e)	Monitoring, auditing and reporting	Section 13, Appendix B

The calculated closure costs calculated are considered to have an accuracy of at least 70%, as required by the Financial Provisioning Regulations, 2015 (GNR 1147), and are summarised below. All the closure costs are at Current Value (CV) as at June 2016.

Time-frame	Closure Cost Calculations based on the following activities	Financial Liability incurred during the year (incl. VAT)	Progressive Financial Liability (incl. VAT)	Progressive Liability as a % of LOM liability
End of Year 1	Construction underway	R 21,163,672	R 21,163,672	25 %
End of Year 2	Construction ongoing	R 33,861,875	R 55,025,547	65 %
End of Year 3	Construction complete	R 25,396,406	R 80,421,953	95 %
End of Year 4	Mine operational for 1 year	R 4,232,734	R 84,654,687	100 %
End of Year 5	Mine operational for 2 years	R -	R 84,654,687	100 %
End of Year 6	Mine operational for 3 years	R -	R 84,654,687	100 %
End of Year 7	Mine operational for 4 years	R -	R 84,654,687	100 %
End of Year 8	Mine operational for 5 years	R -	R 84,654,687	100 %
End of Year 9	Mine operational for 6 years	R -	R 84,654,687	100 %
End of Year 10	Mine operational for 7 years	R -	R 84,654,687	100 %
LOM	**At LOM closure**	**R -**	**R 84,654,687**	**100 %**

The overall level of confidence in the closure cost liability can be further improved by addressing the uncertainties associated with the proposed closure option and also addressing the currently identified gaps, namely:

- Confirm the demolition and removal of all infrastructure (including buildings, powerlines, water supply and treatment, access roads etc.).
- Maintain a database of hazardous materials on site at closure, and the associated method of safe disposal.
- Generate an engineered capping solution for the vertical shaft and decline shafts, including allowance for methane venting and/or potential pressure exerted from groundwater rebound.
- Obtain site (and/or area specific) rates for the scheduled closure activities.

PRELIMINARY MINE CLOSURE PLAN

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ACRONYMS AND ABBREVIATIONS

Below a list of acronyms and abbreviations used in this report.

Acronyms / Abbreviations	**Definition**
AAIC	Anglo American Inyosi Coal (Pty) Ltd
ARD	Acid Rock Drainage
CV	Current Value
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
EML	Emalahleni Local Municipality
EMP	Environmental Programme Management
GMLM	Govan Mbeki Local Municipality
GNR	Government Notice Regulation
GSDM	Gert Sibande District Municipality
IAPs	Interested and Affected Parties
LOM	Life of Mine
MNCA	Mpumalanga Nature Conservation Act
NDM	Nkangala District Municipality
NEM:WA	National Environmental Management: Waste Act (No. 59 of 2008).
PES	Present Ecological State
SANBI	South African National Biodiversity Institute
SLR	SLR Consulting (Pty) Ltd
SMME	Small, medium and micro enterprise
WRD	Waste Rock Dump

PRELIMINARY MINE CLOSURE PLAN

1 SPECIALIST INPUT

1.1 SPECIALISTS THAT PREPARED THE CLOSURE PLAN

The details of the specialists who prepared this preliminary closure plan report are provided in Table 1-1 below:

TABLE 1-1: DETAILS OF THE SPECIALISTS

Details	Project Manager and Reviewer	Environmental Assessment Practitioner
Name:	Stephen van Niekerk	Marline Medallie
Tel No.:	011 467 0945	011 467 0945
Fax No.:	011 467 0978	011 467 0978
E-mail address	svanniekerk@slrconsulting.com	mmedallie@slrconsulting.com

Neither SLR nor any of the specialists involved in the preliminary mine closure plan process have any interest in the project other than fair payment for consulting services rendered as part of the preliminary mine closure plan process.

1.2 EXPERTISE OF THE SPECIALISTS

Stephen van Niekerk is a technical manager at SLR, holds a MSc Civil Engineering degree, has over 20 years of relevant experience and is registered as a Professional Engineer (#20010256) with the Engineering Council of South Africa (ECSA). Marline Medallie holds a MSc degree in Botany and has over 8 years of relevant experience in the assessment of impacts associated with mining operations.

2 CONTEXT OF THE PROJECT

2.1 MATERIAL INFORMATION

This preliminary closure plan has been prepared for Anglo American Inyosi Coal (Pty) Ltd (AAIC) in accordance with GNR 1147 of the National Environmental Management Act (107/1998): *Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations*, published 20 November 2015 (Financial Provisioning Regulations, 2015).

The proposed AAIC Alexander Project (between Kriel and Bethal in the Mpumalanga Province) will be an underground coal mining operation with a life of mine of approximately 30 to 35 years (including an approximate 3 year construction phase).

Access to the underground operations will be via a twin decline shaft (for personnel, material access and coal extraction) and one vertical shaft (for ventilation only). Only the No. 4 coal seam will be mined, at an approximate depth of 63 m below surface. The mining method will be the traditional bord and pillar method with cutting of the coal through continuous miner technology. The coal will be extracted to surface through a conveyor belt system linking to the decline shaft system.

There will be no processing plant at the proposed mine, since all ROM production will be transported via conveyor to Goedehoop, where it will be treated at that beneficiation plant facility.

The site layout and details are presented in Appendix A. Current and proposed mining operations in the area include various underground and opencast coal mines (Anglo – Kriel, Isibonelo, Elders and Goedehoop). The proposed mine project area currently comprises mainly cultivated land with small pockets of grazing land and water bodies.

2.2 ENVIRONMENTAL AND SOCIO-ECONOMIC OVERVIEW

The baseline environmental and socio-economic information is briefly summarised below. Additional information can be found in the EIA/EMP report.

2.2.1 TOPOGRAPHY

The proposed project area is located in a relatively flat to slightly undulating area with a protruding ridge line in the eastern and southern sections. The elevation on site is 1,600m above mean sea level (mamsl). The Steenkoolspruit runs through the centre of the proposed project site.

2.2.2 CLIMATE

The mean annual rainfall ranges from 625 and 675 mm per annum, falling mainly in the summer months between October and March. Average daily maximum temperatures range from 27.9°C in February to 18.9°C in July, with daily minimum temperatures ranging from 11°C in October to 1°C in July. Frost is frequently experienced during the winter months. The mean annual (Lake) evaporation is approximately 1373 mm per annum. The predominant wind directions are from the northeast and northwest.

2.2.3 GEOLOGY

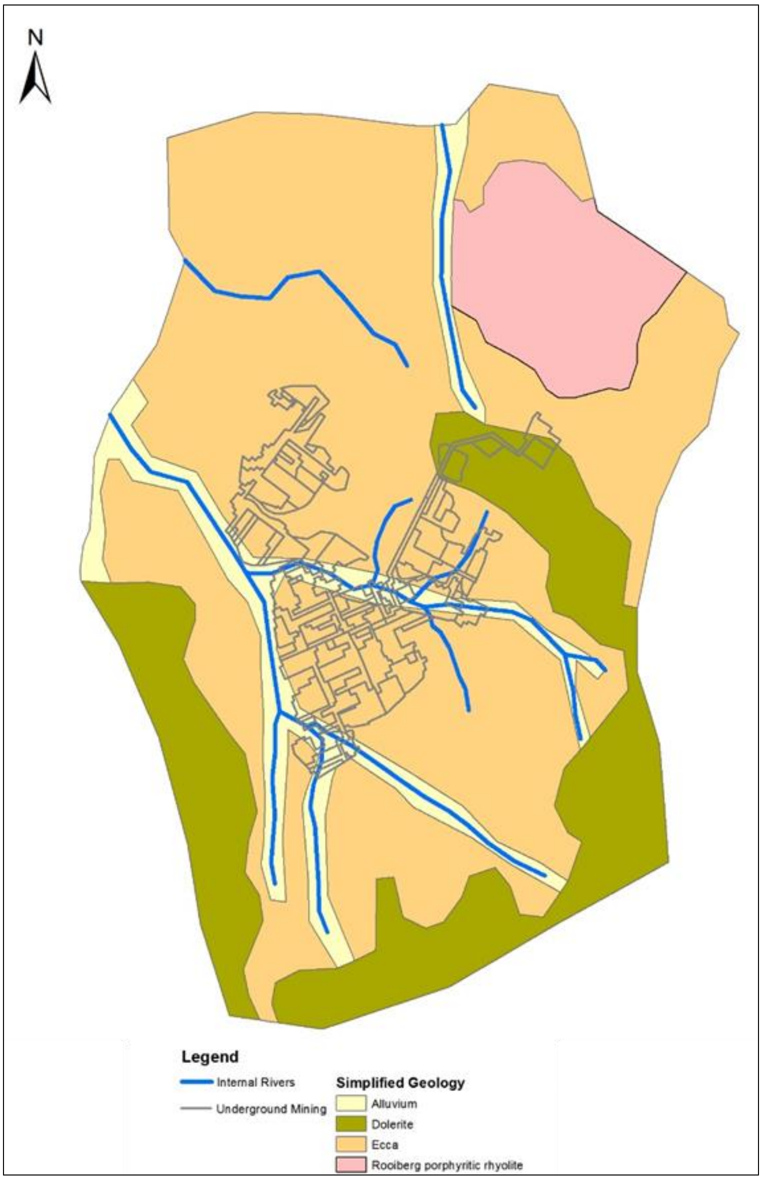
The proposed mining right area is located in the Highveld Coalfield. The geology beneath the project area comprises predominately sedimentary lithological units of the Vryheid Formation.

The Vryheid Formation consists of an interbedded succession of sandstone with subordinate siltstones, grit, mudstones and coal beds and forms part of the Ecca Group of the Karoo Supergroup. The Project Area has been extensively intruded by pre-Karoo dolerites in the form of sills and dykes.

The primary orebody that will be exploited as part of the proposed project is the No.4 Coal Seam. The average thickness of the ore body is 4.96 m, occurring at a depth of 63m below ground level.

Figure 2-1 shows a simplified geology of the Alexander Project area.

FIGURE 2-1: SIMPLIFIED GEOLOGY OF ALEXANDER PROJECT AREA



2.2.4 GEOCHEMISTRY

Geochemical tests and analysis indicate that the waste rock (and remaining underground roof rock material) is potentially acid generating however, the sulphur content of the rock (less than 0.3%) is too low to sustain acid generation for a significant length of time, and there is also significant neutralisation potential.

2.2.5 SOILS

In general soils located within the proposed project area are deep, well-drained sandy soils which allows for high infiltration rates and low organic content. The soils located within the proposed project area are acid in nature which lowers the soil fertility; however these soil forms are still suitable for dry land crop production with the addition of fertilizers.

2.2.6 LAND CAPABILITY

The current land capability within the proposed project areas is a mixture of arable land, grazing and wetland potential.

2.2.7 WETLANDS

Approximately 38% of the project area is covered with various wetland types. These include hillslope seepage wetlands in the majority, two large floodplain wetlands and depression/ pan wetlands.

The majority of wetlands in the study area, 58%, are Moderately Modified (Present Ecological State (PES) C), and 29%, are considered Largely Modified (PES D). Only around 8% of the wetlands in the study area are still considered to be in largely natural (PES B) condition, and consist almost exclusively of hillslope seepage wetlands that have not been significantly cultivated and have not been affected by gully erosion.

30% of the wetlands, consisting mostly of floodplain wetlands and hillslope seepage are considered to have high ecological importance and sensitivity.
The remaining wetlands were rated as being of Moderate (42%) or Low/Marginal (28%) ecological importance. The wetlands classed as being of low/marginal ecological importance consist mostly of hillslope seepage and valley bottom wetlands that have been seriously modified due to anthropogenic activities.

2.2.8 BIODIVERSITY

Although no protected areas or National Protected Area Expansion Strategy Focus Areas occur within the study area, various National Biodiversity Priority Areas in terms of the South African National Biodiversity Institute (SANBI) Grasslands Programme's Mining and Biodiversity Guidelines (2012) exist within the greater study area. The most predominant of which is classified as category D – Moderate Biodiversity Importance with a moderate risk for mining activities.

Furthermore, five of the identified habitats within the study area have High Biodiversity Value, namely Untransformed Grassland on Rocky Ridges, Untransformed Grassland on Hillslopes and Plateaus, Untransformed Grassland on Plains, Evergreen Thickets on Scarps and Wetlands. These are the key ecosystems that need to remain intact and functional. Impacts within these communities will have the highest significance levels and therefore the impact footprint should remain outside of these communities as much as possible.

Species of conservation concern confirmed within the study area include three faunal species classified as Vulnerable and five of which are Near Threatened. Fifteen of the floral species identified are protected under the Mpumalanga Nature Conservation Act (MNCA). There is also the likelihood of additional species of conservation concern being present.

2.2.9 SURFACE WATER

The perennial Steenkoolspruit runs through the centre of the proposed mining right area from east to west, and then along the western boundary. The Piekespruit flows through the southern part of the site, past a confluence with the Debeerspruit, along the western site boundary to a confluence with the Steenkoolspruit. West of the site the Trichardspruit flows in a northerly direction to a confluence with the Steenkoolspruit approximately 1.5 km north west of the project area.

The shaft complex is situated south of the Steenkoolspruit between two non-perennial unnamed tributaries of the Steenkoolspruit, both of which flow north into the Steenkoolspruit. The overland ROM conveyor route passes over the Steenkoolspruit and another non-perennial tributary which flows from the north-east to south-west and features several farm dams. Many of the smaller non-perennial watercourses within the project area feature dams, and a total of 34 dams were identified from aerial photography of the site.

The Steenkoolspruit and associated tributaries and wetlands are in limited hydraulic connection with the underlying groundwater. There is no groundwater contribution to sustain a continuous baseflow as the groundwater levels in the area are between 15 and 20 mbgl and therefore if any hydraulic connectivity exists there will be no waterbodies to maintain any wetlands.

Wetlands generally occur in localised areas where quasi-impermeable lenses of clays and silty-clays are present which will allow water to be stored and maintained in restricted “pockets.

Surface water resources are utilised for irrigation and livestock watering within or downstream of the project area and the possibility of surface water being used for human consumption cannot be ruled out.

2.2.10 GROUNDWATER

With reference to the local geology of the site, the primary aquifer type present is namely a lateral extensive shallow weathered zone aquifer with a moderate (in some places high) hydraulic conductivity. This aquifer extends over the entire study area and is extremely thick, with an average weathering depth/ vertical thickness of 13.92 m below surface. The bulk of the groundwater in this area will be stored and transported within this aquifer zone. The aquifer will also be highly susceptible to surface induced impacts and activities, due to the unconfined and semi- unconfined piezometric conditions that occur within the aquifer.

Groundwater levels over the study area vary from 5 to 65 metres below groundwater level, and is mainly used for domestic water, irrigation and livestock watering purposes.

2.2.11 SOCIAL

The project overlaps the Emalahleni Local Municipality (EML) and Govan Mbeki Local Municipality (GMLM) within the Nkangala District Municipality (NDM) and Gert Sibande District Municipality (GSDM) respectively, in Mpumalanga Province.

