

## **Witkop Fluorspar Mine (Pty) Ltd**

# **Financial Provision and Rehabilitation Report for the Proposed Kanakies Gypsum Mine**

August 2018

REFERENCE: NC30/5/1/2/3/2/1 (10136) MR




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## ACRONYMS AND ABBREVIATIONS

ACRONYM:	DESCRIPTION:
DMR	Department of Mineral Resources
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMPr	Environmental Management Programme Report
EO	Environmental Officer
GG	Government Gazette
GNR	Government Notice
I&AP	Interested and Affected Party
MPRDA	Minerals and Petroleum Resources Development Act 28 of 2002
NEMA	National Environmental Management Act 107 of 1998
NEMAQA	National Environmental Management Air Quality Act 39 of 2004
ROM	Run of Mine
SCC	Species of Conservation Concern

## 1 Introduction

Witkop Fluorspar Mine (Pty) Ltd intends to develop a Gypsum mine over the remainder of the farm Kanakies 332 and as such has submitted an application for a Mining Right (MR) in terms of the Mineral and Petroleum Resources Development Act, Act No. 28 of 2002 (MPRDA).

The Project Background is summarized in Table 1.

**Table 1: Project Summary**

ITEM	DETAIL			
Type of mineral	Gypsum			
Mining method	Surface trench mining			
Depth of the mineral below surface	The deposit consists of 2 layers of gypsum i.e. a powder layer of approximate thickness 0.4 meter, which lies approximately 0.2 to 0.7 meter under the surface, followed by a nodular crystalline layer of gypsum of approximate thickness 0.9 to 1.3 meter.			
Geological formation	Quaternary formation			
Life of mine	+ 30 years			
Production rate	<b>Powder (Ton)</b>	<b>Crystal (Ton)</b>	<b>Life (Years)</b>	
	156 480	258 192	8.4	
	47 318	251 856	6	
	81 101	278 784	7.3	
	21 806	171 336	3.9	
	35 352	129 624	3.3	
	60 192	174 240	4.7	
	0	172 392	3.5	
	<b>402 250</b>	<b>1 436 424</b>	<b>37.1</b>	<b>Total</b>
Primary market	Local (agricultural and industrial use)			

Cabanga Environmental has been appointed by Witkop Fluorspar Mine (Pty) Ltd to assess the Quantum for Financial Provision. This Report has been prepared in accordance with the Financial Provisioning Regulations, 2015 (as amended) (FP Regulations) promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The Report is presented in three sections to satisfy the required information, namely:

- Annual Rehabilitation Plan;
- Final rehabilitation, decommissioning and mine closure plan; and
- Environmental risk assessment report.

The Holder of a Mining Right is required to update the abovementioned on an annual basis. This report constitutes the first rehabilitation and financial provision report for the proposed Kanakies Mine, and will be updated on an annual basis if approved.



**Table 2: Reporting requirements and structure of this Report**

No.	Requirement	Response
Required contents of an Annual Rehabilitation Plan (Appendix 3)		
a)	<ul style="list-style-type: none"> <li>Details and expertise (including qualifications, professional registrations and experience) of the person who prepared the report,</li> <li>Timeframes for implementation of the current rehabilitation activities, and review of the previous rehabilitation activities</li> </ul>	<p>Refer to Section 2</p> <p>Refer to Section 3.3</p>
b)	the pertinent environmental and project context relating directly to the planned annual rehabilitation and remediation activity;	Refer to Section 3
c)	results of monitoring of risks identified in the final rehabilitation, decommissioning and mine closure plan with a view to informing rehabilitation and remediation activities;	See Section 5.2.1
d)	<ul style="list-style-type: none"> <li>an identification of shortcomings experienced in the preceding 12 months;</li> </ul>	See Section 7.1
e)	<ul style="list-style-type: none"> <li>details of the planned activities for the coming 12 months (including activities that will address the aforementioned shortcomings);</li> <li>a motivation for the amount of annual rehabilitation that has taken place and is planned to take place.</li> <li>Pertinent closure objectives and performance targets that will be assessed in the following year;</li> <li>Closure design criteria and planned final land use details;</li> <li>Site plan showing current situation and planned rehabilitation</li> </ul>	<p>See Table 13</p> <p>See Section 6</p> <p>Refer to Appendix A</p>
f)	a review of the previous year's annual rehabilitation and remediation activities (also showing relationship between activities that were planned, and activities that have taken place)	See Table 13
g)	Costing (including methodology, calculations, assumptions and monitoring and maintenance costs)	See Section 9
Required contents of a Final Rehabilitation, Decommissioning and Mine Closure Plan (Appendix 4)		
a)	Details and expertise (including qualifications, professional registrations and experience) of the person who prepared the report,	Refer to Section 2
b)	<ul style="list-style-type: none"> <li>Material information and issues (including stakeholder issues) that have guided the formulation of the plan;</li> </ul>	See

No.	Requirement	Response
	<ul style="list-style-type: none"> <li>overview of the environmental and social context that may influence closure activities and post-mining land use;</li> <li>the mine plan and schedule for the full approved operations</li> </ul>	Section 3
c)	Findings of an environmental risk assessment, leading to the most appropriate closure strategy	Section 5
d)	Design principles, including the legal framework, closure vision, objectives and targets, an evaluation of alternative closure and post-closure options, a motivation for the preferred options and a description of assumptions made with regards to closure actions.	Please see Sections 4, 6 and 12.
e)	Description of the proposed final post-mining land use (including a Map)	Refer to Section 6.1
f)	Closure actions	See Section 6.3
g)	Schedule of closure actions	Section 3.3
h)	Organisational capacity to implement the plan	Section 9
i)	Identification of gaps in the plan, and an action plan to address the gaps	Section 12
j)	Relinquishment criteria	Section 6.4
k)	Closure Cost estimation procedure (including methodology, calculations and cost assumptions)	Section 9
l)	Monitoring, auditing and reporting requirements relating to the risk assessment, legal requirements and knowledge gaps, including a Schedule of reporting requirements (internal and external) and Monitoring Plan	Section 11
m)	Motivation for amendments made to the plan, given the monitoring results in the previous auditing period and the gaps identified.	N/A
Required contents of an Environmental Risk Assessment Report (Appendix 5)		
a)	Details and expertise (including qualifications, professional registrations and experience) of the person who prepared the report,	Section 2
b)	Details of the assessment process used to identify and quantify latent risks including: <ul style="list-style-type: none"> <li>methodology;</li> </ul>	Section 8

No.	Requirement	Response
	<ul style="list-style-type: none"> <li>• reason(s) for the risks being latent (not mitigated prior to closure);</li> <li>• drivers that could result in the manifestation of the risk;</li> <li>• timeframe(s) which the risk is likely to manifest;</li> <li>• triggers that can be used to identify that the risk is imminent or has manifested;</li> <li>• results and findings of the risk assessment; and</li> <li>• explanation of changes to the risk assessment results from the previous year of assessment.</li> </ul>	
c)	Management activities, including monitoring, corrective or adaptive management and alternatives assessment.	Section 11
d)	Costing, including methodology, calculations, assumptions and monitoring costs post closure	Section 9
e)	Monitoring, auditing and reporting requirements	Section 11

## 2 Details of the Specialist

The details of the persons who contributed to the preparation of this report are provided in Table 3 below.

**Table 3: Details of Specialist**

<b>Author:</b>	<b>Michelle Venter</b>
Highest qualification	BSc Honours Geography
Years' experience	8 years
Professional registration	Cert. Sci. Nat (Reg. 114447)
<b>Author:</b>	<b>Ken van Rooyen</b>
Highest qualification	MSc Geography
Years' experience	30 + years
Professional registration	Pr.Sci.Nat (Reg. 121/93)
<b>Review:</b>	<b>Lelani Claassen</b>
Highest qualification	BSc Honours Environmental Management
Years' experience	10

## 3 Project Contextualisation

### 3.1 Locality

The site is located in the Hantam Local Municipality of the Namaqwa District Municipality, Northern Cape Province. The project area is situated 45km west-south-west of the town of Loeriesfontein and 40km north-north-west of the town of Nieuwoudtville.

The Mining Right Area (MRA) comprises 7456.7 Hectares (ha) where approximately 689 Ha is earmarked for mining, whilst a further 9Ha will be affected by surface infrastructure. The MRA covers the following properties:

**Table 4: Affected Properties**

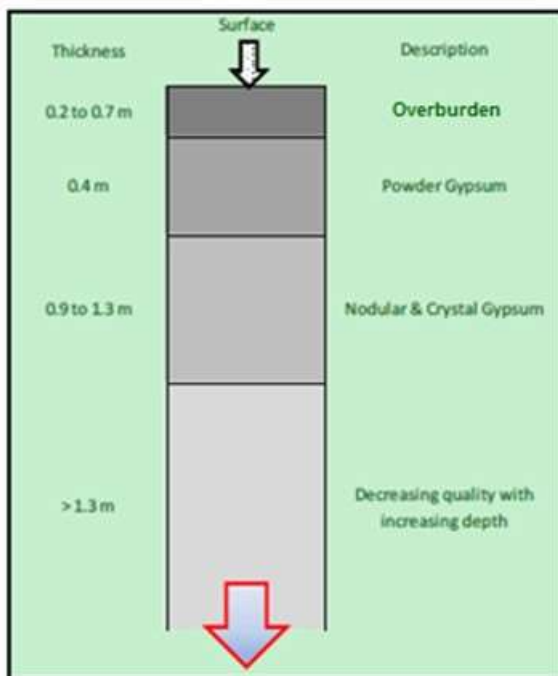
Property	Portion	Deed Transfer	of	Extent - Ha	Registered Owner(s)	Share Owned
Kanakies 332	0 (RE)	TT37913/2016		7456.6974 Ha	PPC Cement SA (Pty) Ltd	100%
<b>Total Extent of Mining Right Application Area</b>				<b>7456.7 Ha</b>		

### 3.2 Activity Description

Gypsum is the resource to be mined.

The proposed project area is characterised by quaternary alluvium, which consists of calcareous and gypsiferous soils and also quaternary gravel, silt and sand. The above mentioned alluvial soils overlie the Besonderheid Formation of the Knersvlakte Subgroup, Vanrhynsdorp Group geologies.

There are two horizontal seams of gypsum, the first of which is 0.4m thick. The second seam is 0.9m to 1.3m thick and is the main gypsum resource for the project. With increasing depth after this seam (>1.3m), the quality of gypsum decreases and will not be mined. The below figure depicts the vertical distribution of the mineral.



**Figure 1 Gypsum seams (Witkop Fluorspar Mine, 2018)**

#### 3.2.1 Mining Method, Processing and Recovery

The gypsum will be mined via simple roll-over trench mining. The depth of the trenching will range from 1.4m - 2.5m. Mine blocks will be 50m x 100m. The overburden soils layer will be cleared across the mine block using a scraper, which is approximately 0.4m. This will be followed by the harvesting of the powder layer in 2.2m x 50m strips with a surface miner. The material will be placed in wind rows whereby an articulated dump truck will collect the material. This layer will be screened so that foreign materials are removed. The expected minimum margin to be recovered is 40%.

Within the centre of eight mine blocks (200m x 200m area) will be the stockpiling and processing area. The material will be crushed and screened using a roller crusher combined with a variable aperture high frequency screen with a recycle system, fed by a wheel loader.

The expected recovery margin is estimated at 65%. The high frequency screening efficiency is expected to be no less than 37%, where the overall mean loss of volume of material harvested has been calculated to be 76%. The upgraded gypsum will be hauled to the quarantine area where a quality check will be undertaken and then bulk blending to produce the approved finished goods.

After this process, it is repeated for the next layer which is the crystal-gypsum carrying clay. When the crystal-gypsum has been harvested, this mine block has been completed and the next mine block will be processed. When eight mine blocks have been mined out, concurrent rehabilitation (backfilling the excavation with stockpiled overburden soils) is undertaken. As this is being undertaken, the next eight mine blocks are being prepared for mining.