Mining in the GSDM are mainly concentrated in the GMLM and comprise of coal and gold mining operations. GMLM has a combination of coal, gold, silver and aggregate sand mining operations; with coal mines forming the majority of these – specifically Sasol mining operations. In ELM predominantly coal is mined.

The 2011 Census indicated that unemployment rates in the EML and GMLM both approximate to 27%, with 73% of the population being economically active. The mining sector is the highest contributor to economic growth and employment in the ELM and GMLM with 46% and 39% respectively.

2.3 STAKEHOLDER ISSUES AND COMMENTS

A summary of the issues and concerns raised by interested and affected parties (IAPs) and regulatory authorities (taken from the EIA/EMP report) that have specifically informed the preliminary closure plan is provided in Table 2-1 below.

TABLE 2-1: SUMMARY OF ISSUES RAISED BY IAPS AND REGULATORY AUTHORITIES

IAP DETAILS		**DATE OF COMMENT**	**ISSUE RAISED**	**RESPONSE (as amended for the purposes of the EIA and EMP report)**
Affected Parties				
Landowners or lawful occupiers on adjacent properties				
Andre Cronje	X	10 February 2016, public scoping meeting at EG Kerk.	What will happen to the coal left underground when mining has been completed? I am specifically concerned about underground coal combustion. If the mine is closed or sold to a third party, we will be left with the problem as communities.	If the mine design is done and implemented properly, there is no reason to believe that the coal left underground at the end of the project, will become an issue. The mine will be sealed off as part of the mine closure process. Any open voids will gradually fill with underground water as the water table re-establishes. Thus it will not be possible for combustion to occur.
			I am concerned about the possibility of the ground surface collapsing due to poor and unstable underground pillars. How will you deal with this matter?	This matter will be dealt with on a case by case situation as there are many contributing factors that must be investigated and considered. If the mine design is done (as included in section 4 of the EIA/EMP report) and implemented properly, there is no reason to believe that this will be an issue. (AAIC). This issue has been investigated and potential impacts on topography have been assessed in Appendix F of the EIA/EMP report.
Ms Lotzhauzen	X	10 February 2016, public scoping meeting at EG Kerk.	What is the impact on groundwater and borehole levels?	This issue has been noted and has been addressed by the Groundwater specialist (in Appendix M of the EIA/EMP report) and potential impacts on groundwater quantity have been assessed in Appendix F of the EIA/EMP report. There is potential for impacts on closer boreholes but with mitigation these potential impacts are reduced/eliminated.
Andre Cronje	X	10 February 2016, public scoping meeting at EG Kerk.	You have indicated in your presentation that the project is located in an area with high air pollution. Is the idea to continue polluting the air seeing that there are already high levels of pollution in the area? My perception is that AAIC does not care about Kriel and are not worried about the high levels of sinusitis cases in the area?	It must be noted that Alexander will be an underground mine, unlike Isibonelo which is an open cast mine, and thus air pollution issues will be limited. AAIC is a responsible company with a reputation to uphold. If the EMP report is approved, it becomes a legally binding document and any member of the public may report AAIC for any non-compliances. Air pollution related impacts have been investigated by the Air Quality specialist (in Appendix O of the EIA/EMP report) and potential impacts on air quality have been assessed in Appendix F of the EIA/EMP report.

IAP DETAILS		DATE OF COMMENT	ISSUE RAISED	RESPONSE (as amended for the purposes of the EIA and EMP report)
Petrus Ngcobo	X	10 February 2016, public scoping meeting at Kriel High school.	Sinkholes should be investigated, as well as the rehabilitation of underground water resources.	Potential impacts on topography and groundwater have been assessed in Appendix F of the EIA/EMP report. Related avoidance and mitigation measures have been included in Part B of the EIA/EMP report.
JH Venter	X	11 February 2016, public scoping meeting at Kuiersaam Guesthouse in Secunda.	One of the biggest concerns for the farmers is water shortages and water contamination, both ground and surface water.	These issues have been investigated by the Surface and Groundwater specialists (in Appendix L and Appendix M of the EIA/EMP report) and potential impacts on ground and surface water have been assessed in Appendix F of the EIA/EMP report.
Henry Duhn	X	11 February 2016, public scoping meeting at Kuiersaam Guesthouse in Secunda.	If water is contaminated, it will be up to the farmers to prove that the contamination was done by the mine. What is the step by step process of laying such a complaint to ensure that farmers are protected? When my borehole dries up, where do I complain?	This has been investigated by the Surface and Groundwater specialists (in Appendix L and Appendix M of the EIA/EMP report) and potential impacts on ground and surface water have been assessed and the management thereof have been provided in Appendix F and Part B of the EIA/EMP report. Monitoring will be done by the mine in terms of the EMP recommendations. There will be a system in place at the mine to formally lodge complaints.
Petrus Ngcobo	X	11 February 2016, public scoping meeting at Enkundleni Primary School near Kriel.	We are concerned about the impact the project will have on water supply especially as we are already experiencing water shortages.	Synergistics has noted your concern, and it has been investigated by the Groundwater specialist (in Appendix M of the EIA/EMP report) and potential impacts on groundwater quantity have been assessed in Appendix F the EIA/ EMP report. In addition, water supply options are discussed in sections 4.2.1, 4.2.2 and 7.1.4 of the EIA/EMP report.
Govan Mbeki Local Municipality				
Mxolisi Fakude	X	3 February 2016 at the authority scoping meeting.	What type of rehabilitation strategy will be used for the project? Will it be ongoing or done at the end of the life of the mine?	The project will be an underground mine and accessed through a shaft. Rehabilitation will only be possible at the end of the life of mine unlike an opencast mine where rehabilitation can be done on an ongoing basis. Information on rehabilitation and closure planning is included in this report and in Part B of the EIA/EMP report.
Ignatius Mathebula	X	3 February 2016 at the authority scoping meeting.	Are there any specific rehabilitation plans that will be implemented such as revegetation initiatives? This could be a good opportunity to partner with local communities in such initiatives.	

IAP DETAILS		DATE OF COMMENT	ISSUE RAISED	RESPONSE (as amended for the purposes of the EIA and EMP report)
Emalahleni Local Municipality				
Dirk Grobler	X	3 February 2016 at the authority scoping meeting.	Farmers are very concerned about the overall impact this project will have on the maize farming industry. Farmers are already stressed with the lack of water and possible drought and how it is already affecting food shortages in the country as a whole.	Related issues have been investigated by the Social specialist (in Appendix T of the EIA/EMP report), Economic specialist (in Appendix U of the EIA/EMP report), Soil, Land Use and Land Capability specialist (in Appendix H of the EIA/EMP report) and Groundwater specialist (in Appendix M of the EIA/EMP report), and potential impacts on cultivation have been assessed in Appendix F of the EIA/EMP report.
Mpumalanga Tourism and Parks Agency (MTPA)				
F. N. Krige	X	24 March 2016, comments received regarding the scoping report	The layout plan of the mining infrastructure should avoid the ecological sensitive areas and the dirty water management plan should be designed and implemented to manage and prevent pollution of the water resources and wetlands.	Nine shaft complex site location and five overland ROM conveyor route alternatives have been investigated for the proposed project. The preferred options were selected based on the alternative which has the smallest impact on ecological sensitive areas. The stormwater management plan was designed by the Surface Water specialist (in Appendix L of the EIA/EMP report) and is discussed in detail in section 4.2.2 of the EIA/EMP report.
			Polluted groundwater if not constantly pumped and purified and released into the wetlands and river will keep on decanting dirty water into the surrounding environment and river indefinitely after mining has ceased. The costs of pumping and purifying the dirty water on the long run will exceed the short term benefit of the coal. The liability for the purification of the water is that of the applicant.	By the Groundwater specialist (in Appendix M of the EIA/EMP report) and potential impacts on ground water have been assessed and the management thereof have been provided in Appendix F and Part B of the EIA/EMP report. No post closure decant has been predicted. The Closure Costing (in this report) has been assessed to determine the financial provision as provided in section 15 of the EIA/EMP report.
			MTPA recommends that the following thorough studies for this proposal are done: Ecological assessment which includes potential decanting points.	No post closure decant has been predicted.
			A risk assessment is done which includes: a) Financial viability – cost/benefits analysis including water purification for a hundred years afterwards. b) Rehabilitation of discard dumps, washing plant and dirty water evaporation dams and water pollution prevention strategies on long term.	The Closure Costing (this report) has been assessed to determine the financial provision as provided in section 15 and Part B of the EIA/EMP report.

IAP DETAILS	DATE OF COMMENT	ISSUE RAISED	RESPONSE (as amended for the purposes of the EIA and EMP report)
		c) Brine control from water purification plant. d) Maintenance of water pollution prevention methods and equipment. e) Building and maintenance or rehabilitation of access roads through sensitive and high risk areas. f) Prevention of subsidence and mitigation costs. g) Prevention of dewatering and mitigation of sensitive grasslands, fountains, wetlands and streams in the underground mine plan area.	

2.4 MINE PLAN AND SCHEDULE

The proposed Alexander project will involve the development of a twin decline shaft (for personnel, material access and coal extraction) and vertical shaft (for ventilation only) in order to mine an estimated underground coal seam area (No. 4 seam) of 7,300 ha. Mining will be the traditional bord and pillar method. Figure 2-2 shows the sequence of the underground mining operations (SLR, 2015).

The total surface area of disturbance is roughly 140 ha (approximately 40 ha for the shaft complex, and 100 ha for the overland conveyor).

2.4.1 LIFE OF MINE

The life of mine is approximately 30 to 35 years (including a 3 year construction phase).

2.4.2 AREAS OF DISTURBANCE

The proposed areas of disturbance associated with the Alexander Project are shown in Figure 2-3 (and Appendix A), and include:

- Boxcut/portal;
- Twin decline shaft (6m x 3m);
- Vertical shaft (6m diameter) with ventilation fans;
- Overland conveyor, surge silo and stone dust silo;
- Topsoil stockpiles and berms;
- Overburden rock dump/ stockpile berm;
- Main access road (sealed);
- Internal and maintenance access roads (gravel);

- Sub-station and Eskom yard; Administrative block (including mine offices, kitchen, canteen, training centre, mustering/ gathering centre and clinic/ emergency room);
- Shaft supervisor offices, change house and lamp room;
- Workshop and stores;
- Water and sewage treatment plants;
- Water holding facilities (raw water tank, fire water tank, ground level potable water storage tank and elevated bulk process water storage tank);
- Stormwater management facilities (drains, berms and recycled water ponds/ pollution control dam);
- Evaporation dam;
- Potable water, process water and sewage effluent pipelines;
- Fuel and oil storage facilities and refuelling bays;
- Waste/ salvage yard;
- Car park, bus stop and shelter;
- Security gate and office;
- Powerlines;
- Lighting masts; and
- Fencing.

FIGURE 2-2: PROJECT ALEXANDER UNDERGROUND MINING OPERATIONS

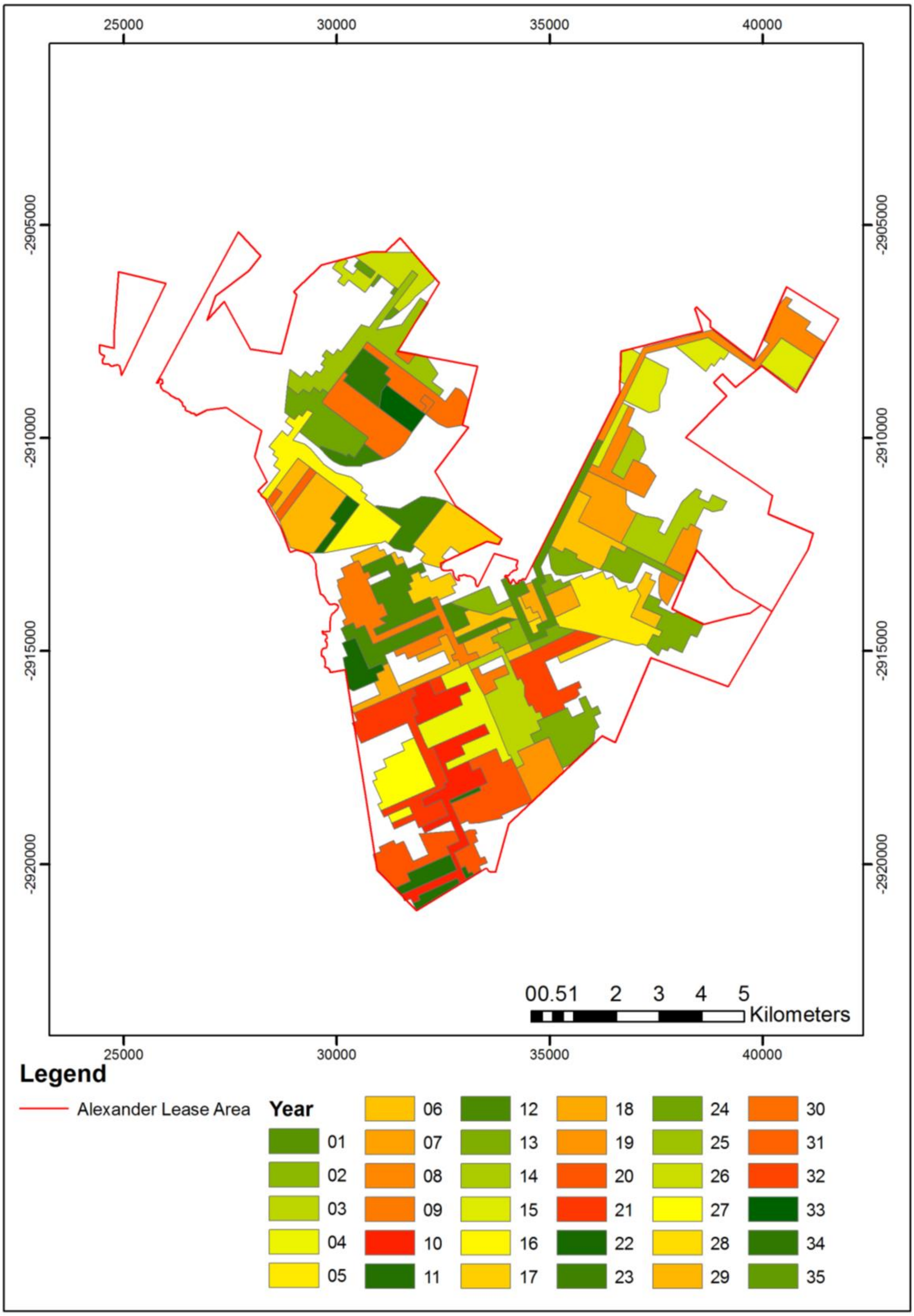
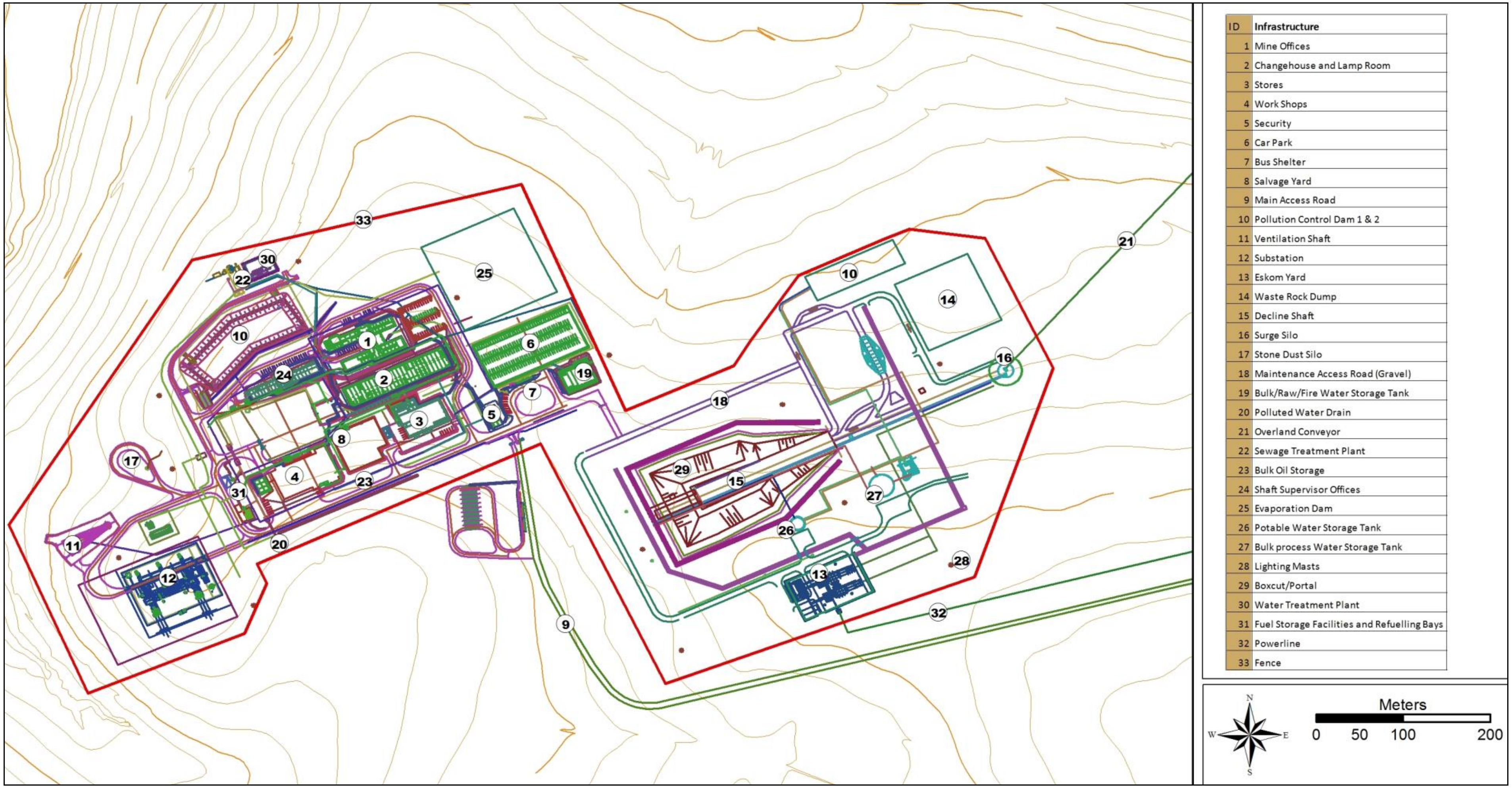


FIGURE 2-3: INFRASTRUCTURE LAYOUT FOR THE ALEXANDER PROJECT



ID	Infrastructure
1	Mine Offices
2	Changehouse and Lamp Room
3	Stores
4	Work Shops
5	Security
6	Car Park
7	Bus Shelter
8	Salvage Yard
9	Main Access Road
10	Pollution Control Dam 1 & 2
11	Ventilation Shaft
12	Substation
13	Eskom Yard
14	Waste Rock Dump
15	Decline Shaft
16	Surge Silo
17	Stone Dust Silo
18	Maintenance Access Road (Gravel)
19	Bulk/Raw/Fire Water Storage Tank
20	Polluted Water Drain
21	Overland Conveyor
22	Sewage Treatment Plant
23	Bulk Oil Storage
24	Shaft Supervisor Offices
25	Evaporation Dam
26	Potable Water Storage Tank
27	Bulk process Water Storage Tank
28	Lighting Masts
29	Boxcut/Portal
30	Water Treatment Plant
31	Fuel Storage Facilities and Refuelling Bays
32	Powerline
33	Fence

3 ENVIRONMENTAL RISK ASSESSMENT

3.1 RISK ASSESSMENT METHODOLOGY

An Environmental Impact Assessment has been carried out as part of the EIA and EMP report for Alexander. Potential environmental impacts were identified by SLR and other stakeholders, and considered in a cumulative manner such that current baseline conditions on site and in the surrounding area were discussed and assessed together.

The assessment methodology used (see Section 7.6 of the EIA/EMP report) enabled the assessment of environmental issues including: cumulative impacts, the severity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated.

The findings of the EIA indicated that all potential impacts can be prevented or reduced to acceptable levels.

3.2 IDENTIFICATION OF STRATEGIES TO MANAGE AND MITIGATE THE IMPACTS AND RISKS

The environmental impacts (at the Decommissioning and Closure phases) as identified by the EIA were:

- Hazardous excavations, infrastructure, surface subsidence and spontaneous combustion
- Loss of soil resources and land capability through contamination
- Loss of soil resources and land capability through physical disturbance
- Physical destruction of biodiversity
- General disturbance of biodiversity
- Contamination of surface water resources
- Alteration of natural drainage patterns
- Contamination of groundwater resources
- Lowering of groundwater levels and reducing availability
- Air pollution
- Noise pollution
- Road disturbance and traffic safety
- Visual impacts
- Loss of or damage to heritage/cultural and palaeontological resources
- Inward migration
- Displacement of workers

- Economic impact
- Change in land use

These impacts are discussed in more detail in Table 3-1.

The assessment of these impacts and associated risk, in the unmitigated and mitigated scenario, are presented in Table 3-2. If all the mitigation measures as per the EIA/EMP report are successfully implemented, then it is anticipated that there will be no latent or residual environmental impacts.

Adherence to the mitigation measures identified in Table 3-2 are the drivers that will result in the elimination and/or reduction of these impacts and the associated risks.

3.3 IDENTIFICATION OF INDICATORS

Three key indicators have been defined which will facilitate evaluation of the ongoing environmental impacts and associated risk to closure (risk triggers). These three key indicators can be evaluated through analysis of ongoing monitoring results. The three key indicators are namely:

- Surface water quality,
- Groundwater quality, and
- Vegetative cover.

TABLE 3-1: POTENTIAL IMPACT SUMMARY DURING DECOMMISSIONING AND CLOSURE

Potential impact	Aspect	Impact discussion
Hazardous excavations, infrastructure, surface subsidence and spontaneous combustion	Topography	Hazardous excavations and infrastructure include all structures into or off which third parties and animals can fall and be harmed. Included in this category is surface subsidence and spontaneous combustion associated with mining areas. Related mitigation measures focus on infrastructure safety as well as on limiting access to third parties and animals.
Loss of soil resources and land capability through contamination	Soil and land capability	Soil is a valuable resource that supports a variety of ecological functions and is the key to re-establishing post closure land capability. Soil and related land capability can be compromised through contamination and through physical disturbance through removal, compaction, and/or erosion. Related mitigation measures focus on contamination prevention, implementing soil conservation management and waste management plans and limiting site clearance to what is absolutely necessary.
Loss of soil resources and land capability through physical disturbance		
Physical destruction of biodiversity	Biodiversity	Areas of high ecological sensitivity are functioning biodiversity areas with species diversity and associated intrinsic value. In addition, some of these areas host protected species. The linking areas have value because of the role they play in allowing the migration or movement of flora and fauna between the areas which is a key function for the broader ecosystem. Development of the project has the potential to impact on biodiversity both through physical destruction (mainly during infrastructure establishment and mine development) and on-going general disturbance during all project phases. Related mitigation measures focus on limiting the project footprint area, avoiding wetland areas as far as possible and operation controls to limit on-going disturbance.
General disturbance of biodiversity		
Alteration of natural drainage lines	Surface water	Rainfall and surface water run-off are collected in all areas that have been designed with water containment infrastructure as required by legislation. The collected run-off will therefore be lost to the catchment and can result in the alteration of drainage patterns. There are also a number of pollution sources in all project phases of the proposed project that have the potential to pollute surface water. Related mitigation measures focus on minimising the footprint areas associated with containing rainfall and runoff and diverting clean run-off away from the project site.
Contamination of surface water resources		
Air pollution	Air quality	There are a number of activities/infrastructure in all phases that have the potential to pollute the air. Related mitigation measures focus on operation controls to limit the impacts on air quality.

Potential impact	Aspect	Impact discussion
Contamination of groundwater resources	Groundwater	There are a number of sources in all mine phases that have the potential to pollute groundwater. Dewatering activities also has the potential to cause a lowering of groundwater levels which may cause a loss in water supply to surrounding borehole users if they are in the impact zone. Related mitigation measures focus on operation controls to limit the impacts on groundwater.
Lowering of groundwater levels and reducing availability		
Noise pollution	Noise	Two types of noise are distinguished: noise disturbance and noise nuisance. The former is noise that can be registered as a discernible reading on a sound level meter and the latter, although it may not register as a discernible reading on a sound level meter, may cause nuisance because of its tonal character (e.g. distant humming noises). Related mitigation measures focus on operation controls to limit the noise impacts.
Visual impacts	Visual	Visual impacts on this receiving environment may be caused by activities and infrastructure in all mine phases. The more significant visual impacts relate to the larger infrastructure components (such as the shaft complex and mineralised waste). Related mitigation measures focus on operation controls to limit the visual impacts.
Road disturbance and traffic safety	Traffic	The key potential traffic related impacts are on road capacity and public safety. Related mitigation measures focus on infrastructure safety and design.
Loss of or damage to heritage/ cultural and paleontological resources	Heritage /cultural and paleontological resources	Heritage and cultural resources include sites of archaeological, cultural or historical importance. Related mitigation measures focus on operation controls to avoid heritage resources.
Change in land use	Land use	There are project related activities and infrastructure that may have an impact on other land uses in the proposed project area in all mine phases. Related mitigation measures focus on remedying through compensation or control through closure planning.

Potential impact	Aspect	Impact discussion
Inward migration	Socio-economic	Mining projects tend to bring with them an expectation of employment in all project phases prior to closure. This expectation can lead to the influx of job seekers to an area which in turn increases pressure on existing communities, housing, basic service delivery and raises concerns around safety and security. As part of the proposed project AAIC is proposing to acquire (purchase or lease) land on which infrastructure will be placed. The acquisition of land for the purpose of mining may leave farm workers displaced from their current accommodation, as well as their livelihood activities and source of income. In the broadest sense, all activities associated with the mine contribute towards the economic impact in operation, decommissioning and closure phase. Related mitigation measures focus on operation controls through procurement programme and bursary and skills development programme.
Displacement of workers		
Economic impact		

TABLE 3-2: ASSESSMENT OF SIGNIFICANT IMPACTS AND RISKS AT DECOMMISSIONING AND CLOSURE

Potential impact	Significance (unmitigated)	Mitigation measures	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures	Is the risk (and associated impact) considered latent or residual?
Hazardous excavations, infrastructure, surface subsidence and spontaneous combustion	High	• Control through access control, • Control through management and monitoring, • Control through rehabilitation, and • Remedy through emergency response procedure.	Medium	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No
Loss of soil resources and land capability through contamination	High	• Manage through the implementation of soil conservation management plan and waste management plan, • Control through rehabilitation, and • Remedy through emergency response procedure.	Medium	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No
Loss and soil resources and land capability through physical disturbance	High	• Manage through the implementation of soil conservation management plan and waste management plan, • Control through rehabilitation, and • Control through limiting project footprint.	Low	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No
Physical destruction of biodiversity	High	• Control through limiting the project footprint, • Control through alien invasive species programme, and • Remedy through rehabilitation close to pre-mining conditions as practically possible.	Medium	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No

Potential impact	**Significance (unmitigated)**	**Mitigation measures**	**Significance (mitigated)**	**Extent to which the impact can be avoided or addressed through the implementation of management measures**	**Is the risk (and associated impact) considered latent or residual?**
General disturbance of biodiversity	High	• Control through dust control, • Control through training of employees, and • Control through waste management procedures.	Medium	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No
Contamination of surface water resources	High	• Control through stormwater management and design, and • Remedy through emergency response procedure.	Low	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No
Alteration of natural drainage lines	Medium	• Control through appropriate design, and • Control through the separation of dirty and clean water.	High positive	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No
Contamination of groundwater resources	Medium	• Control through monitoring, and • Remedy through emergency response procedure.	Low	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No
Lowering of groundwater levels and reducing availability	High	• Control through monitoring	Medium	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No

Potential impact	Significance (unmitigated)	Mitigation measures	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures	Is the risk (and associated impact) considered latent or residual?
Air pollution	Medium	• Control through monitoring.	Medium (Low for dust fallout)	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No
Noise pollution	Medium	• Control through noise control measures and monitoring (if required).	Low	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No
Road disturbance and traffic safety	High	• Control through appropriate design, and • Remedy through emergency response procedure.	Medium	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No
Visual impacts	High	• Control through visual controls	High (Medium at decom-missioning)	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No
Loss of or damage to heritage/ cultural and paleontological resources	High	• Control through avoidance of heritage resources, and • Remedy through emergency response procedure.	Low	Can be avoided during decommissioning and closure.	No

Potential impact	Significance (unmitigated)	Mitigation measures	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures	Is the risk (and associated impact) considered latent or residual?
Inward migration	High	• Control through health policy, monitoring the development of informal settlements, and • Remedy through emergency response procedure.	Medium	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No
Displacement of workers	High positive	• Control through procurement programme and bursary and skills development programme.	Medium	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No
Economic impact	High positive	• Control through procurement programme and bursary and skills development programme.	High positive	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No
Change in land use	High	• Remedy through compensation, and • Control through closure planning.	Medium (Low at closure)	Can be managed/ mitigated to acceptable levels during decommissioning and closure.	No

The first indicator, surface water quality, is an important measure of the overall effectiveness of mitigation activities (for the entire mine site, and particularly for the latent environmental impact of any decant water) and for protecting the health and safety of neighbouring and/or downstream land users, livestock, and wildlife.

The second indicator, groundwater quality, is an important measure of the effectiveness of mitigation activities (particularly for the latent environmental impact of groundwater associated with the underground workings) and for protecting the health and safety of neighbouring and/or downstream land users, livestock, and wildlife.

The final indicator, vegetative cover, is highly correlated with all the other major environmental parameters of the area, including erosion, dust, physical stability, chemical stability, soil quality and hydrology. Good vegetative cover results in a reduction in the volume of surface runoff, increases soil and slope stability, and leads to the formation of an organic layer. In addition, vegetative growth is visually correlated with successful rehabilitation (and/or protection of the surrounding environment). This is an extremely important indicator because it provides a simple, very effective and relevant measure of the lands' current (and/or future) capability.