The theoretical recovery per hectare are as follows:

- Powder layer at +60% purity:  $0.2\text{m} \times 10\,000\text{m}^2 \times 1\text{ton}/\text{m}^3 \times 40\% = 800\text{ t}/\text{ha}$
- Powder layer at +80% purity:  $0.2\text{m} \times 10\,000\text{m}^2 \times 1\text{ton}/\text{m}^3 \times 40\% = 800\text{ t}/\text{ha}$
- Crystal layer at +80% purity:  $1.1\text{m} \times 10\,000\text{m}^2 \times 1\text{ton}/\text{m}^3 \times 24\% = 2\,640\text{ t}/\text{ha}$

The recovery per hectare equates to 800 tons for agricultural material and 3440 tons for industrial material.

### **3.2.2 Water Supply, management and reticulation**

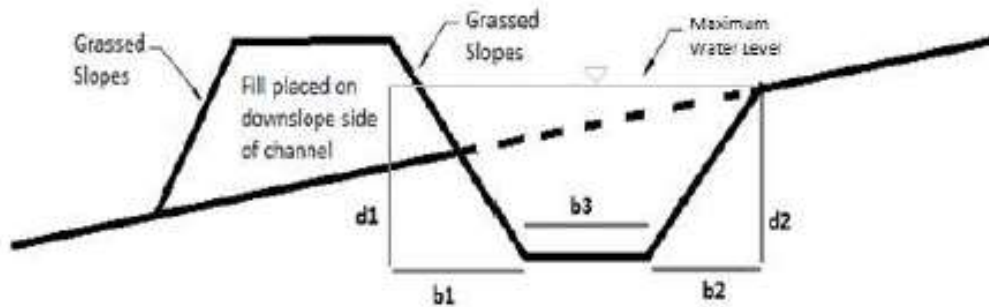
It is anticipated that 81m<sup>3</sup> of water will be used on a daily basis for the operation. A total of 80m<sup>3</sup> will be used for human consumption, toilets and hand washing, where 1m<sup>3</sup> will be used for dust suppression. No water will be required for the processing of gypsum.

The water for the site will be supplied by an existing borehole that is located two kilometres east of the project area. The borehole will be pumped for four hours a day at 21m<sup>3</sup> per hour and piped to the jojo tank for storage. The jojo tank will have a storage capacity of 2500 litres. The necessary water use license applications will be undertaken for this water use.

Berms will be constructed around areas of activity so dirty water is unable to come into contact with clean areas, and also ensuring clean water is diverted around dirty areas.

Clean and dirty water channels will be constructed throughout the site. Dirty water channels will collect dirty water from stockpile areas, overburden areas and infrastructure areas and be directed to silt traps (SD Hydrological Services, 2018). These channels will need to be based on the trapezoidal and triangular channel designs.

Channels that surround the stockpile and overburden are to be vegetated and unlined trapezoidal channels (Figure 2). The side slopes are to be 1:3, bottom width of 1m and a design depth of 1m. Similarly, channels within the infrastructure area are to be vegetated and unlined trapezoidal channels, with side slopes gradient of 1:3, a bottom width of 1m and a design depth of 0.5m.



**Figure 2 Conceptual Trapezoidal Channel (SD Hydrological Services, 2018)**

A detailed mine water balance has been completed by SD Hydrological Services, 2018. It can be found in **Error! Reference source not found.**

The study revealed a sufficient sustainable supply of water that is to be obtained from a combination of rainfall and abstraction from a borehole.

The water balance indicates that on a monthly basis 3204 m<sup>3</sup> will be required and 3204 m<sup>3</sup> will be utilized. There will be no surplus of water anticipated on the project site.

### **3.2.3 Associated Activities, Infrastructure and Services**

Additional services and infrastructure associated with the proposed project include:

#### **3.2.3.1 Soil stripping and stockpiling**

There will be no topsoil stripping as there is little to no topsoil on site. The product stockpiles that will be on site in the unfenced stockpile yard. The ground will be compacted with overburden and with the rejected clay materials. The area will not be fenced off and will be approximately 21,000 m<sup>2</sup> in size. There will be two stockpiles of the finished product, one agricultural and the other industrial grade. Stockpiles will have a radius of 50m and height of 3m.

#### **3.2.3.2 Mine infrastructure**

The mine area will be fenced off and access to site controlled. Surface infrastructure is summarised in Table 5:

**Table 5 Proposed Infrastructure**

<b>SURFACE INFRASTRUCTURE:</b>	<b>DESCRIPTION</b>
Access and security control	<ul style="list-style-type: none"> <li>• Internal haul and access roads</li> <li>• Access will be via the existing Transnet service road off the R355</li> <li>• Security</li> <li>• Weighbridge (in the event product is trucked)</li> <li>• Fencing</li> </ul>

SURFACE INFRASTRUCTURE:	DESCRIPTION
Mine Area	<ul style="list-style-type: none"> <li>• Soil berms</li> <li>• Stockpiles</li> <li>• Mobile crushing and screening plant</li> <li>• Ablution facilities (portable toilets)</li> <li>• Clean and dirty water trenches, water management sumps and silt traps</li> <li>• Hard park area</li> </ul>
Infrastructure Area	<ul style="list-style-type: none"> <li>• Vehicle park area</li> <li>• Workshop and store</li> <li>• Fuel storage</li> <li>• Container offices and laboratory</li> <li>• Ablution facilities</li> <li>• Jojo tank</li> <li>• Stockpile Yard</li> <li>• Generators</li> <li>• Lighting</li> <li>• Clean and dirty water trenches, water management sumps and silt traps</li> </ul>
Siding Area	<ul style="list-style-type: none"> <li>• Stockpile and loading area</li> <li>• Clean and dirty water trenches, water management sumps and silt traps</li> <li>• Ablution facilities (portable toilets)</li> </ul>

There will be no permanent structures on the site with the exception of the fuel storage area and the associated bunding. A total of 120 m<sup>2</sup> of office, laboratory and ablution facilities will be erected by means of mobile park-homes. In addition, a roofed shed will be erected for the purpose of providing shaded area for routine and breakdown maintenance on the small number of yellow equipment that will be operating on site. The floor will be constructed of 100mm reinforced concrete and the total floor area will be maximum 200 m<sup>2</sup>.

### **3.2.3.3 Power supply**

Kanakies Gypsum Mine will be independent from the National Grid. Electricity for administrative and maintenance purposes at the infrastructure area will be provided on demand by means of a 10kVA generator, combined with solar polar panels equipped with battery storage. Gas appliances will be utilised for heating and other domestic purposes.

All mining and ancillary materials handling will be performed by diesel driven machinery and/or electricity generated by a diesel-powered generator (250kVA).

### **3.2.3.4 Access Roads and railway siding**

The site is serviced by a series of gravel farm roads, which provides access to the project area as well as the Transnet Loop 6 rail siding situated alongside the Sishen-Saldanha railway line (approximately 20km from the E355). There is currently only one option proposed for access to site, which is via the gravel Transnet Service Road and the R355. All trucks and private/staff vehicles will make use of the access via the Transnet Service Road.



A maximum of 10km internal haul and access roads will be constructed on site, with a width of 5m, over the life of mine. These will be created and rehabilitated concurrently as the need arises.

#### **3.2.3.5 Transport**

Initially transport will be limited to road haulage as negotiations with Transnet Freight Rail are ongoing.

Given the expected production output of approximately 50 000t/annum; the expected number of trips will be 134 truckloads of 34 tons each per month, or approximately 6 to 7 trips per day over a 5-day week.

It is expected that from year 4 of full operation, the split between road haulage and rail transport will be approximately 60:40 i.e. about 40% of output would potentially be moved by train via the Kanakies Loop 6 Siding. This implies that the road truck trips will be reduced from 7 to approximately 4 trips per day over a 5-day week, whilst the remainder will be loaded and moved by train trucks. It is envisaged that the annual output to be transported by rail will be in the region of 20 000 ton/annum.

#### **3.2.3.6 Waste management**

General and hazardous waste will be generated on site:

- General waste includes office and domestic waste; construction and building waste; scrap metal and old tyres.
- Hazardous waste includes used hydrocarbons, oily rags and sewage.

No landfill site will be constructed on site. All waste will be separated and stored as per the relevant Norms and Standards where applicable. Waste will be recycled and sold/given to interested parties as far as possible. Waste for disposal will be collected by a reputable contractor for transport to a suitably licensed facility. Waste safety disposal certificates for hazardous waste will need to be obtained from disposal contractors and waste manifest will be maintained on site.

Sewage will be collected within conservancy tanks to be emptied by honey sucker for treatment at a suitably licensed facility. Portable toilets will be serviced by a sub-contractor on a weekly basis or as necessary.

#### **3.2.3.7 Fuel storage**

Oils, greases and other hydrocarbons will be stored in lockable stores, of approximately 30 m<sup>2</sup>, to be constructed from brick. Diesel fuel for the machinery will be stored on site in a 5,100 litre tank, rented from an oil company such as Shell or Caltex. The fuel supply company will have specific requirements in terms of bunding. In general, the bunding capacity is to be the capacity of the fuel tank plus 50%. There needs to be an impermeable apron for when refuelling takes place.