Other indicators of rehabilitation success (such as dust fallout) have also been included in the overall general rehabilitation monitoring programme as described in Appendix B.

3.4 Reassessment of Risks

An environmental monitoring programme will be undertaken during the life of the Alexander Project to provide early warning systems necessary to avoid environmental emergencies, and for informing continual improvement of the mine closure plan. The monitoring programme will include:

- Soil resources
- Alteration of drainage patterns
- Surface water resource quality
- Groundwater resource quality
- Air quality
- Disturbance of biodiversity
- Soil and slope stability

Impacts requiring monitoring (including responsibility and frequencies) are detailed in Section 30 (see Table 51) of the EIA/EMP report.

The environmental department manager will also conduct internal management audits against the commitments in the EMP. These audits will be conducted on an on-going basis until final closure. The audit findings will be documented for both record keeping purposes and for informing continual improvement of the mine closure plan. In addition, and in accordance with mining regulation R527, an independent professional will conduct an EMP performance assessment every 2 years. The site's compliance with the provisions of the EMP and the adequacy of the EMP report relative to the on-site activities will be assessed in the performance assessment.

3.5 Financial Provision for Latent Environmental Impacts

The costs associated with the post closure management and monitoring of environmental impacts has been estimated and included in the overall closure cost calculation (see Section 11 and Appendix C for specific details). No residual or latent environmental impacts have been identified and/or costed at this stage of the project.

Any acid rock drainage (ARD) generated in the underground workings following closure is likely to be mildly acidic and saline. However, the topography of the area around the proposed Alexander Project is such that there will be no ARD decanting on surface. The results of the groundwater specialist study (SLR, June 2015) further indicate that only after 70 to 100 years following closure could there possibly be some lateral movement of the ARD in the underground workings once the groundwater cone of drawdown has fully recovered. Therefore, based on the findings above, no specific ARD residual or latent environmental impacts have been costed at this stage. See Figure 4-1 later for more details.

Additional remediation activities (i.e. remediation activities not currently anticipated, and if required) will be identified during the ongoing operation of the Alexander Project through the various monitoring programmes, environmental audits and/or updated risk assessment and pollution potential studies.

4 CLOSURE DESIGN PRINCIPLES

4.1 Legal and Governance Framework

This preliminary mine closure plan has been drafted in accordance with the Financial Provisioning Regulations, 2015 (GNR 1147 of 20 November 2015), for inclusion with the Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP) report for the proposed Alexander Project.

It is a requirement of the Environmental Impact Assessment Regulations, 2014 (GNR 982 of 4 December 2014) that a closure plan must contain the information set out in Appendix 4 of these Regulations (GNR 982), and, where the application for an environmental authorisation is for prospecting, exploration, extraction and primary processing of a mineral or petroleum resource or activities directly related thereto, the closure plan must address the requirements as set in the Financial Provisioning Regulations, 2015 (GNR 1147).

It is a requirement of the Mineral and Petroleum Resources Development Amendment Bill, 2013 (Bill 15 of 2013) that the holder of a mining right must make the prescribed financial provision for the rehabilitation and management of any negative environmental impacts due to mining activities.

4.2 VISION, OBJECTIVES AND TARGETS FOR CLOSURE

The vision, objectives and targets for closure have been developed against the local environmental and socio-economic context of the proposed project, as well as, regulatory requirements and perceived stakeholder expectations.

Stakeholders will continuously be involved in the closure planning process throughout the mine life. The mine will strive to maintain a good working relationship with stakeholders and the local communities in which they operate. Agreements and final approval will be sought from authorities as closure approaches.

4.2.1 VISION FOR CLOSURE

The vision for closure is to minimise the impacts associated with the closure and decommissioning of the mine and to restore the land to a useful land use. At this stage, the proposed post closure land use (for areas disturbed by the mining activities) will be a combination of wilderness and grazing, provided the field quality is maintained by not exceeding the grazing capacity.

4.2.2 OBJECTIVES FOR CLOSURE

The preliminary closure plan objectives and principles have been developed against the background of the project location in the Mpumalanga coalfields, and include the following:

- Environmental damage is minimised to the extent that it is acceptable to all parties involved.
- At closure, the land will be rehabilitated to achieve an end use of wilderness and grazing.
- All surface infrastructure and material stockpiles will be removed from site after rehabilitation.
- The decline shaft and associated boxcut will be backfilled with inert building rubble from the decommissioning activities, and material from the overburden rock dump /stockpile berm.

- Contamination beyond the mine site by surface run-off, groundwater movement and wind will be prevented.
- Mine closure is achieved efficiently, cost effectively and in compliance with the law.
- The social and economic impacts resulting from mine closure are managed in such a way that negative socio-economic impacts are minimised.

Additional and more specific closure objectives may be tied to the final land use for the proposed project area, and these will be determined in collaboration with local communities and other stakeholders during the ongoing operations of the proposed mine.

4.2.3 TARGETS FOR CLOSURE

The closure target outcomes for the proposed Alexander Project site are therefore assumed to be as follows:

- Achieve chemical, physical and biological stability for an indefinite, extended time period over all disturbed landscapes and residual mining infrastructure.
- Protect surrounding surface water, groundwater, soils and other natural resources from loss of current utility value or environmental functioning.
- Maximise visual 'harmony' with the surrounding landscape.
- Create a final land use that has economic, environmental and social benefits for future generations that outweigh the long term aftercare costs associated with the mine.

4.3 ALTERNATIVE CLOSURE OPTIONS

The closure options that have been considered at this stage are presented in Table 4-1 overleaf.

The options currently selected are highlighted in grey.

TABLE 4-1: ALTERNATIVE CLOSURE OPTIONS CONSIDERED

Aspect	Options Considered	
Post closure land-use of disturbed areas	A	Agriculture
	B	Wilderness and grazing
Decline shaft	A	Leave open for alternative use (e.g. hydroponic growing of vegetables, mushrooms or flowers etc.)
	B	Seal and close decline shaft
Boxcut	A	Leave open to support alternative use for decline shaft (as above)
	B	Leave open to fill with decant water, and act as evaporation dam
	C	Backfill with overburden and rehabilitate area
Vertical shaft	A	Leave open for alternative use (e.g. electricity generation)
	B	Seal and close vertical shaft
Workshop, stores, other mine buildings	A	Leave for small business development (e.g. light engineering, baking, laundry services, paper recycling, taxi operations, timber products etc.)
	B	Demolish and rehabilitate area
Administrative block	A	Leave for small business development (e.g. call centre, centralized office services, teaching and training college etc.)
	B	Demolish and rehabilitate area
Water treatment plant	A	Retain for treatment of decant water from underground workings
	B	Demolish and rehabilitate area
Main and internal access roads	A	Retain for access and/or to support post closure land use
	B	Demolish and rehabilitate area
Water holding facilities	A	Retain for use to treat decant water from underground workings
	B	Demolish and rehabilitate area

(Shaded) Option currently selected

4.4 MOTIVATION FOR PREFERRED CLOSURE OPTION

4.4.1 POST CLOSURE LAND USE

The bulk of the proposed Alexander Project surface use area currently comprises cultivated land, and within this area there are also pockets of disused natural land and wetland pan depressions. The disturbed areas associated with the proposed Alexander Project can be successfully rehabilitated back to a post closure land use for grazing provided the field quality is maintained by never exceeding the grazing capacity (TerraAfrica Consult, April 2016). Other undisturbed areas will continue to have a similar pre-mining land use.

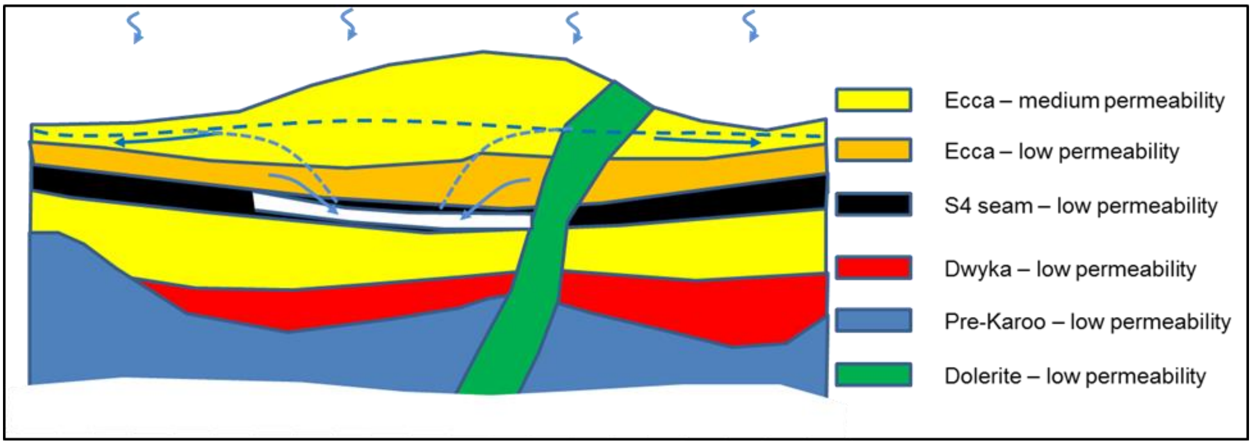
4.4.2 TREATMENT OF DECANT WATER

Any acid rock drainage (ARD) generated in the underground workings following closure is likely to be mildly acidic and saline. However, the topography of the area around the proposed Alexander Project is such that there will be no ARD decanting on surface.

The results of the groundwater specialist study (SLR, June 2015) further indicate that only after 70 to 100 years following closure could there possibly be some lateral movement of the ARD in the underground workings once the groundwater cone of drawdown has fully recovered. See conceptual hydrogeological model in Figure 4-1.

Therefore, based on the findings above, no treatment of decant water has been considered.

FIGURE 4-1: CONCEPT HYDROGEOLOGICAL MODEL AT ALEXANDER PROJECT



4.4.3 ALTERNATIVE POST CLOSURE OPTIONS FOR INFRASTRUCTURE

No alternative closure and post closure options for mine infrastructure have been considered at this stage (e.g. industrial development, SMME development, housing, recreational facilities, forestry, electricity generation etc.). Any alternative and practical closure and post closure options for mine infrastructure will be further investigated during the ongoing operations of the proposed mine.

The feasibility of alternative closure options will be need to be considered in terms of: sustainability of land use, engineering and environmental aspects, monitoring requirements, capital costs, post closure support services and available institutional capacity and skills.

4.5 MOTIVATION FOR CLOSURE AND POST CLOSURE PERIOD

The sealing of the decline shaft, removal of the conveyor foundations and subsequent backfilling of the boxcut (375,000 m^3) is considered to be the most time consuming aspect of this closure plan, and it will take approximately 18 to 21 months to be completed (including revegetation of the area).

Thereafter, a 5-year post closure period for maintenance and aftercare is considered reasonable given that there are no mineralised stockpiles or areas of significant potential erosion.

This 5-year post closure period has been further sub-divided into three years of active maintenance and two years of passive maintenance (i.e. where maintenance activities have decreased and monitoring frequency declined).

4.6 ONGOING RESEARCH FOR PROPOSED CLOSURE OPTIONS

Further research regarding the proposed closure options will only be initiated during the ongoing operations of the proposed mine, for example:

- Various treatment options for the accumulation of underground water which may decant to surface post closure.

Alternative closure options, as suggested in Section 4.3 above, will also only be fully investigated during the ongoing operations of the mine.

4.7 CLOSURE PLAN ASSUMPTIONS

The following assumptions are made for the development of the Preliminary Closure Plan at this stage of the project:

- The mine will follow and adhere to the commitments made in the EIA/EMP report.
- The mine will follow the mine plan and design /layout to minimise the potential for subsidence.
- The volume of stockpiled topsoil that has been stripped from infrastructure and operational areas will be sufficient for closure activities.
- The material excavated for the boxcut will be available for backfilling of the boxcut at closure.
- Groundwater in the primary upper aquifer will not be negatively impacted by the underground workings.
- Runoff water quality from rehabilitated areas will be acceptable and will not require any further treatment.
- No allowance for salvage and/or recycling scrap material has been considered in the estimation procedure.
- Inert building and demolition rubble can be safely disposed and buried on site (or disposed down the mine shafts, or in the backfilled boxcut).
- Hazardous material can be safely disposed of offsite at a nearby appropriate facility.
- Reagent, fuel, lubricant and explosive manufacturers/suppliers will accept returned product at the end of the mine life.
- No consideration of the social closure costs has been included in this report. Details and recommendations regarding a social closure plan can be found in Alexander's socio-economic impact assessment report (Kerryn Desai, June 2016) in the EIA/EMP report.

- No assessment of any socio-economic/shared value/ community based programmes being implemented and whether these would continue post-closure of the operation.
- All costs associated with pre-closure monitoring, auditing and reporting are presumed to be covered under the operations expenditure of the mine, and have not been included in this preliminary closure plan.

Assumptions will be reviewed during the ongoing operations of the proposed mine and any required technical work conducted in order to reduce information gaps and uncertainty prior to mine closure.

5 POST-CLOSURE LAND USE

As discussed and elaborated on previously, and in the absence of additional stakeholder input at this stage of the project, the preferred final post-closure land use (for areas disturbed by mining activities) will be wilderness and grazing. There will be no infrastructure, boxcut or material stockpiles/overburden dumps remaining post closure.

The methodology used to identify final post closure land use, as well as, the generation of a detailed map showing the final post closure land uses will be further developed during the ongoing operations of the proposed mine.

6 CLOSURE ACTIONS

The preliminary closure actions are as follows:

- Surface infrastructure will be demolished and removed. The vertical and decline shafts will be sealed, and the boxcut backfilled.
- Areas where infrastructure has been removed will be levelled and restored in terms of soil horizons (as far as practical), vegetation and drainage.
- There will be no material stockpiles and overburden dumps remaining post closure.

Generally accepted closure methods have been used as the basis for determining the closure cost liability. Further details are provided below

6.1 SPECIFIC TECHNICAL SOLUTIONS

Specific technical solutions related to the preferred closure option for the infrastructure, conveyor route, decline and the vertical shafts are detailed below.

6.1.1 BUILDINGS, PLANT AND MINE INFRASTRUCTURE

Buildings, processing plant and mine infrastructure (conveyors, water supply pipelines etc.) will all be dismantled, and salvageable elements will be sold and removed from site. Inert non-salvageable elements including concrete, plastic liners, brickwork, conveyor belting etc. will be dismantled or broken up and disposed of into the shafts and/or boxcut.

Concrete foundations and underground services (e.g. electrical, water and sewer) will all be removed or buried at least 0.5m below natural ground surface. Any contaminated soil from the decommissioned areas (that cannot be remediated) will be excavated and disposed of offsite at a nearby appropriate facility. Contaminated soils will typically include those contaminated by hydrocarbons (i.e. diesel, oil, grease etc.) and non-biodegradable chemicals (i.e. reagents, chemicals, dust suppressants etc.).

All the decommissioned areas will be landscaped and levelled so that natural stormwater flow is restored and that there is no ponding of water. The decommissioned areas will be covered with topsoil/growth medium material (i.e. whatever was initially stripped from the area prior to construction) and revegetated.

6.1.2 UNDERGROUND WORKINGS, VERTICAL AND DECLINE SHAFTS

The sealing of the vertical and decline shafts is primarily a safety consideration (i.e. to prevent future access to the underground workings) and this should be conducted in such a manner that potential safety risks are largely removed.

The underground workings will need to be cleared of all salvageable equipment and material. All tanks, pipes and sumps containing hydrocarbons and other fluids need to be flushed or emptied prior to removal, and the remaining fluids safely disposed of offsite at a nearby appropriate facility.

Inert building rubble arising from the demolition of surface infrastructure (or waste rock) will be deposited into the shafts. Once the shafts has been filled with all available inert building rubble (or waste rock), a 1m thick concrete cap will be cast.

For the vertical shaft (where the concrete cap is on surface), it is best that the concrete cap is not further covered by topsoil/soil so that the position of the shaft can in future be identified. The cap for the decline shaft will be fully covered by backfilling of the boxcut.

The concrete caps for the vertical and decline shafts will require further engineering design and specification based on the geology and engineering of the shafts, as well as, to provide for methane venting and/or potential pressure exerted from groundwater rebound.

6.1.3 BOXCUT AND OVERBURDEN DUMP

There will be no overburden dump remaining post closure. Instead, the boxcut associated with the decline shaft will be backfilled with material from the overburden rock dump / stockpile berm (i.e. material that was initially excavated in order to create the boxcut). The boxcut will be overfilled with this overburden material due to bulking of the original excavated material. The final area of the boxcut will be shaped to ensure the surface is free draining, and to allow, for any future settling and consolidation of the backfill material. The backfilled boxcut and overburden dump area will be covered with topsoil/growth medium material (i.e. whatever was initially stripped from the area prior to construction) and revegetated.

6.1.4 CONVEYOR ROUTE

The conveyor route will be dismantled, and salvageable elements sold. Inert non-salvageable elements including concrete (foundations, slabs and footings) and conveyor belting will be dismantled or broken up and disposed of into the shafts and/or boxcut. Concrete foundations and underground services (e.g. electrical, water and sewer) buried 0.5m or deeper below natural ground surface will remain. Any contaminated soil from the decommissioned areas (that cannot be remediated) will be excavated and disposed of offsite at a nearby appropriate facility. The decommissioned conveyor route area will be levelled and covered with topsoil/growth medium material (i.e. whatever was initially stripped from the area prior to construction) and revegetated.

6.1.5 ROAD NETWORK

Gravel roads no longer required for post closure use will be ripped and covered with stockpiled topsoil to promote the re-establishment of indigenous vegetation. Bituminous roads no longer required for post closure use will first have the top layer works removed (and carted to a safe disposal facility), and then rehabilitated as per gravel roads.

All concrete lined drainage channels, sumps and culverts associated with closed roads will be broken up and disposed of into the shafts and/or boxcut.

6.1.6 FENCING

Fencing no longer required for post closure use will be removed and recycled for scrap. Inert material such as concrete foundations will be disposed of into the shafts and/or boxcut.

6.1.7 POWERLINES

Powerlines no longer required for post closure use will be removed and recycled for scrap. Inert material such as concrete foundations will be disposed of into the shafts and/or boxcut.

6.1.8 STORMWATER MANAGEMENT

The existing stormwater management plan will be updated to identify what stormwater management structures are required post closure and which can be decommissioned. All the decommissioned areas of the mine site will be levelled and shaped so that the areas are free draining and there is no ponding of water. Any remaining slopes will be modified to at least 1V:4H (or flatter) to minimise erosion, and long slopes may require energy/flow breakers to curb the velocity of stormwater runoff.

It is currently anticipated that none of the pollution control dams will be required post closure, and hence these facilities and associated infrastructure can be decommissioned (as for concrete foundations, inert liner material etc. as mentioned previously). Any accumulated silt in the pollution control dams (that is typically classified as hazardous) will need to be safely disposed of at a nearby appropriate facility.

The remaining depressions /voids of the pollution control dams may however still prove useful during the maintenance and aftercare phase to act as settling dams and/or silt traps (and can thereafter be filled in and/or shaped to be free draining, and the area revegetated).

6.1.9 REVEGETATION

Revegetation of disturbed areas will be undertaken by replacing the previously stockpiled topsoil and growth medium materials and planting with indigenous grasses and trees/shrubs (i.e. hydroseeding and hand planting of trees/shrubs).

Areas requiring revegetation will be shaped and landscaped to ensure that they are free draining (reinstate original drainage lines if practical), steep slopes in excess of 1V:4H are avoided (where practical) and all unnecessary remnants (e.g. building rubble and material stockpiles) are removed and/or buried.

Grass and tree species to be used for revegetation will need to be carefully selected based upon their soil building capabilities, erosion protection characteristics, natural occurrence in the area, social/commercial value, and wildlife habitat value. Field trials may need to be undertaken during the mining operations to best determine the better plant species and methodology for re-establishing vegetation (in the absence of revegetation knowledge gained from the closure of the nearby Elders colliery). Revegetation activities also need to be carefully undertaken so as not to unnecessarily introduce any alien and/or invasive plant species into the area.

It is recommended that seed and plant harvesting be undertaken using vegetation from the surrounding area. Grass seeds in particular should be harvested as well as pods (from deeper rooted species).

A suitable seed store should be established on site. Also, an on-site nursery to germinate tree and shrub species, particularly from pods, should be established to provide sufficient stock for revegetation.

6.1.10 MAINTENANCE AND AFTERCARE

All the rehabilitated areas will require some form of aftercare and maintenance to ensure closure success. These activities will typically include erosion control, filling of erosion gulley's and repairing covers/capping/armouring due to settlement; fertilising of struggling rehabilitated areas; monitoring of surface and groundwater quality; monitoring of vegetation composition and diversity; control and eradication of alien plants; monitoring of dust fallout, creating firebreaks etc.

It is currently anticipated that most of the maintenance and aftercare activities will be undertaken in the first 3 years following closure (the active maintenance period), and thereafter the frequency of activities is expected to stop (in areas were vegetation is considered self-sustaining) and/or decline (passive maintenance period). The passive maintenance period is a further 2 years of monitoring with a reduced frequency.

6.1.11 SURFACE WATER AND GROUNDWATER MANAGEMENT

Monitoring of surface water quality and groundwater quality post closure will be undertaken during the 5 year active and passive maintenance and aftercare period in order to prove that agreed water quality standards will not be exceeded at monitored locations, and that surface water and groundwater on (and immediately downstream of) the rehabilitated areas are suitable for post closure land users.

6.2 OPPORTUNITIES ASSOCIATED WITH CLOSURE OPTION

Opportunities exist to currently engage with the surrounding community to get buy-in and support for the mining operations and the subsequent post closure environment. There is an opportunity to investigate alternative post closure options (see Table 4-1) that are less disruptive to the stakeholders that will derive the bulk of their income from the mining operation (i.e. develop alternative income sources and promote skills development).

Opportunities also exist to currently engage with all the employees and contractors associated with the mine:

- To inform and educate them around the need to not unnecessarily pollute and/or disturb the environment,
- To follow good operational, decommissioning and rehabilitation practices and procedures, and
- To the support the operations executive, environmental department and stakeholder engagement forums to adhere to the commitments made in the EIA/EMP report.

6.3 THREATS ASSOCIATED WITH CLOSURE OPTION

The post closure land use of wilderness and/or grazing is feasible provided the field quality is maintained by not exceeding the grazing capacity. If grazing capacity is exceeded (i.e. over-grazing) then the closure objectives to prevent contaminated stormwater runoff, dust, land degradation etc. may not be met.

The effects of climate change on the future local environment are unknown and may present a threat (or opportunity) for the preferred post closure land use.

There also exists a social threat from a community that derives the bulk of its income from the mining operation and it reliant on the mine for the provision of services.

6.4 UNCERTAINTIES ASSOCIATED WITH CLOSURE OPTION

It is currently assumed that all infrastructure will be demolished and removed from site. This assumption should be confirmed with post closure stakeholders since there may be some post closure use for certain infrastructure (e.g. offices, workshops, roads, water treatment facilities, electrical reticulation etc.).

7 SCHEDULE OF CLOSURE ACTIONS

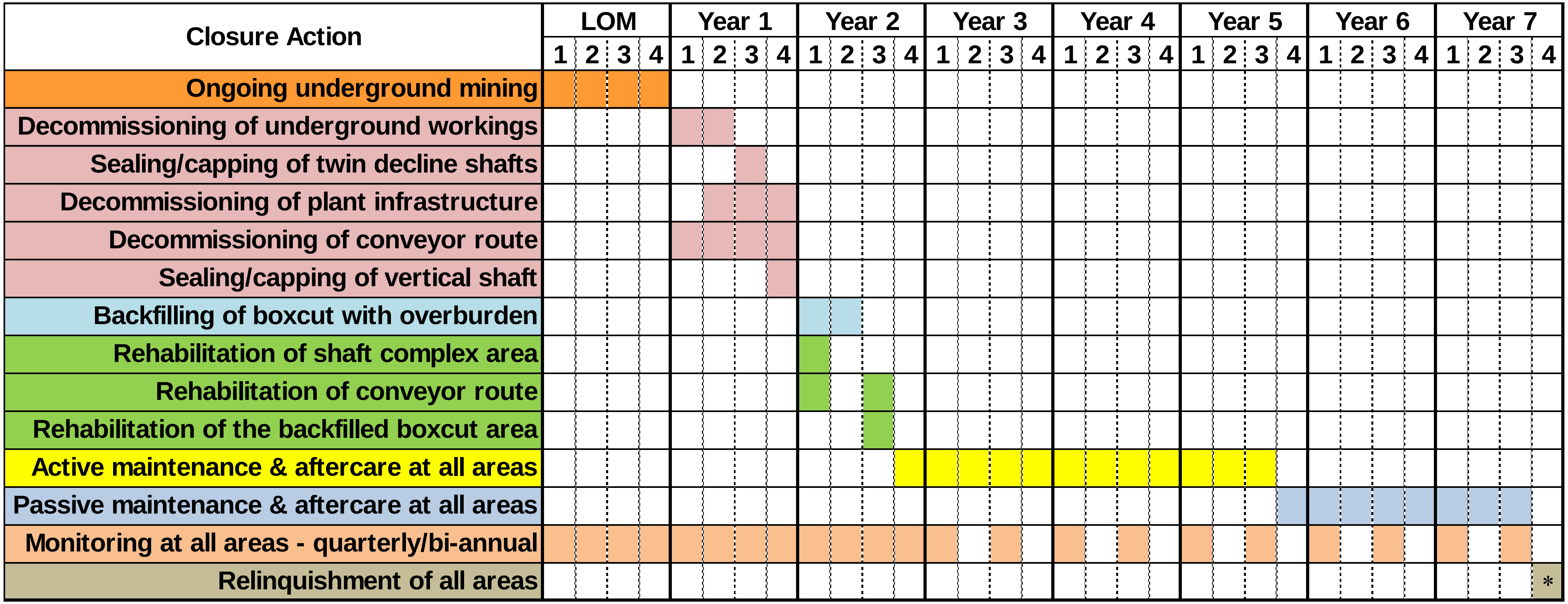
Decommissioning and rehabilitation will commence at the end of operations and will most likely be completed within a period of 18 to 21 months. Concurrent rehabilitation during operations will occur wherever practical (e.g. open areas around the perimeter of the shaft complex, and open areas in between buildings and infrastructure).

A preliminary schedule of the decommissioning and rehabilitation activities is shown in Figure 7-1.

The main driver for the preliminary schedule is the backfilling of the boxcut with overburden, which can only be done after:

- Decommissioning of underground workings has taken place (and salvageable equipment removed),
- Sealing and concrete capping of the twin decline shafts, and
- Inert building rubble from plant and conveyor decommissioning activities is disposed of into the decline shafts and/or boxcut void.

FIGURE 7-1: PRELIMINARY SCHEDULE OF DECOMMISSIONING AND REHABILITATION ACTIVITIES



8 ORGANISATIONAL STRUCTURE AND ROLES

Typical key personnel to ensure compliance to the Closure Plan and associated commitments will be the operations executive, the environmental department manager and the stakeholder engagement manager. As a minimum, these roles as they relate to the implementation of monitoring programmes and management activities will include:

- Senior Operational Manager and Environmental Department Manager
    - Ensure that commitments in the Closure Plan are developed and implemented timeously.
    - Ensure that the monitoring programmes and audits are scoped and included in the annual mine budget.
    - Identify and appoint appropriately qualified specialists/engineers to undertake the programmes.
    - Appoint specialists in a timeously manner to ensure work can be carried out to acceptable standards.
- Stakeholder Engagement Department:
    - Liaise with the relevant structures in terms of the commitments in the Closure Plan.
    - Establish and maintain good working relations with surrounding communities and landowners.
    - Facilitate stakeholder communication, information sharing and grievance mechanism.

8.1 CAPACITY BUILDING

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

AAIC however, recognises that there is likely to be the need to build the capacity of the local communities who will be influenced by the mining activities of the Alexander Project and who would be considered project stakeholders. AAIC will embark on a capacity building program with stakeholders so that stakeholders are in a position to understand the risks that may exist at closure and limitations around risk mitigation strategies and that the stakeholders are able to provide meaningful input to engagements around possible post closure land use.

9 GAP IDENTIFICATION

Current gaps (and/or known unknowns) associated with the closure plan, that will be addressed once the mine is operational include:

- Calculate the amount of hazardous material (e.g. fluorescent light bulbs, bitumen products from roads etc.) and determine a safe disposal option and/or nearby facility.

- Engineered capping solution for the vertical shaft and decline shaft, including allowance for methane venting and/or potential pressure exerted from groundwater rebound.
- Obtain site (and/or area specific) rates for the scheduled closure activities.

10 RELINQUISHMENT CRITERIA

Relinquishment criteria will be developed in communication with the regulatory authorities and project stakeholders to define specific end-points that demonstrate the closure objectives have been met.

Three key indicators have been defined which will facilitate evaluation of closure objectives having been met at Alexander. These three key indicators can be evaluated through analysis of ongoing monitoring results. The three key indicators are namely:

- Surface water quality,
- Groundwater quality, and
- Vegetative cover.

The first indicator, surface water quality, is an important measure of the overall effectiveness of closure activities (for the entire mine site, and particularly for the latent environmental impact of any decant water) and for protecting the health and safety of post closure land users, livestock, and wildlife.

The second indicator, groundwater quality, is an important measure of the effectiveness of closure activities (particularly for the latent environmental impact of groundwater associated with the underground workings) and for protecting the health and safety of post closure land users, livestock, and wildlife.

The final indicator, vegetative cover, is highly correlated with all the other major environmental parameters of the area, including erosion, dust, physical stability, chemical stability, soil quality and hydrology. Good vegetative cover results in a reduction in the volume of surface runoff, increases soil and slope stability, and leads to the formation of an organic layer. In addition, vegetative growth is visually correlated with successful rehabilitation (and/or protection of the surrounding environment). This is an extremely important indicator of rehabilitation success because it provides a simple, very effective and relevant measure of the rehabilitated lands' capability.