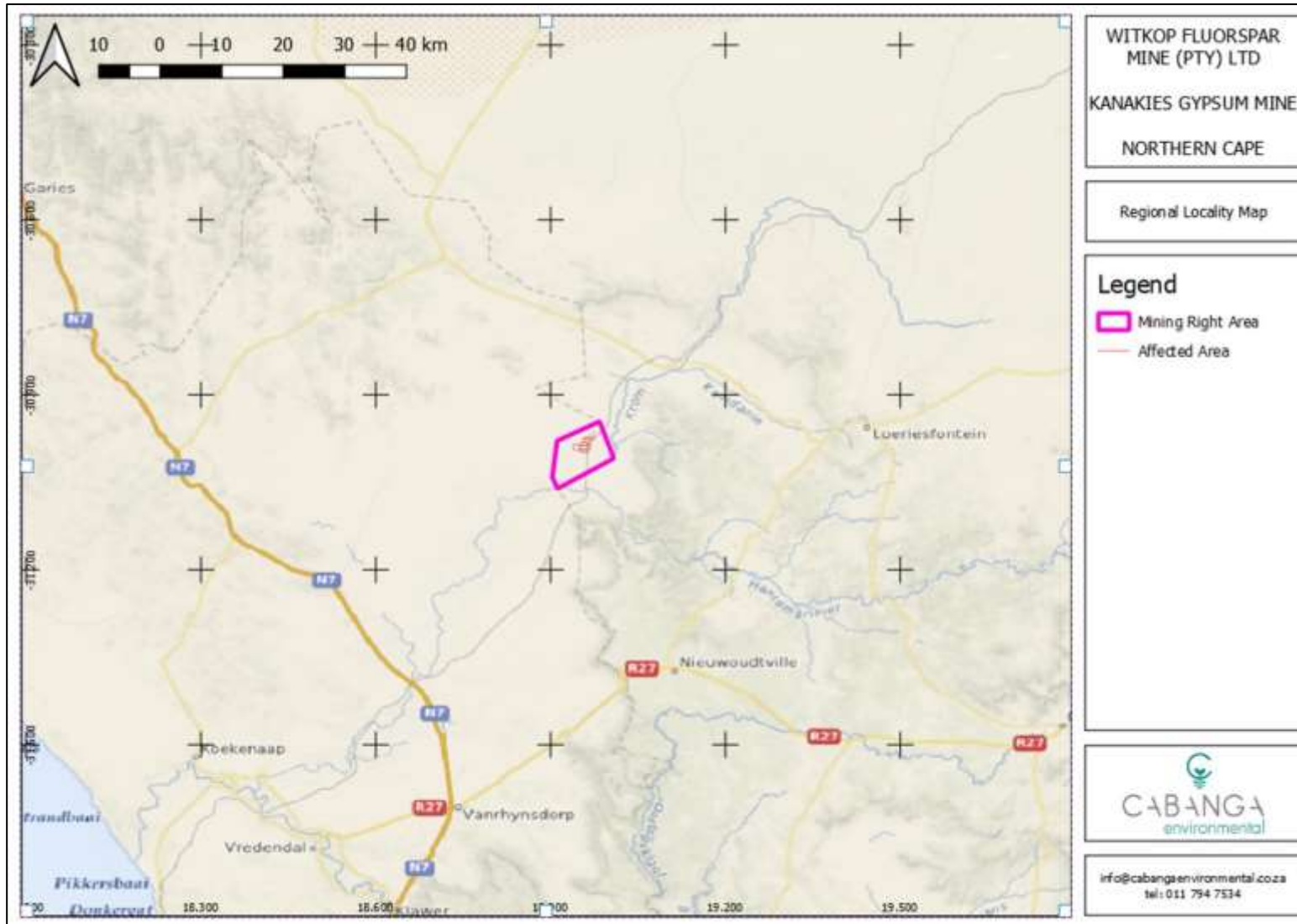


Figure 3: Regional Location of Kanakies Mine

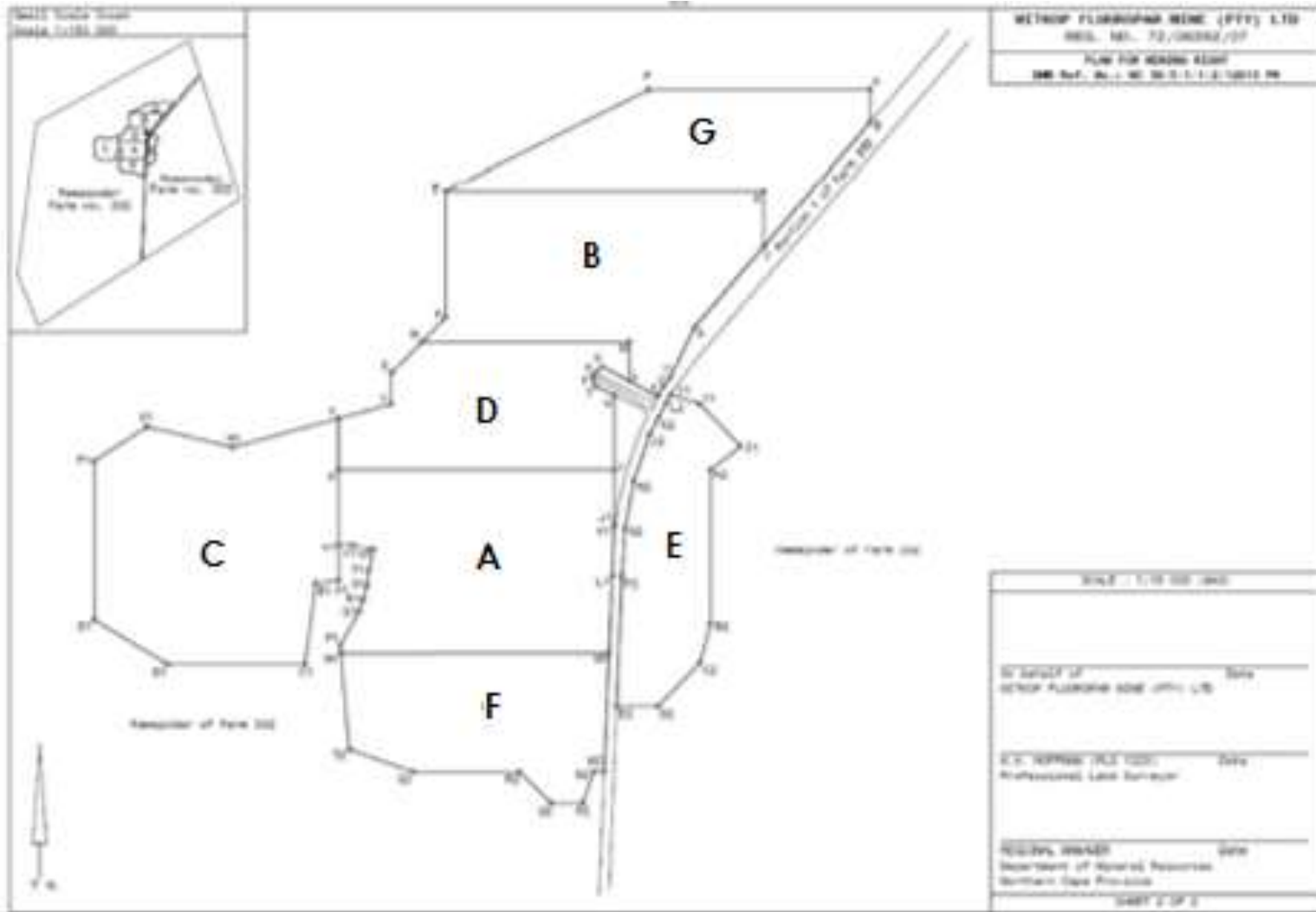


Figure 4: Mining Blocks (Witkop Fluorspar Mine (Pty) Ltd, 2018)

### 3.3 Life of Mine Description and Closure Schedule

The project life is estimated at 37 years.

It is anticipated that construction activities will take six (6) months, where the life of mine is expected to be in excess of thirty (30) years. Decommissioning and closure activities are estimated at one (1) year.

Post-closure monitoring is proposed for a period of 5 years.

Surface trench mining will take place to extract the gypsum reserve. Mine blocks, as per Figure 4, are labelled A to G. Mining will take place in a chronological order. As each trench is completed, roll over rehabilitation will take place whereby the waste material, material excavated (sans tradeable industrial and agricultural gypsum) will be backfilled into the trenches.

Table 6 depicts the resource extent. The mine block design / layout is shown in Figure 4.

**Table 6 Resource Extent and Mine Block Design (Witkop Fluorspar Mine (Pty) Ltd, 2018)**

Mine Block	Area (Hectares)	%Powder Coverage	%Crystal Coverage	Powder (Ton)	Crystal (Ton)	Life (Years)
Block A	97.8	100	100	156 480	258 192	8.4
Block B	95.4	31	100	47 318	251 856	6.0
Block C	105.6	48	100	81 101	278 784	7.3
Block D	64.9	21	100	21 806	171 336	3.9
Block E	49.1	45	100	35 352	129 624	3.3
Block F	66.0	57	100	60 192	174 240	4.7
Block G	65.3	0	100	0	172 392	3.5
<b>TOTAL</b>	<b>544.1</b>			<b>402 250</b>	<b>1 436 424</b>	<b>37.1</b>

### 3.4 Summary of the Environmental and Social Context of the Project

The pertinent environmental and social conditions at the Site are summarised in Table 7.

**Table 7: Environmental and Social Context**

Aspect	Description
Climate	<p>The project area experiences arid conditions with hot summers and cold winters. Temperature fluctuations vary from 35°C in summer to sub-zero temperatures in winter.</p> <p>The mean annual precipitation (MAP) is approximately 146mm per annum.</p>
Topography	<p>The topography of the project area is characterised by relatively flat to slightly undulating terrain. A mountainous area surrounds the greater area.</p>
Surface Water and Wetlands	<p>The proposed MRA falls within the Berg-Olifants Water Management Area. The proposed Kanakies Gypsum Mine is on the south eastern boundary of the E33A quaternary catchment. The major rivers falling within Berg-Olifants is the Olifants, Doring, Krom, Sand and Sout rivers. Runoff from the project area drains south into the Krom River and Doring River, which runs along the southern and eastern boundary of the MRA.</p> <p>In the overall MRA there is an unchannelled valley bottom and floodplain wetland present. In addition, an ephemeral drainage line is also present. These wetlands are avoided by the mine plan.</p>
Groundwater	<p>The depth to groundwater level ranges from 9.45- 12.87 metres below ground level (mbgl). The hydraulic conductivity of gypsum ranges from <math>3.5 \times 10^{-8}</math> and <math>2 \times 10^{-3}</math> m/day. Below the layer of gypsum is a layer of weathered, clayey, mudstone and siltstone, the hydraulic conductivity if this ranged between 0.001 to 10m/day.</p> <p>The proposed mining depth is a maximum of 2.5m. Therefore no dewatering of the mining areas is envisaged.</p> <p>Existing groundwater quality exceeds the SANS241: 2015 drinking water guidelines for sodium, chloride and sulphate. One of the hydrocensus boreholes also exceeded the SANS241: 2015 drinking water guidelines for fluoride.</p>
Geology	<p>The area is well known to be characterised by quaternary alluvium, comprising calcareous and gypsiferous soils, followed by quaternary gravels, silts and sands. These formations are believed to unconformably overlie the Besonderheid Formation of the Knersvlakte</p>

Aspect	Description
	<p>Subgroup, Vanrhynsdorp Group in the study area. The Besonderheid Formation comprises of green shale, siltstone, sandstone, gritstone and conglomerates, interbedded with shale, limestone and chert in the south east. It is believed that the ancient Doringrivier and its tributaries eroded the Besonderheid Formation and may have accumulated gypsiferous sediments in the paleochannels and topographic low points within the study area.</p>
Soils	<p>The dominant soil forms are Kimberly/Plooysburg. This type of soil is characterised by a shallow effective rooting depth with a carbonate-rich (calcrete) horizon underlying them. These types of soils are found in relatively flat areas and arid regions with high evaporation. The other soil form that was found in the project area is the Witbank (disturbed) soil form, which is present due to surface infrastructure such as roads and the rail line.</p>
Biodiversity	<p>The project area falls within the Knersvlakte Vygieveld vegetation type. Two habitats fall within this vegetation type based on the extent of use, being "Intact Knersvlakte Vygieveld" and "Overgrazed Knersvlakte Vygieveld". In addition, some transformed areas are present, which are associated with roads and railway.</p> <p>Certain parts of the MRA have been mapped as a Critical Biodiversity Area Two (CBA2) and an Ecological Support Area (ESA). The project does not overlap any aquatic CBA or ESAs.</p> <p>According to the Mining Biodiversity Guidelines (2012) the southwestern corner of the project area is considered Highest Biodiversity Importance. There were several floral Species of Conservation Concern (SCC) noted during the summer and winter assessment, as listed under the Northern Cape Nature Conservation Act, 2009 (Act 9 of 2009). These were:</p> <ul style="list-style-type: none"> <li>• <i>Hoodia gordonii</i>;</li> <li>• <i>Mesembryanthum</i> spp.;</li> <li>• <i>Drosanthemum</i> spp.;</li> <li>• <i>Brownanthus</i> spp.;</li> <li>• <i>Lessertia frutescens</i>;</li> <li>• <i>Oxalis ambigua</i>;</li> <li>• <i>Oxalis luteola</i>;</li> <li>• <i>Lampranthus maximiliani</i>;</li> <li>• <i>Ornithogalum secundum</i>;</li> <li>• <i>Lapeirousia spinosa</i>;</li> <li>• <i>Tetragonia microptera</i></li> <li>• <i>Malephora purpureo-corcea</i>;</li> <li>• <i>Ruschia robusta</i>;</li> <li>• <i>Gethyllis villosa</i>;</li> <li>• <i>Delosperma hisidium</i>;</li> <li>• <i>Bulbine torta</i>;</li> </ul>