Other indicators of rehabilitation success (such as dust fallout) have also been included in the overall general rehabilitation monitoring programme as described in Appendix B.

A summary of the criteria to be utilized for evaluation of rehabilitation success for each of the selected key indicators is provided in the following sections.

Details of the decommissioning and rehabilitation monitoring program designed to provide the data necessary to evaluate rehabilitation success, including monitoring methods and frequency, are provided in Appendix B.

10.1 Surface Water Quality Evaluation System

To utilise surface water quality as an indicator for rehabilitation success Alexander will:

- Identify sampling locations for operations, rehabilitation, and post-rehabilitation periods;
- Determine which water quality analyses are required and the required frequency of sampling;
- Establish a detailed field sampling methodology; and
- Analyze and compare the results of chemical analyses of surface water samples to the agreed standards to provide proof of compliance, and therefore verification of rehabilitation success, over the agreed monitoring period.

The proposed surface water quality monitoring program for Alexander is described in detail in Appendix B, including methods of analysis, monitoring schedule, and definition of rehabilitation success in terms of the monitoring program.

10.2 Groundwater Quality Evaluation System

To utilise groundwater quality as an indicator of rehabilitation success Alexander will:

- Identify sampling locations for operations, rehabilitation, and post-rehabilitation periods;
- Determine which water quality analyses are required and the required frequency of sampling;
- Establish a detailed field sampling methodology; and
- Analyze and compare the results of chemical analyses of groundwater samples to the agreed standards to provide proof of compliance, and therefore verification of rehabilitation success, over the agreed monitoring period.

The proposed groundwater quality monitoring program for Alexander is described in detail in Appendix B, including methods of analysis, monitoring schedule, and definition of rehabilitation success in terms of the monitoring program.

10.3 Vegetative Cover Evaluation System

The degree to which the vegetation cover is effective at reducing erosion is a function of the height and continuity of the plant canopy, the density of the ground cover, and the root depth. The vegetation cover also dissipates the energy from surface water runoff, thereby decreasing erosional forces.

An increase in the vegetation cover also results in an increase in both the evapo-transpiration rate and the infiltration rate leading to changes in the water balance.

Wildlife diversity (and/or livestock populations) respond positively to an increase in available habitat and food supply that is brought on by the establishment of vegetative cover. Additionally, the success of vegetative cover reflects the chemical and physical suitability of soils to develop and maintain a productive ecosystem that will support a post-closure land use of wilderness and/or grazing (provided the field quality is maintained by not exceeding the grazing capacity).

Three parameters will be measured to evaluate vegetative cover on rehabilitated land:

- The percentage of vegetative cover,
- The tree/shrub (woody species) density, and
- The percentage of indigenous species.

The percentage of vegetative cover is the parameter which best represents the overall success of revegetation efforts given all relevant considerations. It is proposed that the Notched Boot Method be utilized to determine the percentage of vegetative cover in representative transects established on rehabilitated lands. This method is utilized worldwide and is advantageous because it is simple and reliable, produces valid results, which are easily interpreted, and does not require any specialised equipment. Tree/shrub density and species composition will be evaluated by direct field count in representative belt transects within the Alexander property. The vegetative cover monitoring program for Alexander is described in detail in Appendix B, including methods of analysis, monitoring schedule, and definition of rehabilitation success in terms of the monitoring program.

A list of vegetative species that are considered appropriate for use in rehabilitation of the mine property will be confirmed during ongoing field trials (or knowledge gained from nearby Elders colliery) once the mine is operational.

It is proposed that rehabilitation success for vegetative cover is demonstrated when monitoring of vegetative cover in rehabilitated areas at Alexander indicates that:

- The percentage of vegetative cover on rehabilitated areas is greater than or equal to 90% of the vegetative cover percentage found on corresponding reference plots with a similar land use;
- The density of tree/shrub species (woody species) on rehabilitated areas is greater than or equal to 90% of the density of tree/shrub species found on corresponding reference plots with a similar land use; and

- The percentage of indigenous/common commercial species on rehabilitated areas is greater than or equal to 90% of the percentage of indigenous/common commercial species found on corresponding reference plots with a similar land use.

11 CLOSURE COST ESTIMATION PROCEDURE

11.1 CLOSURE COST ASSUMPTIONS

The Financial Provisioning Regulations, 2015 (GNR 1147) require the closure cost estimate to have an accuracy of approximately 70% since the LOM is more than 10 years but less than 30 years.

The assumptions made for the development of the Preliminary Closure Plan (see Section 4.7) are also relevant to the closure cost calculation.

11.2 CLOSURE COST METHODOLOGY

11.2.1 QUANTITIES

The quantities were calculated from the current conceptual design details and site layouts available to date for Alexander (See Appendix A).

11.2.2 UNIT RATES

It is SLR's experience that reliable site specific rates can only be obtained through a formal tender process with a detailed bill of quantities, detailed scope of work with engineered drawings, as well as, contract specifications (i.e. the level of detail required to generate a 90% cost accuracy when the remaining LOM is 5 years or less, as per the Financial Provisioning Regulations, 2015 (GNR 1147)).

The rates used for the determination of this closure liability have instead been derived from SLR's own database of rates. This database is considered to be a national average of rates for South African operations, since the rates are obtained from various sources throughout the country, mainly in the gold, platinum, coal and base metal industries. These rates are typically acquired through the due diligence work that SLR gets involved with, or where SLR has been requested to undertake a detailed closure plan for a client.

Where up-to-date rates are not available, then previous known rates are escalated by a contract price adjustment formula (that is considered appropriate by SLR - specifically for closure related activities) that considers the escalation of labour, fuel, plant and materials. The escalation of labour, fuel, plant and materials is obtained from the monthly data provided by Statistics South Africa (www.statssa.gov.za).

The rates provided in Table 11-1 are considered satisfactory by SLR to meet the 70% accuracy requirement for Alexander i.e. mines with a LOM of more than 10 years but less than 30 years (as per the Financial Provisioning Regulations, 2015 (GNR 1147)).

TABLE 11-1: MASTER RATES USED FOR ALEXANDER CLOSURE LIABILITY CALCULATIONS

Description	Unit	Rate
Dismantle medium steel structures (upto 300 kg per square m)	m^2	R 540.00
Demolish light duty concrete floors and bases after removal of superstructure	m^2	R 230.00
Demolish medium duty concrete floors and bases after removal of superstructure	m^2	R 425.00
Demolish heavy duty concrete structures	m^2	R 1240.00
Demolish single storey brick buildings	m^2	R 310.00
Dismantle overland conveyor and remove foundations	m	R 335.00
Remove bitumous access roads and parking areas	m^2	R 65.00
Remove gravel access roads	m^2	R 30.00
Sealing of shafts – vertical shaft	No.	R 50,000.00
Sealing of shafts – decline shaft	No.	R 246,000.00
Backfill of boxcut	m^3	R 30.00
Remove and dispose HDPE liner	ha	R 65,000.00
Dismantle security fencing	m	R 60.00
Shaping and levelling areas	ha	R 90,000.00
Import 300 mm layer topsoil and establish vegetation	ha	R 105,350.00
Treatment of decant water (if required) [1]	Sum	R 5,750,000.00
Active maintenance and aftercare (3 years)	ha	R 19,535.00
Passive maintenance and aftercare (2 years)	ha	R 4,885.00

The rates in Table 11-1 are current value (CV) rates as at June 2016.

[1] Rate taken from Elders Colliery estimate (SRK, February 2016).

11.2.3 Time, Fee and Contingency Costs

The following time, fee and contingency costs have also been included in the closure cost calculations based on SLR's experience with similar projects.

TABLE 11-2: TIME, FEE AND CONTIGENCY COSTS

Description	Unit	Rate
Contingency	%	15
Tender process and procurement of contractors	%	6
Contractor P&G's	%	18
Site supervision of closure works	%	6
Post closure supervision and monitoring costs (See Appendix B, Table B-3)	Sum	R2.582 m

11.3 Closure Cost Calculation

The closure cost calculations at life of mine (LOM) for the Alexander Project are provided in Appendix C. The closure cost associated with the Alexander Project as at LOM is R 84,654,687 (incl. VAT). The closure cost is at current value (CV) as at June 2016.

The Alexander Project is an underground operation, and hence there is minimal additional surface disturbance once the mine is operational i.e. the closure cost at LOM is practically identical to the closure cost once the mine starts operating (after the three year construction period).

The following percentages of the LOM closure cost have been used to estimate the closure cost during the three year construction period and first year of operations:

- End of year 1, 25%
- End of year 2, 65%
- End of year 3, 95%
- End of year 4, 100%

A summary of the closure cost calculations is provided in the table below. All the closure costs are at CV as at June 2016.

TABLE 11-3: CLOSURE COST CALCULATION RESULTS

Time-frame	Closure Cost Calculations based on the following activities	Financial Liability incurred during the year (incl. VAT)	Progressive Financial Liability (incl. VAT)	Progressive Liability as a % of LOM liability
End of Year 1	Construction underway	R 21,163,672	R 21,163,672	25 %
End of Year 2	Construction ongoing	R 33,861,875	R 55,025,547	65 %
End of Year 3	Construction complete	R 25,396,406	R 80,421,953	95 %
End of Year 4	Mine operational for 1 year	R 4,232,734	R 84,654,687	100 %
End of Year 5	Mine operational for 2 years	R -	R 84,654,687	100 %
End of Year 6	Mine operational for 3 years	R -	R 84,654,687	100 %
End of Year 7	Mine operational for 4 years	R -	R 84,654,687	100 %
End of Year 8	Mine operational for 5 years	R -	R 84,654,687	100 %
End of Year 9	Mine operational for 6 years	R -	R 84,654,687	100 %
End of Year 10	Mine operational for 7 years	R -	R 84,654,687	100 %
LOM	**At LOM closure**	**R -**	**R 84,654,687**	**100 %**

12 ANNUAL REHABILITATION PLAN

According to the Financial Provisioning Regulations, 2015 (GNR 1147), the objective of the annual rehabilitation plan is to:

- Review concurrent rehabilitation and remediation activities already implemented;
- Establish rehabilitation and remediation goals and outcomes for the forthcoming 12 months, which contribute to the gradual achievement of the post-mining land use, closure vision and objectives identified in the holder's final rehabilitation, decommissioning and mine closure plan;
- Establish a plan, schedule and budget for rehabilitation for the forthcoming 12 months;
- Identify and address shortcomings experienced in the preceding 12 months of rehabilitation; and
- Evaluate and update the cost of rehabilitation for the 12 month period and for closure, for purposes of supplementing the financial provision guarantee or other financial provision instrument.

Once environmental authorisation for the Alexander Project has been obtained, and the construction phase underway, then the annual rehabilitation plan for the forthcoming 12 months will be prepared.

Rehabilitation and remediation activities associated with the annual rehabilitation plan (during the initial 3 year construction phase) will focus primarily on:

- Clearing of vegetation in accordance with the relevant vegetation management procedures;
- Destructing and disturbing as little vegetation and biodiversity as possible (i.e. maintaining a small 'construction buffer zone'), and retaining as much natural vegetation as possible;
- Stripping and stockpiling of soil resources in areas designated for surface infrastructure in line with a soil conservation procedure to be developed for the project;
- Establishment of stormwater management facilities;
- Establishment of dust suppression techniques;
- General, hazardous and medical waste collection, storage and disposal; and
- Monitoring of groundwater, surface water and air quality.

13 MONITORING, AUDITING AND REPORTING

13.1 PRE-CLOSURE MONITORING, AUDITING AND REPORTING

The environmental department manager will conduct internal management audits against the commitments in the EMP. These audits will be conducted on an on-going basis until final closure. The audit findings will be documented for both record keeping purposes and for informing continual improvement. EMP performance assessment must be undertaken in accordance to the conditions of the environmental authorisation. The site's compliance with the provisions of the EMP and the adequacy of the EMP report relative to the on-site activities will be assessed in the performance assessment.

A monitoring schedule will also be established once the mine is operational, and will include a surface water quality, groundwater quality and air quality monitoring programme. Additional monitoring programmes (e.g. trials for revegetation of disturbed areas) may also be established during the ongoing operations of the mine (in the absence of revegetation knowledge gained from the closure of the nearby Elders colliery). Monitoring will be the responsibility of the environmental department, and will most likely be carried out by the environmental officers, who will report to the environmental department manager.

The closure plan, environmental risk assessment and annual rehabilitation plan will be audited (and updated) on an ongoing basis throughout the life of the mine in order to inform the annual financial provision required for closure at LOM, as well as, unforeseen premature closure. The auditing and update of the closure plan, environmental risk assessment and annual rehabilitation plan will be carried out by external and independent environmental consultants.

In accordance with the Financial Provisioning Regulations, 2015 (GNR 1147), financial provision for closure at LOM, as well as, unforeseen premature closure will be updated on an annual basis once the mine is operational. The financial provision will be calculated based on the information contained within the closure plan, environmental risk assessment and annual rehabilitation plan. This update will be carried out by external and independent environmental consultants. The financial provision amount will also be audited by an independent auditor that is registered with the Independent Regulatory Board of Auditors.

All costs associated with pre-closure monitoring, auditing and reporting are presumed to be covered under the operations expenditure of the mine, and have not been included in this preliminary closure plan.

13.2 POST-CLOSURE MONITORING, AUDITING AND REPORTING

A preliminary post-closure monitoring and reporting programme has been developed as part of this preliminary closure plan. The total estimated cost of the post-closure monitoring and inspection activities has been calculated to be R 2,582,000 (a breakdown of the cost is provided in Appendix B – Section 6 and Table B-3). This cost makes provision for:

- bi-annual water sampling and site inspections by external and independent environmental consultants over a period of 7 years (2 years during the decommissioning and rehabilitation works, and 5 years during the active and passive maintenance and aftercare periods), and
- a small on-site maintenance team over a period of 3 years (active maintenance and aftercare period only).

14 RECOMMENDATIONS

This preliminary closure plan for the Alexander Project, and hence the overall level of confidence in the closure cost liability can be improved by addressing the uncertainties associated with the proposed closure option (see Section 6.2) and also addressing the currently identified gaps (see Section 9), namely:

- Confirm the demolition and removal of all infrastructure (including buildings, powerlines, water supply and treatment, access roads etc.).
- Maintain a database of hazardous materials on site at closure, and the associated method of safe disposal.
- Generate an engineered capping solution for the vertical shaft and decline shaft, including allowance for methane venting and/or potential pressure exerted from groundwater rebound.
- Obtain site (and/or area specific) rates for the scheduled closure activities.

15 CONCLUSION

This preliminary closure plan has been generated based on existing information currently available for the proposed Alexander Project, and as documented in the EIA/EMP report.

The calculated closure costs calculated are considered to have an accuracy of at least 70%, as required by the Financial Provisioning Regulations, 2015 (GNR 1147).