Aspect	Description
	<ul style="list-style-type: none"> <li>• <i>Trachyandra falcata</i>; and</li> <li>• <i>Moraea collina</i>.</li> </ul> <p>SCC fauna noted on site are as follows:</p> <ul style="list-style-type: none"> <li>• <i>Felis nigripes</i> (Black-footed cat)</li> <li>• <i>Ardeotis kori</i> (Kori bustard)</li> <li>• <i>Orycteropus afer</i> (Aardvark),</li> <li>• <i>Otocyon megalotis</i> (Bat-eared fox) and</li> <li>• <i>Brinckiella arboricola</i> (Tree Winter Katydid)</li> </ul> <p>No SCC reptiles were observed but it is expected that SCC <i>Homopus signatus</i> (Speckled tortoise, VU) occurs in the southern portion of the project area. It is further expected that <i>Brinckiella mauerbergerorum</i> (Mauerberger's Winter Katydid) and <i>Brinckiella aptera</i> (Mute Winter Katydid) may occur in the area.</p> <p>Intact Knersvlakte Vygieveld, Overgrazed Knersvlakte Vygieveld and Transformed areas occur on Kanakies farm.</p>
Land Use	<p>The mining right area (MRA) is currently zoned for agricultural purposes. The dominant land use is grazing. Due to the climatic restrictions the grazing capacity is low and thus many areas are left as wildlife/wilderness areas.</p>
Socio-Economic	<p>The proposed mining right area falls within the Hantam Local Municipality of the Namaqwa District Municipality. The Hantam Municipality covers approximately 36,128km<sup>2</sup> and includes Calvinia (the centre) as well as Brandvlei, Loeriesfontein, Middelpoos and Nieuwoudtville. Farming is the main contributor to the economy, namely sheep, wool, lucerne as well as rooibos tea.</p> <p>The unemployment rate for the Municipality is 11.8%.</p>
Heritage and Archaeology	<p>No grave sites were found within the MRA but tools from the Middle Stone Age (MSA) were noted.</p> <p>Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the shales, sandstones, diamictites, tillites, gneisses, schists, granites and sands are typical for the country and do not contain any microfossils, fossil plant, insect, invertebrate and vertebrate material.</p>

### 3.5 Stakeholder Issues and Comments

This report constitutes the first rehabilitation and closure plan as part of the EIA EMPr process. During the EIA EMPr process public participation was undertaken. The following concerns from Interested and Affected Parties are summarised as follows:

- Employment and procurement opportunities for locals.
- Health and safety of adjacent land users as a result of environmental and social impacts. Specifically dust.
- Proximity of the Kalk Gat reserve to the proposed operations. This is a protected area. Appropriate buffer zones must be recommended and established.
- Wear and tear to surrounding road system.
- The area is water scarce. The reduction in groundwater quality and quantity must be assessed.
- The presence of graves and other heritage and archaeological sites must be determined. These may not be damaged or destroyed without the necessary permissions.
- The impacts on the cultural landscapes and viewsapes must be assessed.
- Water uses on site must be licensed as required by the NWA.
- Proximity of the mining activities to the Transnet rail line, and disruption of the rail services (Sishen to Saldanha Bay). No mining operations may be carried out within a horizontal distance of 100 metres from buildings, roads, railway.
- Certain areas have been mapped as areas of biodiversity importance appropriate ecological buffers should be recommended by the specialists and implemented.
- Plant species of concern must be relocated in the Loeriesfontein area.
- Waste generation and management.

## 4 Legal Framework for Closure

On 2 September 2014, the One Environmental System came into effect making the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) the overarching National environmental legislation.

The NEMA (as amended) states in Section 24P that the applicant or holder of an environmental authorisation pertaining to mining must comply with the prescribed financial provision for the rehabilitation, closure and on-going post decommissioning management of negative environmental impacts arising from the mining operation.

The financial provision contemplated in Section 24P must guarantee the availability of sufficient funds to:

- Rehabilitate adverse environmental impacts of the activities<sup>1</sup>;

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<sup>1</sup> "Activities" in this context refers to Activities Listed in terms of the NEMA Regulations, as well as prospecting, exploration, mining or production activities, including the pumping and treatment of polluted or extraneous water.



- Undertake decommissioning and closure of the operations, including removal of buildings, structures and other related facilities and objects;
- Remediate latent or residual environmental impacts resulting from the operations, which may only become known or apparent in future; and
- Remediate any other negative environmental impacts.

The Financial Provision Regulations, 2015 (as amended) regulates the determination and provision as contemplated in NEMA for the costs associated with the management, rehabilitation and remediation of environmental impacts resulting from mining operations. The Regulations apply to applicants and holders of mining rights and permits.

This report was compiled in terms of the Financial Provision Regulations, 2015 (as amended) on behalf of the Kanakies Mine.

There are a number of other laws and regulations which are relevant to the operations and eventual closure and rehabilitation of Kanakies Mine. The most pertinent legal requirements that are relevant to the closure and rehabilitation, in addition to the Financial Provision Regulations, are summarised in Table 8.

**Table 8: Summary of additional relevant legislation**

Legislation	Relevance to closure & rehabilitation
<p>Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) (as amended)</p>	<p>The Constitution is the supreme law of the country and sets the framework within which all other laws are implemented.</p> <p>Section 24 of the Constitution states that:</p> <p><i>Everyone has the right to (a) an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -</i></p> <ul style="list-style-type: none"> <li>• <i>Prevent pollution and ecological degradation;</i></li> <li>• <i>Promote conservation; and</i></li> <li>• <i>Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.</i></li> </ul> <p>To give effect to Section 24 of the Constitution, several laws have been promulgated to ensure environmental protection and sustainable development.</p> <p>Closure and Rehabilitation at Kanakies Mine after the LoM has been reached must be undertaken with due cognisance of the constitutional obligations of the Holder of the Mining Right (if approved), not to threaten the rights of other people to an environment that is safe and healthy.</p>
<p>Minerals and Petroleum Resources Development Act, 2002 (MPRDA) (Act No. 28 of 2002) and its Regulations.</p>	<p>The MPRDA is the predominant piece of legislation dealing with the acquisition of rights to search for, extract and process mineral resources in South Africa.</p> <p>Decommissioning, closure and rehabilitation of Mines were in the past regulated in terms of the MPRDA, through these matters are currently dealt with in terms of the NEMA. Still, when applying for a mining right, the MPRDA requires an assessment of the closure and rehabilitation of the Mine and a calculation of the financial provision that will be required for closure.</p> <p>Section 43 of the MPRDA deals specifically with closure certificates and states that the Holder of a Mining Right will remain responsible for environmental liabilities, pollution and ecological degradation and the management thereof, until the Minister of Mineral Resources has issued a closure certificate for the operation. The Holder (if the application is approved) (Kanakies Mine) must apply for a closure certificate upon the lapsing of the validity of the Mining Right (or abandonment or cancellation); cessation of the mining operation or relinquishment of any portion of the land to which the Mining Right relates.</p>

Legislation	Relevance to closure & rehabilitation
Mineral and Petroleum Resources Development Amendment Act, 2008 (Act No. 49 of 2008) (MPRDAA).	The MPRDAA of 2008 amended certain sections of the MPRDA to make the Minister of Mineral Resources the responsible authority for implementing environmental matters in terms of the NEMA as it relates to mining and prospecting operations and incidental activities, and to align the MPRDA with NEMA.
National Environmental Management Act, 1998 (Act No. 107 of 1998)	The NEMA provides for environmental governance and all matters affecting the environment, including mining operations. NEMA places an obligation on all persons to take reasonable measures to prevent pollution and environmental degradation, and to minimise and rectify pollution and environmental degradation that could not be prevented. It is in this context that Mines are required to plan and make financial provision for closure and rehabilitation.
EIA Regulations, 2014 (as amended)	The EIA Regulations includes lists of activities that may not be undertaken without Environmental Authorisation in terms of NEMA having been granted. Decommissioning of facilities, and activities that require licenses or permits in terms of the MPRDA are included in the Listed Activities. Mine decommissioning and closure will therefore be subject to an application for Environmental Authorisation and be associated with the compilation of a detailed closure plan, the required contents of which is set out in the EIA Regulations. The EIA Regulations also refer to the Financial Provisioning Regulations where an activity relates to mining.
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEM:BA) and its Regulations, and the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA) (as amended) and its associated Regulations	<p>The NEMBA provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA and deals specifically with the protection of species and ecosystems that warrant national protection (among others). Permits in terms of the NEMBA have to be obtained prior to disturbance at Kanakies for the relocation of protected species.</p> <p>Pertinent to decommissioning, closure and rehabilitation at Kanakies are the Alien and Invasive Species Regulations. The Regulations place an obligation on a person in control of land to manage certain alien and/or invasive species. Alien and invasive species management at Kanakies Mine is the Mine's responsibility and must be implemented in terms of concurrent and eventual final rehabilitation of affected and surrounding areas.</p>
National Environmental Management: Air Quality Act (NEM:AQA), Act 39 of 2004 as	Decommissioning, closure and rehabilitation activities are also often associated with the generation of dust and emissions. Dust, PM10 and PM2.5 monitoring at Kanakies must continue throughout the decommissioning, closure and rehabilitation phases to ensure the Mine's compliance to the National Dust

Legislation	Relevance to closure & rehabilitation
amended and its associated regulations	control regulations and emission standards.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA) and its Regulations	NEM:WA addresses waste generation, classification and management issues, including recycling of waste. Part 8 of the NEM:WA deals specifically with contaminated land, and remediation thereof. Apart from requisite compliance to the NEM:WA and its regulations in terms of the management of mineral- and non-mineral waste throughout the LoM (including closure), relinquishment criteria should include the specific determination of the status of the land, in terms of Part 8. If the land had been contaminated by the Mining or related activities, remediation in terms of Part 8 must be successfully undertaken by Kanakies Mine, prior to a closure certificate being granted.
National Water Act, 1998 (Act No. 36 of 1998) (NWA)	<p>The NWA is the principal Act regulating water use in South Africa, and places an obligation on the owner, occupier or person in control of land to mitigate against potential pollution of water resources, including the remediation of polluted water after closure.</p> <p>The Regulations on use of water for mining and related activities aimed at the protection of water resources promulgated in terms of the NWA (GN704) must be implemented throughout the LoM.</p> <p>Regulation 2(2) requires that the Holder notify DWS in writing prior to the temporary or permanent cessation of mining and related activities. Regulation 9 stipulates that the requirements of GN704 still applies to operations that have permanently or temporarily ceased.</p>
DWS Guidelines	<p>The Department of Water Affairs and Forestry (DWAF, currently known as the Department of Water and Sanitation, DWS) have published a series of best practice guidelines for water resource protection in the Mining Industry in South Africa. Guideline G5 relates specifically to Water Management Aspects for Mine Closure.</p> <p>The Guideline covers the general principles that relate to water management aspects for Mine Closure, typical issues, the legal framework, planning and actions required prior to closure, including the Environmental Risk Assessment process, financial provisioning for water management actions associated with decommissioning, closure and post-closure and the Key Issues that DWS will require information on when assessing a mine closure plan.</p>

## 5 Environmental Risk Assessment to identify the closure strategy

This section contains the findings of an environmental risk assessment leading to the most appropriate closure strategy. The Section includes:

- (i) a description of the risk assessment methodology including risk identification and quantification for all areas of infrastructure or activity or aspects for which a holder of a right or permit has a responsibility to mitigate an impact or risk at closure;
- (ii) an identification of indicators that are most sensitive to potential risks and the monitoring of such risks with a view to informing rehabilitation and remediation activities;
- (iii) an identification of conceptual closure strategies to avoid, manage and mitigate the impacts and risks;
- (iv) a reassessment of the risks to determine whether, after the implementation of the closure strategy, the residual risk has been avoided and / or how it has resulted in avoidance, rehabilitation and management of impacts and whether this is acceptable to the mining operation and stakeholders; and
- (v) an explanation of changes to the risk assessment results, as applicable in annual updates to the plan.

### 5.1 Risk Assessment Methodology

The Risk Assessment is undertaken on desktop level with reference to the impacts identified in the various assessment and application processes that are being undertaken for the Kanakies Mine. Risks are identified in one or more of the following Risk Categories:

- Environmental Risk;
- Health and Safety Risk;
- Legal / regulatory risk;
- Company Risk (loss of social license to operate etc.)

### 5.2 Risk Identification and assessment

The most significant risks associated with the decommissioning and closure of the proposed Kanakies Mine were identified as follows:

- Siltation of water resources due to erosion of post-mining landscape.
- Impacts on groundwater quality due to poor quality seepage.
- Loss of agricultural land capability from soil contamination and soil erosion.
- Impact on floral SCC, floral habitat and species diversity in the Vygieveld Vygieveld vegetation type and ephemeral drainage lines.
- Impact on faunal SCC, faunal habitat and species diversity.

The identified risks are rated according to the criteria presented in Table 9, to determine the significance of each:

The results of the Risk Assessment are shown in Table 10.

**Table 9: Risk Criteria**

The status of the impact					
Status	Description				
Positive:	a benefit to the holistic environment				
Negative:	a cost to the holistic environment				
Neutral:	no cost or benefit				
The Significance		= Consequence x Likelihood.			
Likelihood = Frequency + Probability					
Likelihood	1	Impossible	Probability	Unlikely: Impact Could occur in extreme events. Less than 15% chance of the impact ever occurring.	1
	2	Highly Unlikely		Possible: possibility of impact occurring is very low. 16% - 30% chance of the impact occurring.	2
	3	Unlikely		Probable There is a distinct possibility of the impact occurring. 31% to 60% chance.	3
	4	Improbable		Highly Probable: The impact is expected to occur. Between 61% and 85 % chance.	4
	5	Possible		Definite: There are sound scientific reasons to expect that the impact will occur	5
	6	Probable	Frequency	Annually: The Impact is not expected to occur more than once per year.	1
	7	Likely		Quarterly: The Impact is expected to occur at least once every three months	2
	8	Highly Probable		Monthly: The impact is expected to occur at least once per month for the duration of the activity.	3
	9	Almost Certain		Weekly: The impact is expected to occur once a week for the duration of the activity.	4
	10	Definite		Daily: the impact is expected to occur daily for the duration of the activity.	5
Consequence = duration + scale + magnitude of the impact + sensitivity of the aspect					
	Duration	Scale	Magnitude	Sensitivity	
5	Permanent	National	High	Irreplaceable	
4	Long Term	Regional	Moderate – High	Very sensitive	
3	Medium Term	Local	Moderate	Sensitive	
2	Short to Medium	Site	Slight to Moderate	Somewhat Sensitive	
1	Short term	Isolated	Slight	Not sensitive	

**Table 10: Risk Assessment and Management Measures**

Aspect	Impact description	Mitigation status	SIGNIFICANCE RATINGS (score out of 200)		Mitigation measures
Surface Water	Siltation of water resources due to erosion of post-mining landscape.	Unmanaged	78	Moderate	Rehabilitation must promote natural runoff of areas. Ensure all spills (hydrocarbon, gypsum, sediment or other) are cleaned and the area rehabilitated immediately.
		Managed	36	Low	
Groundwater	Impacts on groundwater quality due to poor quality seepage	Unmanaged	60	Moderate	Calculations show that the contaminant plume will migrate up to 250 m from the edge of the trench in a down gradient direction. Plume migration must be monitored (groundwater monitoring) for a period of at least 5 years post-closure and mitigation (cut-off trenches or intercepting drains) implemented if required
		Managed	24	Low	
Soil and land capability	Loss of agricultural land capability from soil contamination and soil erosion	Unmanaged	52	Moderate	Replaced soils will be lightly ripped to at least 25 cm to alleviate soil compaction and subsequently re-vegetated with indigenous grass to minimize erosion. The recommended ripping and re-vegetation must be implemented concurrently on the subsections where mining is complete.
		Managed	27	Low	
Flora	Impact on floral SCC, floral habitat and species diversity in the Intact Vygieveld, Overgrazed Vygieveld and Ephemeral Drainage Lines	Unmanaged	65	Moderate	Concurrent rehabilitation should be undertaken with mining activities. Establishment of indigenous plant species/SCC propagated in the nursery or preserved in the nursery after removal from the mine footprint (SCC under relocation permits) should be done to facilitate successful rehabilitation.  Rehabilitation of natural vegetation should proceed in accordance with this rehabilitation plan and can be elaborated upon by a regional floral specialist. Relocation to be overseen by a qualified botanist as vegetation establishment in this arid environment is tricky.
		Managed	14	Low	
Fauna	Impact on faunal SCC, faunal habitat and species diversity in the Intact Vygieveld, Overgrazed Vygieveld and	Unmanaged	52	Moderate	Concurrent rehabilitation should be undertaken with mining activities so that the fauna will be able to return. Successful restoration of floral habitats with local occurring species will facilitate this.
		Managed	30	Low	

Aspect	Impact description	Mitigation status	SIGNIFICANCE RATINGS (score out of 200)		Mitigation measures
	Ephemeral Drainage Lines				



### 5.2.1 Identification of risk indicators and risk monitoring

Table 11 identifies indicators and monitoring requirements for each of the risks identified in Section 5, to ensure early identification of the manifestation of risks, and to inform the rehabilitation and remediation activities that are required to manage each risk (in addition to the Management measures detailed in Table 10).

**Table 11: Environmental Indicators and Monitoring**

<b>Risk</b>	<b>Source / Activity presenting the Risk</b>	<b>Risk indicator that requires monitoring, and monitoring criteria</b>
Siltation of water resources due to erosion of post-mining landscape	Un-vegetated land post mining can cause erosion that will end up in the water resources	Visual inspection of affected surface areas for signs of erosion
Impacts on groundwater quality due to poor quality seepage	Waste material, after gypsum has been removed from the material, backfilled into the trenches with rainfall there could be seepage and AMD (as it has been identified that the material is potentially acid-generating –see Section 8.1.1).	Groundwater quality monitoring as per section 11.
Loss of agricultural land capability	This would have been caused by soil contamination and soil erosion	Post-closure investigations to identify potential contamination/erosion.
Impact on floral SCC, floral habitat and species diversity in the Intact Vygieveld, Overgrazed Vygieveld and Ephemeral Drainage Lines	General disturbance of the Mining Right Area	Annual Rehabilitation monitoring.  Relocation of SCC and vegetation establishment to be overseen/monitored by a qualified botanist as per section 11.
Impact on faunal SCC, faunal habitat and species diversity in the Intact Vygieveld, Overgrazed Vygieveld and Ephemeral Drainage Lines	General disturbance of the Mining Right Area	Annual Rehabilitation monitoring.

The management measures identified in Table 10 are aimed at the avoidance, management or mitigation (as appropriate) of the identified impacts and risks associated with closure of the Kanakies Mine.

The identified impacts and risks are based on the EIA/EMP that is pending approval and the associated specialist studies. In the aforementioned documents, the potential

impacts of the Mine were rated first without the consideration of mitigation or management measures, and again after the implementation of such measures.

### **5.2.2 Discussion of significant risks**

According to the impact and risk assessment that was undertaken and seen in Table 10, there are no risks of moderate to high significance post mitigation.

## **6 Closure Objectives and Vision**

The closure objectives as per the Environmental Management Program (EMP) are:

### **General**

- After Life of Mine (LoM), no active mining will take place though sales from stockpiles will continue.
- The execution of the rehabilitation and closure plan will enjoy first priority and will be completed over a 12 month decommissioning period with inspections and audits continuing beyond this timeframe as directed by the updated closure plan at that stage.
- The personnel will be redeployed at a new gypsum facility as output at such facility demands and key personnel will remain on-site at Kanakies to wind down the operations, administration and facilitate the relocation to the new site (the Applicant is continuing with research into other gypsum deposits in the area. The Applicant will apply for prospecting and mining rights at these other potential projects as they are identified).

### **Topography**

- To ensure that the final elevation will result in the site being free draining.

### **Soil, Land Capability and Land Use**

- To ensure post-mining land capability is at least similar to pre-mining, which is grazing.
- To ensure that the land capability is self-sustaining.
- To ensure that pre-mining land uses can continue.
- Should the proposed infrastructure encroach on the Kimberly/Plooysburg soils, concurrent rehabilitation to take place so that the soils and landscape setting is restored to a natural condition to allow for natural land uses to continue.

### **Surface Water**

- Ensure that the surface profile is rehabilitated to promote natural runoff drainage and avoid ponding of water within the rehabilitated area.
- Surface inspection should be continuously undertaken to ensure clean runoff drains into the downstream drainage/rivers.
- All rehabilitated areas must be established with vegetation.

### **Groundwater**

- Remediation of physical activity: roll over rehabilitation to occur as each trench is complete. Waste material used to backfill the trench area. Final product stockpiles will be remediated during the decommissioning phase.
- Remediation of storage facilities: surface storage facilities will be removed and remediated.
- Remediation of environmental impacts: groundwater monitoring to occur for at least five years after mine closure to monitor the contaminant migration. Based on results a remediation plan will need to be put in place.
- Remediation of water resources impacts: material handled on site is expected to form AMD conditions therefore streams, when flowing, are to be monitored. Flow management such as cut off-trenches located down gradient of the pollution sources and management of seepage will be implemented if required.

### **Flora**

- Rehabilitation of natural vegetation should proceed in accordance with this report. This rehabilitation plan should consider all development phases of the project indicating rehabilitation actions to be undertaken during and once construction has been completed, ongoing rehabilitation during the operational phase of the project as well as rehabilitation actions to be undertaken during closure.
- Any post-development re-vegetation or landscaping exercise should use locally indigenous species.
- Development of a nursery may be considered where indigenous/endemic plant species must be propagated with focus on rehabilitation in conjunction with a suitably qualified specialist.
- Rehabilitation trials must be continuously undertaken from the commencement of construction in order to determine the efficiency of rehabilitation methods and the suitability of flora propagated in the nursery for rehabilitation.
- A floral SCC relocation, monitoring and management plan must be designed and implemented by a suitably qualified specialist prior to clearance activities commencing on site and should address all species which can be successfully rescued and relocated. Relocation may only take place under the required relocation permits.
- As much vegetation growth as possible should be promoted within the rehabilitated areas in order to protect the soils;
- Monitor the success of rehabilitation efforts of open cast mining areas and access roads seasonally; and
- Continue with and update the alien and invasive plant control plan accordingly.

### **Fauna**

- Concurrent rehabilitation to take place, this will alleviate loss of habitat and food resources.

### **Visual**

- Vast extent and percentage of vegetation recovery as well no mining infrastructure or traces thereof being present.

### **Freshwater Resources**

- Footprints must be clearly demarcated and no related activities, including the movement of vehicles, must be permitted to occur outside of the footprint area;
- All related waste and rubble must be removed from site and disposed of according to relevant SANS standards. No waste must be permitted to enter wetland resources;
- Edge effects such as erosion must be monitored and managed;
- It is critical that ongoing monitoring of alien vegetation is maintained post-closure, as proliferation of alien vegetation in the mining areas is expected; and

### **Air Quality**

- Concurrent rehabilitation will ensure that dust fall out, PM10 and PM2.5 will be limited.

## **6.1 Final Land Use**

Land use activities include grazing and wildlife/wilderness and it is proposed that the land be returned to this land use post- mining.

## **6.2 Alternatives**

It is believed that the identified post-closure land use is the most viable closure option and no further post-closure land use alternatives were evaluated. The mining right area (MRA) is currently zoned for agricultural purposes with a land use of grazing and wildlife/wilderness. Post mining will resemble the pre-mining land use as a mixture of grazing and wilderness land capability.