Steve Van Niekerk

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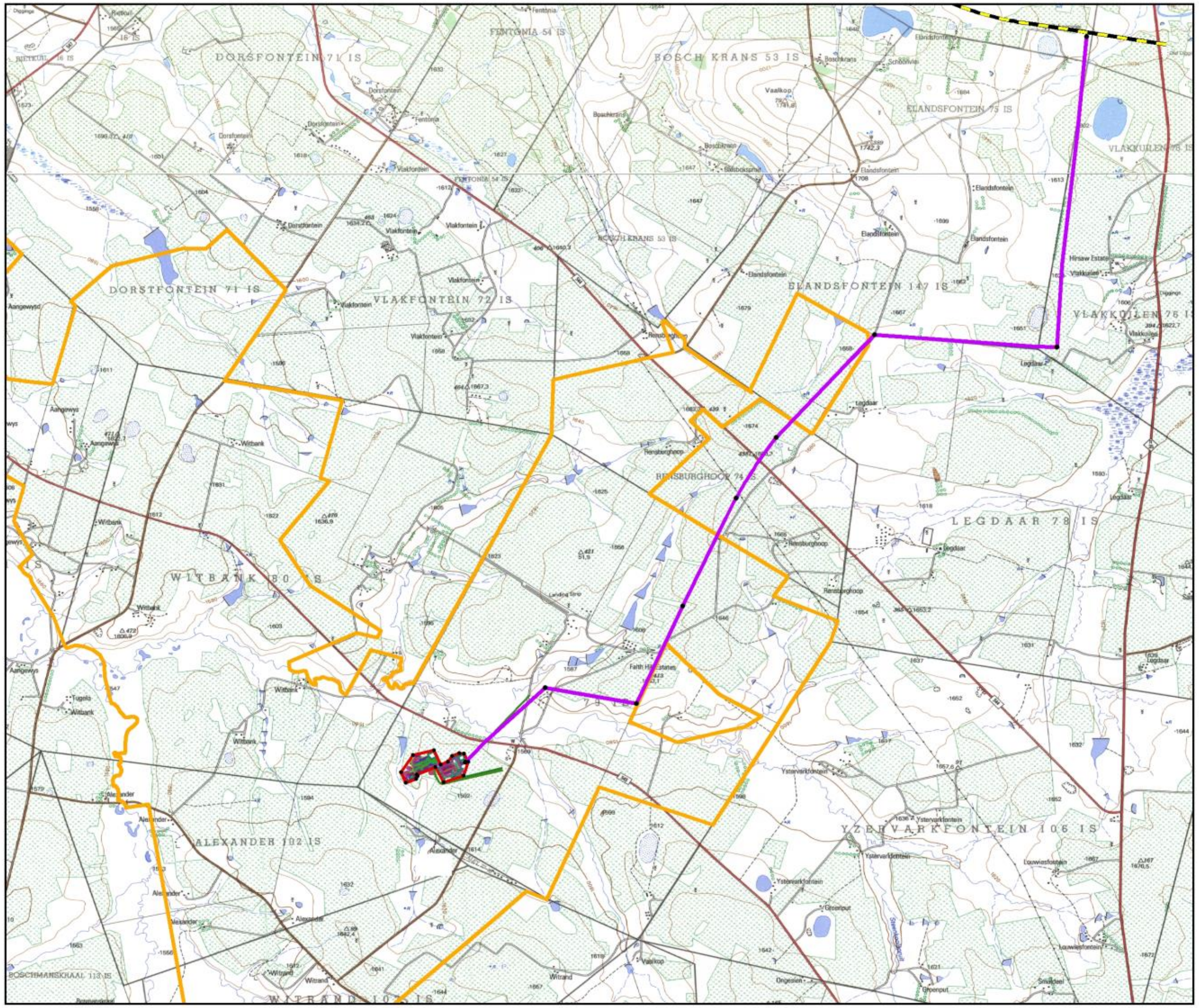
APPENDIX A: SITE LAYOUT AND DETAILS FOR PROJECT ALEXANDER



Legend

(purple line)	Proposed Alexander Conveyor Route
(red line)	Proposed Alexander Shaft Complex
(yellow/black dashed line)	Elders Conveyor to Goedehoop Colliery
(orange box)	Proposed Alexander Mining Right Area

Conveyor Route Coordinates (Hartebeesthoek'94)

CID	Latitude	Longitude
0	26° 20' 38.85" S	29° 21' 10.24" E
1	26° 19' 56.34" S	29° 21' 56.09" E
2	26° 20' 5.36" S	29° 22' 48.47" E
3	26° 19' 9.45" S	29° 23' 14.80" E
4	26° 18' 7.61" S	29° 23' 45.51" E
5	26° 17' 32.74" S	29° 24' 8.51" E
6	26° 16' 33.70" S	29° 25' 5.12" E
7	26° 16' 40.79" S	29° 26' 49.63" E
8	26° 13' 42.88" S	29° 27' 6.75" E

Shaft Complex Coordinates (Hartebeesthoek'94)

CID	Latitude	Longitude
0	26° 20' 31.99" S	29° 20' 52.28" E
1	26° 20' 40.39" S	29° 20' 56.14" E
2	26° 20' 38.72" S	29° 21' 0.17" E
3	26° 20' 35.38" S	29° 21' 2.56" E
4	26° 20' 33.65" S	29° 21' 6.69" E
5	26° 20' 33.99" S	29° 21' 9.50" E
6	26° 20' 38.81" S	29° 21' 12.01" E
7	26° 20' 46.57" S	29° 21' 9.10" E
8	26° 20' 50.51" S	29° 20' 57.63" E
9	26° 20' 41.62" S	29° 20' 52.99" E
10	26° 20' 46.08" S	29° 20' 42.45" E
11	26° 20' 46.79" S	29° 20' 42.81" E
12	26° 20' 48.66" S	29° 20' 41.99" E
13	26° 20' 50.87" S	29° 20' 36.17" E
14	26° 20' 44.62" S	29° 20' 33.23" E
15	26° 20' 34.80" S	29° 20' 40.03" E

Kilometers
0 0.75 1.5 3

Synergistics Environmental Services

SLR Synergistics is an SLR group company

Figure 3: Infrastructure Layout

750.01080.00002	Coordinate System DMS	
	Spheroid Hartebeesthoek '94	Central Meridian LO29

–

Legend

ID	Infrastructure
1	Mine Offices
2	Changehouse and Lamp Room
3	Stores
4	Work Shops
5	Security
6	Car Park
7	Bus Shelter
8	Salvage Yard
9	Main Access Road
10	Pollution Control Dam 1 & 2
11	Ventilation Shaft
12	Substation
13	Eskom Yard
14	Waste Rock Dump
15	Decline Shaft
16	Surge Silo
17	Stone Dust Silo
18	Maintenance Access Road (Gravel)
19	Bulk/Raw/Fire Water Storage Tank
20	Polluted Water Drain
21	Overland Conveyor
22	Sewage Treatment Plant
23	Bulk Oil Storage
24	Shaft Supervisor Offices
25	Evaporation Dam
26	Potable Water Storage Tank
27	Bulk process Water Storage Tank
28	Lighting Masts
29	Boxcut/Portal
30	Water Treatment Plant
31	Fuel Storage Facilities and Refuelling Bays
32	Powerline
33	Fence

N S E W

Meters
0 50 100 200

Synergistics Environmental Services

SLR Synergistics is an SLR group company

Figure 4: Shaft Complex

750.01080.00002

Coordinate System DMS

Spheroid Hartebeesthoek '94

Central Meridian LO29

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APPENDIX B: COSTED REHABILITATION EVALUATION CRITERIA

APPENDIX B – COSTED REHABILITATION EVALUATION CRITERIA

1 INTRODUCTION

This appendix presents a description of criteria to be utilised in the evaluation of rehabilitation success on rehabilitated areas and a suggested monitoring programme to be implemented for this evaluation. The monitoring programme is designed to measure the success of decommissioning and rehabilitation measures in terms of the rehabilitation success indicators defined in the Preliminary Closure Plan.

The monitoring programme will include evaluation of:

- Vegetative success on rehabilitated areas in terms of vegetative cover, tree/shrub (woody species) density, and indigenous species composition;
- Surface water quality in drainages and other water bodies down gradient of rehabilitated areas; and
- Groundwater quality surrounding the shaft complex and previous overburden dump.

Other indicators of rehabilitation success (such as dust fallout) have also been included in the overall general rehabilitation monitoring programme as described below.

2 GENERAL REHABILITATION MONITORING

In addition to the specific monitoring activities described in Sections 3 and 4 of this Appendix report, the post-rehabilitation monitoring programme will include regular general inspections of rehabilitated areas to assess their condition and to determine any maintenance requirements. These inspections will include:

- Dust fallout monitoring – if required, and largely dependent on the progress of the revegetation efforts;
- Stormwater and erosion control features including drainage channels and diversions;
- Soil erosion, soil conditions (nutrients, trace constituents) and soil structure;
- Faunal habitation of rehabilitated areas;
- Biological productivity;
- Tree growth data (width, height, diameter measurements);
- Protected access, fences and signs erected for public safety;
- Site security; and
- Unusual conditions in any rehabilitated area.

General inspections of all rehabilitated areas will be completed at a minimum of quarterly intervals for the aspects defined. Records of all the monitoring and maintenance activities undertaken will be kept.

If the general site condition monitoring activities reveal the requirement for any maintenance or repair of rehabilitated areas, then the necessary works will proceed in a timely fashion to minimise the potential for damage to rehabilitated areas such as soil loss, plant loss and drainage channel disturbance. Should a condition be identified in any rehabilitated area which has the potential to cause serious environmental damage, or which threatens the health and safety of post closure land users, then the relevant Authorities (DMR, DWS) will be immediately notified of this condition and the remedial measures being undertaken to reduce the potential for harm.

3 VEGETATIVE COVER MONITORING

The vegetative cover monitoring programme is designed to verify that rehabilitated areas are successfully developing a productive, self-sustaining ecosystem, which facilitates the post closure land use.

The success of the vegetative cover is an important aspect in rehabilitation because of its impact on other parameters such as the extent of soil development, soil chemistry and surface erosion (by water and wind). The degree to which the vegetation cover is effective in reducing erosion is a function of the height and continuity of the plant canopy, the density of the ground cover, and the root density. The vegetation cover also dissipates the energy from surface water runoff, thereby decreasing erosion forces. An increase in the vegetation cover results in an increase in both the evapo-transpiration rate and the infiltration rate leading to changes in the water balance. Finally, wildlife diversity and populations respond positively to an increase in available habitat and food supply that is brought on by the establishment of vegetative cover.

The major potential concerns with vegetative cover on rehabilitated areas are related to the adequacy of ground cover, the overall density of tree/shrub (woody) species and indigenous species composition. The vegetative cover monitoring programme has been designed to evaluate these parameters where appropriate to ensure long-term environmental protection and the suitability of rehabilitated areas for post closure land use.

3.1 VEGETATIVE COVER ANALYSIS

3.1.1 VEGETATIVE COVER PERCENTAGE ANALYSIS

The adequacy of vegetative ground cover in providing effective erosion control, habitat establishment and soil building for post closure land uses is related to the percentage of ground surface covered by vegetation and its products.

Analysis of the percentage of vegetative cover involves determining the percentage of ground surface that falls under the live parts of plants (the crown cover) or the aerial parts plus the mulch (the basal cover). The Notched Boot Method [2] can be utilised for determination of the percentage of vegetative cover on rehabilitated areas, however the latest developed methods must also be considered in order to ensure the best procedure is used.

3.1.2 TREE/SHRUB DENSITY ANALYSIS

The density of tree and shrub (woody) species on rehabilitated areas provides an indication of the success of efforts in re-establishing a diverse forest/bush environment for post closure land use. A direct count of woody species within belt transects is utilised to determine the density of woody species on rehabilitated areas.

Selected transects used in the rehabilitated areas for analysis of vegetative cover percentage as detailed in Section 3.1.1 will be utilised for determining woody species density. A 2 m wide by 100 m long rectangular plot centred on each transect line selected will be demarcated and the number of plants of woody species that are rooted in each plot will be counted, even if not all of an individual plant's aerial canopy is within the plot. Likewise, plants whose aerial canopy overlap the plot but are not rooted within the plot will not be counted. This method is effective in determining woody species density in areas of low to semi-dense stands of vegetation.

3.1.3 SPECIES COMPOSITION ANALYSIS

The composition of indigenous species (and/or common commercial species due to previous farming activity) within rehabilitated areas also provides an indication of the success of revegetation efforts in re-establishing a diverse bush environment which is similar to that found in nearby undisturbed areas, thereby ensuring similar productive capability of the rehabilitated area for post closure land use.

A direct count of vegetative species composition is undertaken on portions of selected belt transects utilised for analysis of woody species density in order to determine the percentage of indigenous species (and/or common commercial species due to previous farming activity) growing on rehabilitated areas.

All vegetation rooted within a representative 5 m long section of each belt transect selected will be identified and classified as either indigenous/common commercial or alien.

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[2] This method is utilised by the office of Surface Mining (OSM) in the United States of America (Hunsberger & Michaud, 1994) and is advantageous because it is simple and reliable, produces valid results, and requires no specialised equipment.

3.1.4 HISTORIC RECORD SAMPLING IN REFERENCE AREAS

Representative vegetation reference plots (with similar/identical land uses as per the proposed post closure land use of rehabilitated mine areas) will be demarcated areas near rehabilitated mine areas for determining the degree of achievement of rehabilitation success criteria for vegetative cover. This procedure, known as historic record sampling, provides an indication of the percentage of ground cover, woody species density and percentage of indigenous species found in undisturbed areas.

Vegetative growth on reference plots will be compared with the vegetation on rehabilitated areas. These reference areas will be at least 2500 m^2 in size. Analysis of vegetative cover percentage, tree/shrub density, and percentage of indigenous species will be undertaken on each reference plot. The results of these analyses will be compared with the results of similar analyses on rehabilitated areas as described in Sections 3.1.1, 3.1.2 and 3.1.3 to determine the degree of achievement of rehabilitation success for vegetative cover.

3.2 VEGETATIVE COVER MONITORING SCHEDULE

Vegetative cover monitoring will begin one year after completion of revegetation activities and continue annually until rehabilitation success for vegetative cover is achieved. Analyses of vegetative cover percentage, tree/shrub density, and percentage of indigenous species will be completed on rehabilitated areas by trained staff under the supervision of a qualified professional. These monitoring activities will also be completed for reference plots and the values obtained averaged over the aftercare period for the purposes of defining rehabilitation success criteria (see Section 3.3). Vegetative cover monitoring will be completed each year during the seasonal period of peak standing biomass.

Should vegetative cover monitoring after the first year of the aftercare period on any rehabilitated area indicate that the vegetation in that area is not developing in a manner that will lead to achieving vegetative cover success criteria, then necessary remedial measures will be undertaken to enhance vegetative growth in that area to the extent that required standards can be expected to be met.