## **6.3 Closure Actions**

The mining method lends itself to concurrent rehabilitation being implemented. Therefore, backfilling of mined out areas will occur at the same time as mining of new areas. The footprint area remaining to be backfilled at the end of LoM will therefore be minimal. Final closure actions will involve the following actions:

- Removal of all redundant infrastructure including mobile office, change room, ablution facilities, workshop, diesel storage area etc.
  - Containerised facilities will be removed by a suitable service provider for re-use;
  - General Waste will be removed by a suitable contractor for off-site recycling, where possible, or disposal at a registered landfill.
  - Hazardous waste will be removed from site by a suitable contractor for disposal at a registered and authorised site and the Applicant will maintain records of safe disposal;
  - Diesel storage facilities: Diesel tanks will be removed by the oil company to whom it belongs. The bunded area will be completely cleared of all

hydrocarbons. Affected soils (if any) will be removed from site and disposed of as hazardous waste. If contamination is excessive, remediation will be undertaken in accordance with Part 8 of the National Environmental Management: Waste Act (59 of 2008); The bunded area will be demolished and concrete / brick waste removed from site.

- Disturbed soils will be lightly ripped to at least 25 cm, to alleviate soil compaction and subsequently re-vegetated with indigenous grass to alleviate soil compaction and minimize erosion (including infrastructure and stockpile areas as well as roads that are no longer to be used).
- Revegetate affected areas with indigenous plant species/SCC propagated in the nursery or preserved in the nursery after removal from the mine footprint (SCC under relocation permits).
- Post mining land capability must be restored to as close to pre-mining land capabilities as possible, in this case grazing/wilderness.
- Plant and processing infrastructure will be re-used at other sites or sold to other mining companies before being considered as scrap.
- All scrap metal will be removed and sold where possible, or disposed of at an appropriate site.
- All fences will be dismantled and either disposed of at a permitted disposal site or sold as scrap.
- Old hydrocarbon spills that went unnoticed during operation to be remediated and disposed as hazardous waste.
- Continue rehabilitation monitoring for a period of 5 years after closure. Implement additional measures where required (including the establishment of cut-off drains or treatment options if groundwater monitoring reveals the presence of acidic conditions and leachate from the backfilled trenches).

#### **6.4 Relinquishment Criteria**

The ultimate objective of closure is to ensure that appropriate closure certification is obtained. This can only be achieved upon acceptance from the DMR that all obligations associated with decommissioning, closure and rehabilitation (including post-closure monitoring and mitigation of latent and residual environmental impacts) have been met.

Criteria for relinquishment have to be set to ensure that all parties (the Holder of the Right and the Regulatory Authority) have clearly defined targets that need to be met prior to closure being approved. Relinquishment criteria have to be set for each activity and infrastructure component in the context of the environmental aspects upon which the mine could impact.

Relinquishment criteria for each environmental aspect of the Mine are presented below in Table 12.

**Table 12 Relinquishment Criteria**

<b>Environmental Aspect</b>	<b>Relinquishment Criteria</b>	<b>Monitoring and Reporting requirements</b>
Groundwater	Groundwater quality complies with the stipulations of the WUL.	Quarterly groundwater monitoring and reports.
Surface Water	Surface Water Quality complies with stipulations of the WUL (as rivers are ephemeral, samples are to be taken when they are flowing).	Monthly Surface Water monitoring (when water resources are flowing) and quarterly reports.
	Surface Water ponding is not observed on site and the site is free-draining.	Visual inspection on rehabilitated areas. Closure reports.
	Surface water management infrastructure have been removed/backfilled (as they are unlined and un-vegetated trenches).	Visual inspection of surface water management infrastructure.
Soils and Land Capability	No contaminated soils on site	Soil contamination assessment to be completed on all areas where hydrocarbon or other chemical spillages could have occurred.
	Soil depth appropriate to post-closure land use (grazing/wilderness).	Soil studies must take place to determine success of rehabilitation in re-establishing usable soils for grazing/wilderness.
	No signs of erosion. Integrity of erosion prevention measures that have been established.	Visual inspection and agreement by land owner / authority.
Air Quality	Dust fallout, PM <sub>10</sub> and PM <sub>2.5</sub> compliant to NEM:AQA and Regulations.  No dust generation sources to remain on site (such as un-vegetated land that was vegetated prior to mining etc)	Monthly dust monitoring reports. Continuous PM <sub>10</sub> and PM <sub>2.5</sub> monitoring. Annual reporting to NAEIS.

Environmental Aspect	Relinquishment Criteria	Monitoring and Reporting requirements
Biodiversity	Establishment of indigenous plant species/SCC propagated in the nursery or preserved in the nursery after removal from the mine footprint (SCC under relocation permits)  The vegetation cover must be self-sustaining.	Specialist input into the revegetation of rehabilitated areas due to arid karoo environment. Success of vegetation to be monitored throughout.  Annual Rehabilitation monitoring report.  Relocation to be overseen by a qualified botanist.
Health & Safety	The site does not pose a health or safety risk to humans or animals	Mine manager/ Engineer and EAP to undertake an inspection at closure.
Waste	There is no waste material remaining on site.	Visual inspection and records of waste removal.

## 7 Concurrent Rehabilitation Commitments

The purpose of the Annual Rehabilitation Plan is to evaluate the concurrent rehabilitation undertaken in the preceding year, and plan for concurrent rehabilitation to be undertaken in the coming year. The proposed Kanakies Mine is not operational as yet, the site is still greenfields therefore the progress on the rehabilitation plan cannot be assessed.

The areas to be disturbed by the mining activities and rehabilitation for year 1 of operations (assuming approval of all relevant applications) are shown below in Table 13 .

**Table 13: Rehabilitation and remediation activities**

Activity / Infrastructure	Life of activity / infrastructure	Spatial extent of activity / infrastructure (planned) (Ha)
Plant and Infrastructure	30 years	0.006
Administration Area	30 years	0.01345
Workshop Areas	30 years	0.03
Roads	30 years	0.1319
Surface Trenching	30 years	10
Railyard stockpile	30 years	0
Water Management Facilities	30 years	0.0002
Surface Trenching	30 years	10
Railyard stockpile	30 years	0

Water Management Facilities	30 years	0.0002
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The infrastructure areas are required to remain on site until end of Life of Mine. These have not been established as yet.

It is planned that approximately 10Ha of surface trenching will take place within year 1 of the Mine, where after this area will be concurrently rehabilitated as mining progresses (backfilled, shaped and vegetated).

### 7.1 Shortcomings identified during the preceding 12 months

This report constitutes the first rehabilitation and financial provision report for the proposed Kanakies Mine, and will be updated on an annual basis if approved. There are no shortcomings identified during the preceding 12 months as the operation is not active as yet.

### 7.2 Planned rehabilitation for the forthcoming 12 months

As this project is on the EIA EMPr phase and there is no Environmental Authorisation nor Water Use License yet construction and operation has not commenced. Therefore, there is no rehabilitation planned for the forthcoming 12 months.

Throughout the LoM, mined out surface trenches will be backfilled concurrently.

## 8 Latent and Residual Impacts

This section of the report aims to identify those impacts and risks that may only become manifest in future. The purpose of the identification of possible latent risks is to ensure that these risks are identified proactively, before they manifest or immediately as they manifest, to enable appropriate management measures to be implemented by the Mine.

### 8.1 Environmental Risk Assessment

An applicant or holder of right or permit must make financial provision for (inter alia) remediation and management of latent or residual environmental impacts which may become known in future, including the pumping and treatment of polluted or extraneous water (Regulation 5(c)).

The Financial provision must be determined through a detailed itemisation of all activities and costs required for remediation of latent or residual environmental impacts as reflected in an environmental risk assessment report (Regulation 6(c)).

These risks are considered latent as the impacts resulting from the risks may only manifest over time and are caused by the surface and underground disturbance associated with mining.



Ideally, all risk and impacts should be managed during the operational, decommissioning and closure phases of the Mine, and relinquishment criteria met, negating the possibility of latent impacts. However, it is acknowledged that some residual impacts may be associated with the backfilled trenches, as it has been identified that the material is potentially acid-generating.

It is impossible to predict hydrological, hydrogeological and ecological processes in perpetuity and therefore there will always be an inherent level of uncertainty and risk post-closure.

Potential residual risks include the following:

- Acid mine drainage from waste material backfilled into trenches;
- Continued loss of floral habitat and habitat for SCC associated with the mining footprint area;
- Alien and invasive plant proliferation in disturbed areas as well as edge effects from the mining footprint and activities. Alien vegetation will outcompete natural and indigenous species, leading to a further loss of species diversity in the centre of endemism and to the surrounding environment;
- Continued loss of faunal habitat, SCC habitat, diversity, and SCC.

Risk Significance is a function of the severity of the risk and the probability that the risk will manifest. The methodology employed in the risk assessment has been discussed in Section 5.1.

Results and findings of the risk assessment for the identified latent and residual risks are discussed below and summarised in Table 14.

#### **8.1.1 Acid mine drainage (AMD) from waste material backfilled into trenches**

When waste material is backfilled into the surface trenches and rainfall occurs, there is a possibility that this could cause AMD. There should be groundwater monitoring (5) five years post mining.

#### **8.1.2 Continued loss of floral habitat and habitat for SCC associated with the mining footprint area**

Indigenous species and floral SCC are to be relocated (with a permit) or stored in a nursery prior to disturbance at Kanakies Mine. These plants are highly sensitive and specialised for the arid and nutrient poor environment and thus cannot be done easily. A specialist botanist for the region and vegetation type should monitor the success of this. The active involvement of a botanist during the relocation, set up and maintenance of the nursery must also be ensured.

If this does not succeed it will lead to a loss of floral SCC. In the event of floral SCC loss, the seedbank at the SANBI Kirstenbosch Botanical Garden in Cape Town can be consulted to obtain seeds as part of the rehabilitation activities and process.

### 8.1.3 Alien and invasive plant proliferation

This will happen in the event that bare ground is timeously not revegetated with indigenous species and if there is no alien invasive management programme on site during operation and rehabilitation.

Areas are to be revegetated and alien invasive species removed as they appear on site during construction, operation and rehabilitation.

### 8.1.4 Continued loss of faunal habitat, SCC habitat, diversity, and SCC

If the habitat is not returned to its original state, fauna and faunal SCC might not return as there will be no food resources for them.

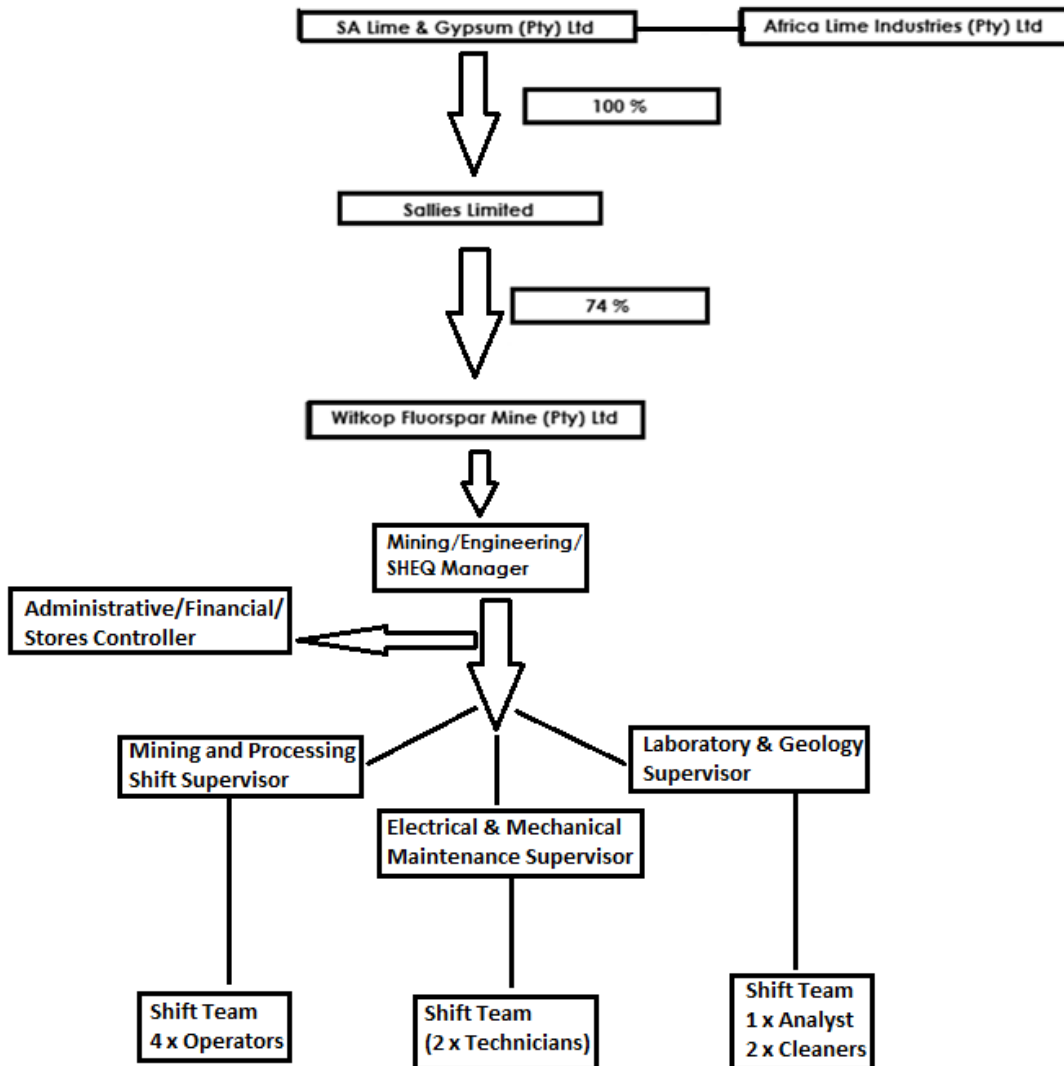
The same measures are to be followed as under Section 8.1.2.

**Table 14: Latent and residual risk assessment**

Risk	STATUS	SIGNIFICANCE RATINGS (score of 200)	
Acid mine drainage from waste material backfilled into trenches;	Neg	33	Low
Continued loss of floral habitat and habitat for SCC associated with the mining footprint area;	Neg	48	Moderate
Alien and invasive plant proliferation in disturbed areas as well as edge effects from the mining footprint and activities. Alien vegetation will outcompete natural and indigenous species, leading to a further loss of species diversity in the centre of endemism and to the surrounding environment;	Neg	30	Low
Continued loss of faunal habitat, SCC habitat, diversity, and SCC.	Neg	42	Moderate

## 9 Organisational Structure and Capacity

The organisational structure of the Mine is indicated in Figure 5.



**Figure 5: Kanakies Mine Operational Organogram**

According to the pending EMP (Cabanga Environmental, August 2018), the ECO and Site Manager or the EAP are in charge of monitoring on site. They will also be in charge of the following:

- ensure that the monitoring programmes are scoped and included in the annual mine budget;
- identify and appoint appropriately qualified specialists/engineers to undertake the programmes; and

- appoint specialists in a timeous manner to ensure work can be carried out to acceptable standards.

Contractors that conduct work on behalf of the Holder of the Mining Right are bound by the content of the EMP and a contractual condition to this effect will be included in all such contracts entered into by the mine (including contractors involved in the decommissioning, rehabilitation and closure process). If contractors are used, the responsibility for ensuring compliance with the EMP will remain with the Holder (Witkop Fluorspar Mine (Pty) Ltd).

The mine is obligated to provide sufficient organisation capacity to ensure effective implementation of the closure actions as stipulated in the EMP and this Report.

## 10 Quantum of Financial Provision

### 10.1 Closure Cost Methodology

The following steps were followed to calculate the closure cost for the proposed Kanakies Mine:

- Undertake a site visit to determine / confirm the nature of the site and the presence / absence of infrastructure;
- Measure the sizes of the site using the Mine Works Programme and Mine design drawings provided by the Applicant;
- Obtain rates for the demolition and / or removal of the various types of infrastructure and structures and the rehabilitation of areas from three different contractors, and calculate an average cost for removal of the different infrastructure/ structure types planned on the site, per area;
- Calculate the costs of infrastructure removal and site rehabilitation, by multiplying the areas calculated for each type of infrastructure with the rates provided by the contractors. Calculate the rehabilitation costs in terms of year 0 (immediate closure and rehabilitation) as well as concurrent rehabilitation of all infrastructure and structures on site over a ten-year period.

### 10.2 Closure Cost Estimate

The total calculated financial provision is R2,059,312.85 as summarised in Table 15.

**Table 15: Closure Cost Estimate Summary**

MINE AREA	TOTAL CALCULATED CLOSURE LIABILITY
Offices	R 56,842.00
Plant & Stores	R 15,000.00
Workshop	R 214,490.80
Access	R 1,355.05
Rail & yard	R 512,190.00
Mining area	R 1,259,435.00
<b>TOTAL</b>	<b>R2,059,312.85</b>

## 11 Monitoring, auditing and reporting requirements

This section of the report contains the monitoring, auditing and reporting requirements relevant to the mine, specifically as they relate to the risk assessment, legal requirements and knowledge gaps.

Table 16 contains a summary of the monitoring plans that will be implemented at the Mine. The Table identifies the person responsible for undertaking the audit / monitoring and the frequency of each monitoring / auditing and reporting exercise.

All monitoring which requires the analysis of laboratory results will only be associated with SANAS accredited laboratories. Surface and groundwater monitoring will be undertaken according to the Mine's approved Water Use License (application will be made for a water use license after finalisation of the application for mining right and environmental authorisation). Air Quality and dust monitoring should be undertaken in accordance with the National Environmental Management Air Quality Act and the Regulations promulgated thereunder. Monitoring of ecological aspects will take place in accordance with the EMP (once approved). Auditing will be in accordance with the EIA Regulations, 2014 (as amended).

If the results of monitoring or auditing show the need to amend critical aspects of the Mine, the necessary applications for approval should precede implementation of alternative designs or methodologies (if authorisation is required). The application for authorisation for amendments will be associated with public participation, which is instrumental in identifying potential methods to manage or mitigate potential impacts. If adaptive or corrective actions are required to minimise impacts, the appropriate specialist team will be appointed to advise the mine on impact/risk reduction strategies.

**Table 16: Summary of Monitoring Plans**

Activity	Aspect	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and Responsibilities (for the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
All infrastructure areas, development footprints and associated activities	Soil	Loss of agricultural soils Soil erosion, soil contamination and soil compaction	Ensure proper storm water diversion and separation to avoid contamination of soils. Spill kits to be utilized for spills. Soil ripping up to 25cm for compacted soils	ECO	Continuous or as issues arise.
	Fauna	Direct mortality of SCC fauna Direct mortality of fauna Reduced dispersal/migration of fauna Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust and light	Activities to be undertaken in a phased manner so that fauna are able to move. Specifically: <i>Brinckiella arboricola</i> , this species lays its eggs within the ground or plant stems, with only one egg laying event per year and adults usually living for a year. As such it is highly recommended that prior to vegetation clearing activities a search be conducted in order to locate and move adults out of the area to be cleared. Furthermore, cleared vegetation must be stored for a period of a year in order to allow for any eggs to hatch. Should any small scorpion species, insects and harmless reptiles be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. For larger venomous snakes, a suitably trained mine official should be contacted to effect the relocation of the species, should it not move off on its own.  Ensure all activities are done according to best practice to minimise all impacts to flora and fauna of site.	ECO	Continual monitoring of site for evidence of any impact to fauna of the area. Report any animal interactions or deaths and follow up with mitigation actions.
	Surface water	Runoff, erosion and sedimentation.	Ensure proper storm water diversion and separation and ensure adequately sized storm water management features. Monitoring to ensure that the mining does not exceed the proposed footprint area.	ECO	Monitoring and inspections of storm water diversions as seen below (SD Hydrological Services, April 2018):

Activity	Aspect	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and Responsibilities (for the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions																																																																																	
					<table border="1"> <thead> <tr> <th rowspan="2">Months</th> <th rowspan="2">Wet Season</th> <th rowspan="2">Dry Season</th> <th colspan="3">SITE INSPECTION AND REMEDIATION</th> </tr> <tr> <th>Pre Dry Season</th> <th>Pre Wet Season</th> <th>Peak Wet Season</th> </tr> </thead> <tbody> <tr><td>January</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>February</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>March</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>April</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>May</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>June</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>July</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>August</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>September</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>October</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>November</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>December</td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table> <ul style="list-style-type: none"> <li>Pre-wet season- before the wet season all of the channels should be inspected so that they are free of debris, blockages as well as silt traps checked to ensure that there is enough storage capacity.</li> <li>Peak wet season- this is a follow up to the previous inspection to ensure that there have been no damages from the storms and if there are any blockages to ensure that these are cleared.</li> <li>Pre- dry season- this is to inspect and rectify any damage incurred from the wet season. An inspection should also be undertaken to ensure that all storm water controls are operating correctly.</li> </ul>	Months	Wet Season	Dry Season	SITE INSPECTION AND REMEDIATION			Pre Dry Season	Pre Wet Season	Peak Wet Season	January						February						March						April						May						June						July						August						September						October						November						December					
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	Air Quality	Dust fall out, PM10 & PM 2.5 generation.	Ensure dust and PM monitoring plan is being done correctly.	ECO & Site Manager	<p>Dust fallout monitoring as per the National Dust Control Regulations (2013) and reporting is to occur on a monthly basis. The parameters for dust monitoring can be seen below:</p> <table border="1"> <thead> <tr> <th>Restriction Areas</th> <th>Dust Fallout Rate (mg/m2/day)</th> <th>Frequency of Exceedance</th> </tr> </thead> <tbody> <tr> <td>Residential Areas</td> <td>D &lt; 600</td> <td>Two within a year, no two sequential months</td> </tr> <tr> <td>Non-residential areas</td> <td>600 &lt; D &lt; 1200</td> <td>Two within a year, no two sequential months</td> </tr> </tbody> </table> <p>Continuous PM10 &amp; PM2.5 ambient monitoring is to occur. The mine to register on NAEIS and report annually on their emissions.</p> <p>The following points to be monitored are as follows (Rayten Engineering Solutions, June 2018):</p> <table border="1"> <thead> <tr> <th>Location</th> <th>Latitude</th> <th>Longitude</th> <th>Location</th> <th>Latitude</th> <th>Longitude</th> </tr> </thead> <tbody> <tr> <td>D1</td> <td>30°58'57.95"S</td> <td>18°56'25.49"E</td> <td>D5</td> <td>30°58'47.49"S</td> <td>18°58'11.59"E</td> </tr> </tbody> </table>	Restriction Areas	Dust Fallout Rate (mg/m2/day)	Frequency of Exceedance	Residential Areas	D < 600	Two within a year, no two sequential months	Non-residential areas	600 < D < 1200	Two within a year, no two sequential months	Location	Latitude	Longitude	Location	Latitude	Longitude	D1	30°58'57.95"S	18°56'25.49"E	D5	30°58'47.49"S	18°58'11.59"E																																																												
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Activity	Aspect	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and Responsibilities (for the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions					
					D2	30°57'33.36"S	18°59'21.06"E	D6	30°59'29.74"S	18°56'13.08"E
					D3	30°57'23.76"S	18°57'44.31"E	D7	30°59'28.29"S	18°58'25.05"E
					D4	31° 0'22.50"S	18°57'46.54"E	D8	30°57'34.47"S	18°58'23.31"
					PM station	30°57'52.68"S	18°58'30.68"E			
	Flora	Killing of floral SCC. Spread and/or establishment of alien and/or invasive plants and resultant impacts on surrounding natural vegetation.	SCC to be relocated. Control, with the aim of eradicating, alien and invasive species listed under CARA and NEM:BA from the relevant properties.	Botanist/plant specialist ECO	This can occur as a botanist sees fit to keep the SCC thriving. Area must be generally inspected at least biannually and areas where plants were removed must also be revisited monthly to remove any new saplings.					
	Visual	Deterioration in visual aesthetics and sense of place.	Ensure all material is stored in designated areas and the site is neat and orderly. Maintain communication with I&APs and provide a platform for I&APs to lodge any comments.	Site Manager	General monthly inspections of areas for any materials not within designated areas, spills or litter. Continual inspections of complaints register.					
	Waste	Waste separation Littering Hazardous waste	Ensure waste is separated and there is no littering on site. Ensure hazardous waste is disposed of at a reputable hazardous waste service provider. Mine to register on SAWIS.	ECO	Weekly inspections to ensure waste is separated and that there is no littering. Monthly inspections to ensure safety disposal certificates were received for general waste and hazardous waste. Annual reporting of monthly volumes on SAWIS.					
	Groundwater	Pollution plume and seepage from contaminants	Storage of potentially hazardous material will be within properly constructed and lined or paved areas. Oil traps will be sized, operated and maintained to contain all discarded oil from working areas.	ECO/EAP	<ul style="list-style-type: none"> <li>Groundwater monitoring to occur monthly for the first year and quarterly after the first year. Ideally, the monitoring program should start a year before mining starts in order to be able to build a database that is not impacted by the mining activities. Monitoring to continue 5 years post closure.</li> </ul> <p>The following parameters to be tested and a reported to Department of Water Affairs on a quarterly basis:</p> <ul style="list-style-type: none"> <li>General chemistry such as pH, Total Dissolved Solids (TDS) and Electrical Conductivity (EC);</li> <li>Major elements such as calcium, magnesium, sodium, potassium, sulphate, nitrate, fluoride, chloride, phosphate;</li> <li>An Inductively Coupled Plasma (ICP) scan of minor elements including aluminium, arsenic, barium, boron, bismuth, cadmium, copper, chrome (total), cyanide, iron, manganese, mercury, molybdenum, nickel, lead, antimony, selenium, vanadium and zinc.</li> </ul> <p>The monitoring program should include:</p> <ul style="list-style-type: none"> <li>The groundwater monitoring boreholes drilled during this study: KAN1 to KAN4; and</li> <li>Hydrocensus points which lie close to the zones of impact and could possibly be at risk: KH01 and KH04.</li> </ul> <p>The coordinates for monitoring boreholes are as follows:</p> <p>KAN1 30°59'44.04"S 18°56'56.81"E KAN2 30°58'47.20"S 18°57'20.28"E</p>					