3.3 REHABILITATION SUCCESS CRITERIA FOR VEGETATIVE COVER INDICATORS

Rehabilitation success for the vegetative cover indicator will be demonstrated when the following criteria are met:

- The percentage of vegetative cover on rehabilitated areas is greater than or equal to 90% of the vegetative cover percentage found on corresponding reference plots with a similar land use;
- The density of tree/shrub species (woody species) on rehabilitated areas is greater than or equal to 90% of the density of tree/shrub species found on corresponding reference plots with a similar land use; and

- The percentage of indigenous/common commercial species on rehabilitated areas is greater than or equal to 90% of the percentage of indigenous/common commercial species found on corresponding reference plots with a similar land use.

Achievement of the rehabilitation success criteria for vegetative cover will ensure that a productive, self-sustaining vegetative community has been established which facilitates a sustainable post closure land use.

4 SURFACE WATER QUALITY MONITORING

The surface water quality monitoring programme is designed to verify that surface water quality downstream of all rehabilitated areas complies with agreed standards.

The major potential concerns with post closure surface water quality downstream of the rehabilitated areas are related to turbidity (suspended solids), pH, salts, and metals. The surface water quality monitoring programme has therefore been designed to evaluate these parameters where appropriate to ensure long-term environmental protection and the suitability of surface waters for post closure land uses.

4.1 SURFACE WATER QUALITY ANALYSIS

The physical and chemical parameters to be included in laboratory analyses of surface water samples has been selected based upon site criteria/characteristics and geochemical results to date. A list of current minimum recommended parameters is given in Table B-1. This may expand following further geochemical analysis and collection of baseline data.

TABLE B-1: RECOMMENDED SURFACE WATER QUALITY ANALYSIS PARAMETERS

pH	Total suspended solids, TSS	Strontium, Sr
Electrical conductivity, EC	Total dissolved solids, TDS	Tungsten, W
Temperature	Bicarbonate as HCO_3	Silicon, Si
Fluoride as F	Phosphorus, P	Selenium, Se
Total alkalinity as $CaCO_3$	Lead, Pb	Antimony, Sb
Chloride as Cl	Zinc, Zn	Uranium, U
Sulphate as SO_4	Vanadium, V	Yttrium, Y
Nitrate as N	Tin, Sn	Zirconium, Zr

4.2 SURFACE WATER QUALITY MONITORING SCHEDULE

The locations (and frequency) of surface water quality monitoring during decommissioning, rehabilitation and aftercare periods will be based on the surface water monitoring locations (and frequency) at LOM with additional sampling points added as necessary to ensure all potentially affected surface waters are monitored.

Surface water quality samples will be collected by trained staff following standard international protocol for collection of environmental samples. Surface water monitoring results will be recorded and included in ongoing monitoring reports.

Should statistical analysis of surface water monitoring results for the five year (active and passive maintenance and aftercare) period following completion of decommissioning and rehabilitation activities indicate that agreed standards for protection of surface water quality will not be met for a particular area, then a study will be commissioned to determine the causes of such failure, the potential for harm to the environment and/or post closure land users, the need for remedial measures, and to recommend practicable remedial measures if required. In such a case, if the indicated surface water quality emanating from rehabilitated areas is representative of baseline/background (or upstream) surface water quality on the rehabilitated areas and in the surrounding region, then the previously agreed standards may need to be modified (in agreement with the regulatory Authorities, DWS and DMR).

4.3 REHABILITATION SUCCESS CRITERIA FOR SURFACE WATER QUALITY INDICATORS

Rehabilitation success for the surface water quality indicators will be demonstrated when statistical analysis (and trends) of monitoring results for the five year (active and passive maintenance and aftercare) period following the completion of decommissioning and rehabilitation activities indicate that agreed water quality standards for surface water will not be exceeded at monitored locations. Achievement of the rehabilitation success criteria for surface water quality will ensure that surface waters on (and immediately downstream of) the rehabilitated areas are suitable for post closure land users.

5 GROUNDWATER QUALITY MONITORING

The groundwater quality monitoring programme is designed to verify that groundwater quality downstream of potential sources of pollution such as the previous overburden dump complies with agreed standards.

The major potential concerns with post closure groundwater quality downstream of potential sources of pollution are related to pH, salts, and metals.

The groundwater quality monitoring programme has therefore been designed to evaluate these parameters where appropriate to ensure long-term environmental protection and the suitability of groundwater for post closure land uses.

5.1 GROUNDWATER QUALITY ANALYSIS

Groundwater monitoring should occur at those locations where there are surface activities or infrastructure which has the potential of pollution.

The physical and chemical parameters to be included in laboratory analyses of groundwater samples has been selected based upon site criteria/characteristics and geochemical results to date. A list of recommended parameters is given in Table B-2. This may expand following further geochemical analysis and collection of baseline data.

TABLE B-2: RECOMMENDED GROUNDWATER QUALITY ANALYSIS PARAMETERS

pH	Total suspended solids, TSS	Strontium, Sr
Electrical conductivity, EC	Total dissolved solids, TDS	Tungsten, W
Temperature	Bicarbonate as HCO_3	Silicon, Si
Fluoride as F	Phosphorus, P	Selenium, Se
Total alkalinity as $CaCO_3$	Lead, Pb	Antimony, Sb
Chloride as Cl	Zinc, Zn	Uranium, U
Sulphate as SO_4	Vanadium, V	Yttrium, Y
Nitrate as N	Tin, Sn	Zirconium, Zr

5.2 GROUNDWATER QUALITY MONITORING SCHEDULE

The locations (and frequency) of groundwater quality monitoring during decommissioning, rehabilitation and aftercare periods will be based on the groundwater monitoring locations (and frequency) at LOM with additional sampling points added as necessary to ensure all potentially affected groundwater are monitored.

Groundwater quality samples will be collected by suitably qualified staff following standard international protocol for collection of environmental samples. Groundwater monitoring results will be recorded and included in ongoing monitoring reports.

Should statistical analysis of groundwater monitoring results for the five year (active and passive maintenance and aftercare) period following completion of decommissioning and rehabilitation activities indicate that agreed standards for protection of groundwater quality will not be met for a particular area, then a study will be commissioned to determine the causes of such failure, the potential for harm to the environment and/or post closure land users, the need for remedial measures, and to recommend practicable remedial measures if required.

In such a case, if the indicated groundwater quality emanating from rehabilitated areas is representative of baseline/background (or upstream) groundwater quality on the rehabilitated areas and in the surrounding region, then previously agreed standards may need to be modified (in agreement with the regulatory Authorities, DWS and DMR).

5.3 REHABILITATION SUCCESS CRITERIA FOR GROUNDWATER QUALITY INDICATORS

Rehabilitation success for the groundwater quality indicators will be demonstrated when statistical analysis (and trends) of source term monitoring results for the five year (active and passive maintenance and aftercare) period following the completion of decommissioning and rehabilitation activities indicate that agreed water quality standards for groundwater will not be exceeded at monitored locations. Achievement of the rehabilitation success criteria for groundwater quality will ensure that groundwater on (and immediately downstream of) the rehabilitated areas are suitable for post closure land users.

6 MONITORING AND INSPECTION COSTS

Unit rates for monitoring, analyses and inspection activities were developed based on the costs of similar activities being undertaken by SLR. The total estimated cost of the monitoring and inspection activities as described is R 2,582,000. A breakdown of the cost is presented in Table B-3.

At this stage, provision has been made for 15 water sampling points to be monitored at the following frequency during the 7 years of rehabilitation, monitoring and maintenance activities:

- Quarterly during decommissioning and rehabilitation (2 years),
- Bi-annually during active maintenance and aftercare (3 years),
- Bi-annually during passive maintenance and aftercare (2 years) – at only 8 water sampling points.

The total cost of sampling is thus estimated to be R 242,000.

Provision has also been made for bi-annual inspections and reporting by an environmental scientist. There will thus be 14 inspections over the 7 year period. The total provision is R 720,000.

The cost of the personnel required for the on-site maintenance and monitoring activities have also been included at R 540,000 per annum. Allowance has only been made for the first 3 years of active maintenance and aftercare, and no provision has been made for the remaining 2 years of passive maintenance and aftercare. It is assumed that this work will be contracted out and provision has been made for a manager (part-time), a field supervisor (full-time) and 5 labourer’s (full time).

TABLE B-3: SUMMARY OF SUPERVISION AND MONITORING COSTS

Item	Monitoring / Maintenance Activity	Sampling Points	Cost / Sample	Duration (years)	Frequency	Unit	Quantity	Total Cost
1	**WATER QUALITY**							
1.1	*Collection and Laboratory Analysis of Surface and Ground Water Samples*							
1.1.1	Decommissioning and Rehabilitation Phase	15	R 1 000	2	quarterly	Sum	120	R 120 000
1.1.2	Maintenance and Aftercare (Active)	15	R 1 000	3	bi-annual	Sum	90	R 90 000
1.1.3	Maintenance and Aftercare (Passive)	8	R 1 000	2	bi-annual	Sum	32	R 32 000
2	**BI-ANNUAL INSPECTIONS**							
2.1	*Inspection of Decommissioning and reclamation works by a suitably qualified and experienced Professional Engineer / Environmental Scientist*							
2.1.1	Decommissioning and Rehabilitation Phase	1	R 60 000	2	bi-annual	Sum	4	R 240 000
2.1.2	Maintenance and Aftercare (Active)	1	R 60 000	3	bi-annual	Sum	6	R 360 000
2.1.3	Maintenance and Aftercare (Passive)	1	R 30 000	2	bi-annual	Sum	4	R 120 000
	No. of Days on Site	*1*						
	Report Compilation	*1*						
	Rate per day	R 15 000.00						
3	**MANAGEMENT OF MONITORING AND MAINTENANCE**							
3.1	*On-Site Management and Supervision of the Decommissioning and Reclamation Process by an appropriately qualified and experienced team.*					Years	3	R 1 620 000
		Days/month	**Rate / day**	**Total/month**	**Total/year**			
	- 1 Manager	*1*	*R 10 000*	*R 10 000*	R 120 000			
	- 1 Field Supervisor	*20*	*R 500*	*R 10 000*	R 120 000			
	- 5 Labourers	*100*	*R 250*	*R 25 000*	R 300 000			
					R 540 000			
							TOTAL	**R 2 582 000**

APPENDIX C: CLOSURE COST CALCULATION

Mine:		Proposed Alexander Project		Period:		LOM
Evaluators:		S van Niekerk (SLR)				
No.	Description:	Unit:	Operational Area	A Quantity	B Master rate	Amount (Rands)
1. Shaft Complex						
1.1	Dismantle medium steel structures (upto 300 kg per square metre)	m^2	Workshops	4 500	R 540.00	R 2 430 000.00
		m^2	Stores	1 650	R 540.00	R 891 000.00
		m^2	Substation and Eskom yard	4 290	R 540.00	R 2 316 600.00
		m^2	Bulk/raw/fire water storage tank	1 200	R 540.00	R 648 000.00
		m^2	Ventilation shaft	825	R 540.00	R 445 500.00
		m^2	Bulk oil storage	200	R 540.00	R 108 000.00
		m^2	Fuel storage facilities and refuel bays	400	R 540.00	R 216 000.00
		m^2	Potable and bulk water storage	1 800	R 540.00	R 972 000.00
		m^2	Sewage and Water treatment plants	1 500	R 540.00	R 810 000.00
1.2	Demolish light duty concrete floors and bases after removal of superstructure	m^2	Stores	1 650	R 230.00	R 379 500.00
		m^2	Substation and Eskom yard	4 290	R 230.00	R 986 700.00
		m^2	Bulk/raw/fire water storage tank	1 200	R 230.00	R 276 000.00
		m^2	Ventilation shaft	825	R 230.00	R 189 750.00
		m^2	Bulk oil storage	200	R 230.00	R 46 000.00
		m^2	Fuel storage facilities and refuel bays	400	R 230.00	R 92 000.00
		m^2	Potable and bulk water storage	1 800	R 230.00	R 414 000.00
		m^2	Sewage and Water treatment plants	1 500	R 230.00	R 345 000.00
		m^2	Salvage yard	2 500	R 230.00	R 575 000.00
1.3	Demolish medium duty concrete floors and bases after removal of superstructure	m^2	Workshops	4 500	R 425.00	R 1 912 500.00
1.4	Demolish heavy duty concrete structures	m^2	Surge Silo and Stone Dust Silo	270	R 1 240.00	R 334 800.00
1.5	Demolition of single storey brick buildings	m^2	Mine offices	2 775	R 310.00	R 860 250.00
		m^2	Changehouse and lamp room	3 000	R 310.00	R 930 000.00
		m^2	Shaft supervisor offices	1 080	R 310.00	R 334 800.00
		m^2	Security	300	R 310.00	R 93 000.00

1.6	Dismantle overland conveyor and remove foundations	m	Overland conveyor	19 320	R 335.00	R 6 472 200.00
1.7	Remove gravel access roads	m^2	Maintenance access roads	12 250	R 30.00	R 367 500.00
1.8	Remove bitumous access roads and parking areas	m^2	Main access road	23 450	R 65.00	R 1 524 250.00
		m^2	Main car park	6 000	R 65.00	R 390 000.00
		m^2	Office car parks and bus yard	5 500	R 65.00	R 357 500.00
1.9	Sealing of shafts	no.	Vertical shaft (6m diameter)	1	R 495 000.00	R 495 000.00
		no.	Decline shaft (2 No. - 6m x 3m)	2	R 480 000.00	R 960 000.00
1.10	Backfill of boxcut	m^3	Decline shaft	375 000	R 30.00	R 11 250 000.00
1.11	Remove and dispose HDPE	ha	Evaporation dam and PCD 1 & 2	1.60	R 65 000.00	R 104 000.00
1.12	Dismantle security fencing	m	Perimeter security fence	3 470	R 60.00	R 208 200.00
1.13	Shaping and levelling areas	ha	Shaft complex	40.00	R 90 000.00	R 3 600 000.00
1.14	Import topsoil and establish vegetation	ha	Shaft complex	40.00	R 105 350.00	R 4 214 000.00
		ha	Conveyor route	11.59	R 105 350.00	R 1 221 217.20
1.15	Treatment of decant water (not included)	Sum	Treatment plant operating for 20 years	n/a	R 5 750 000.00	R -
1.16	Active maintenance and aftercare (3 years)	ha	Shaft complex	40.00	R 19 535.00	R 781 400.00
		ha	Conveyor route	100.00	R 4 215.00	R 421 500.00
1.17	Passive maintenance and aftercare (2 years)	ha	Shaft complex	40.00	R 4 885.00	R 195 400.00
		ha	Conveyor route	100.00	R 2 635.00	R 263 500.00
					Subtotal 1: Shaft Complex	**R 49 432 067.20**
2. P&G's, Contingency & VAT						
2.1	Contigency	%	All areas	15		R 7 414 810.08
2.2	Procurement, tender process	%	All areas	6.0		R 2 965 924.03
2.3	P&G's, site establish & demob.	%	All areas	18		R 8 897 772.10
2.4	Site supervision	%	All areas	6		R 2 965 924.03
2.5	Post closure monitoring	Sum	All areas	1		R 2 582 000.00
					Subtotal 2 (Subtotal 1 + P&G's, Contingency)	**R 74 258 497.44**
2.6	VAT	%	All areas	14		R 10 396 189.64
					Grand Total (Subtotal 2 + VAT)	**R 84 654 687.08**

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