Activity	Aspect	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and Responsibilities (for the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
					KAN3 30°58'0.20"S 18°58'33.26"E KAN4 30°59'11.89"S 18°58'18.50"E KH01 30°58'33.93"S 18°58'10.11"E KH04 30°58'57.66"S 18°56'25.44"E
Surface trench mining	Soil	Loss of agricultural soils Soil erosion, soil contamination and soil compaction	Ensure proper storm water diversion and separation to avoid contamination of soils. Spill kits to be utilized for spills. Soil ripping up to 25cm for compacted soils	ECO	Continuous or as issues arise.
	Fauna	Direct mortality of SCC fauna Direct mortality of fauna Reduced dispersal/migration of fauna Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust and light	Activities to be undertaken in a phased manner so that fauna are able to move. Ensure all activities are done according to best practice to minimise all impacts to flora and fauna of site.	ECO	Continual monitoring of site for evidence of any impact to fauna of the area. Report any animal interactions or deaths and follow up with mitigation actions.
	Surface water	Runoff, erosion and sedimentation. Encroachment into ephemeral drainage line nor the 100m buffer.	Ensure proper storm water diversion and separation and ensure adequately sized storm water management features. Monitoring to ensure that the mining does not exceed the proposed footprint area.	ECO	Monitoring schedule of storm water management to be undertaken as per Surface Water in all infrastructure areas mentioned above. <ul style="list-style-type: none"> <li>Pre-wet season- before the wet season all of the channels should be inspected so that they are free of debris, blockages as well as silt traps checked to ensure that there is enough storage capacity.</li> <li>Peak wet season- this is a follow up to the previous inspection to ensure that there have been no damages from the storms and if there are any blockages to ensure that these are cleared.</li> <li>Pre- dry season- this is to inspect and rectify any damage incurred from the wet season. An inspection should also be undertaken to ensure that all storm water controls are operating correctly.</li> </ul> Weekly/monthly monitoring to take place to ensure the mining footprint has not encroached into the ephemeral drainage line nor the 100m buffer.
	Air Quality	Dust fall out, PM10 & PM 2.5 generation.	Ensure dust and PM monitoring plan is being done correctly.	ECO & Site Manager	Dust fallout monitoring as per the National Dust Control Regulations (2013) and reporting is to occur on a monthly basis. Parameters and dust monitoring points can be seen under Air Quality All Infrastructure Areas mentioned above.  Continuous PM10 & PM2.5 ambient monitoring is to occur. The mine to register on NAEIS and report annually on their emissions.
	Flora	Killing of floral SCC. Spread and/or establishment of alien and/or invasive plants and resultant impacts on surrounding natural vegetation.	SCC to be relocated. Control, with the aim of eradicating, alien and invasive species listed under CARA and NEM:BA from the relevant properties.	Botanist/plant specialist ECO	This can occur as a botanist sees fit to keep the SCC thriving.  Area must be generally inspected at least biannually and areas where plants were removed must also be revisited monthly to remove any new saplings.
Visual	Deterioration in visual aesthetics	Ensure all material is stored in designated areas	Site Manager	General monthly inspections of areas for any materials not within designated areas, spills or	

Activity	Aspect	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and Responsibilities (for the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
		and sense of place.	and the site is neat and orderly. Maintain communication with I&APs and provide a platform for I&APs to lodge any comments.		litter. Continual inspections of complaints register.
All material stockpile areas	Soil	Erosion	Ensure that stockpiles do not stand for too long.	ECO	Continuous.
	Fauna	Direct mortality of SCC fauna Direct mortality of fauna Reduced dispersal/migration of fauna Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust and light	Activities to be undertaken in a phased manner so that fauna are able to move. Ensure all activities are done according to best practice to minimise all impacts to flora and fauna of site.	ECO	Continual monitoring of site for evidence of any impact to fauna of the area. Report any animal interactions or deaths and follow up with mitigation actions.
	Surface water	Runoff, erosion and sedimentation.	Ensure proper storm water diversion and separation and ensure adequately sized storm water management features. Monitoring to ensure that the mining does not exceed the proposed footprint area.	ECO	Monitoring schedule of storm water management to be undertaken as per Surface Water in all infrastructure areas mentioned above. <ul style="list-style-type: none"> <li>Pre-wet season- before the wet season all of the channels should be inspected so that they are free of debris, blockages as well as silt traps checked to ensure that there is enough storage capacity.</li> <li>Peak wet season- this is a follow up to the previous inspection to ensure that there have been no damages from the storms and if there are any blockages to ensure that these are cleared.</li> <li>Pre- dry season- this is to inspect and rectify any damage incurred from the wet season. An inspection should also be undertaken to ensure that all storm water controls are operating correctly.</li> </ul>
	Air Quality	Dust fall out, PM10 & PM 2.5 generation.	Ensure dust and PM monitoring plan is being done correctly.	ECO & Site Manager	Dust fallout monitoring as per the National Dust Control Regulations (2013) and reporting is to occur on a monthly basis. Parameters and dust monitoring points can be seen under Air Quality All Infrastructure Areas mentioned above. Continuous PM10 & PM2.5 ambient monitoring is to occur. The mine to register on NAEIS and report annually on their emissions.
	Visual	Stockpiles will change the topographical nature of the area.	Stockpiling must be done correctly to minimise visual / topographical negative impact. Stockpiles to not exceed 3 metres in height.	Site manager	Weekly/monthly monitoring to ensure stockpiles do not exceed 3 metres.
Access and hauling along roads	Air Quality	Dust fall out, PM10 & PM 2.5 generation.	Ensure dust and PM monitoring plan is being done correctly.	ECO & Site Manager	Dust fallout monitoring as per the National Dust Control Regulations (2013) and reporting is to occur on a monthly basis. Parameters and dust monitoring points can be seen under Air Quality All Infrastructure Areas mentioned above. Continuous PM10 & PM2.5 ambient monitoring is to occur. The mine to register on NAEIS and report annually on their emissions.
	Roads	Deterioration of road	Re-cutting and cleaning of side-drains and pipes, grading and shaping as well as dust suppression (where required).	Mine Transnet Transnet and the Northern Cape Provincial Department of Transport	Continuous or as issues arise.

Activity	Aspect	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and Responsibilities (for the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
Product handling	Air Quality	Dust fall out, PM10 & PM 2.5 generation.	Ensure dust and PM monitoring plan is being done correctly.	ECO & Site Manager	Dust fallout monitoring as per the National Dust Control Regulations (2013) and reporting is to occur on a monthly basis. Parameters and dust monitoring points can be seen under Air Quality All Infrastructure Areas mentioned above.  Continuous PM10 & PM2.5 ambient monitoring is to occur. The mine to register on NAEIS and report annually on their emissions.
	Air Quality	Dust deposition that could reach the water resources located out of the MRA	Implement dust mitigation measures. Ensure proper storm water diversion and separation and ensure adequately sized storm water management features.	Environmental & Site manager	Daily dust suppression.  Monitoring schedule of storm water management to be undertaken as per Surface Water in all infrastructure areas mentioned above. <ul style="list-style-type: none"> <li>Pre-wet season- before the wet season all of the channels should be inspected so that they are free of debris, blockages as well as silt traps checked to ensure that there is enough storage capacity.</li> <li>Peak wet season- this is a follow up to the previous inspection to ensure that there have been no damages from the storms and if there are any blockages to ensure that these are cleared.</li> </ul> Pre- dry season- this is to inspect and rectify any damage incurred from the wet season. An inspection should also be undertaken to ensure that all storm water controls are operating correctly.
Water Supply and storage (potable)	Groundwater	Irresponsible use of water and water wastage.	Ensure water usage is managed correctly.	Environmental & Site Manager	Inspections to ensure no taps are left running – continuously or as issues arise.  Monitoring and reporting to occur as under Groundwater in All infrastructure areas, development footprints and associated.
Surface water management measures	Surface Water	Altered hydrological regime (flow). Environmental pollution due to uncontrolled runoff in to surrounding environment and potentially into the water resources located outside of the MRA.	Ensure proper storm water diversion and separation and ensure adequately sized storm water management features.	Environmental & Site manager	Monthly surface water monitoring, biannual biomonitoring (wetlands and rivers) and quarterly groundwater monitoring with quarterly reports to DWS.
	Groundwater	Seepage	Ensure that no water is ponded on site in dirty areas.	EAP/ECO	Continuous or as issues arise in terms of ponding.  Monitoring and reporting to occur as under Groundwater in All infrastructure areas, development footprints and associated.
Ablutions and change house	Soil and Surface Water	Environmental pollution due to increased sedimentation and chemical runoff into the surrounding environment.  Potential contamination of surface water bodies with sewage and nutrient enrichment of aquatic environments.	Reduce the risk of spills and leaks to optimise water use and minimise wasting of water.	Environmental & Site manager	Weekly inspections of ALL water management features (inclusive of ablutions).

## 12 Assumptions, Limitations and Uncertainties

A list of the assumptions made to develop closure actions in the absence of detailed knowledge on site conditions, potential impacts, material availability, stakeholder requirements and other factors for which information is lacking is given below.

- Areas are estimated and may vary.

This operation has not commenced as yet and is expected to be 30+ years therefore the cost estimates presented in the calculations were prepared to an accuracy level of 50%.

## 13 Conclusion

The total calculated financial provision for 2018 is R2,059,312.85.

Kanakies Mine is required to:

- Guarantee the newly calculated closure cost;
- Implement concurrent rehabilitation as per their mine plan (if approved); and
- Undertake annual updates of the financial provision and this report in accordance with the relevant Regulations applicable at the time.

## 14 References

Cabanga Environmental. (August 2018). *Environmental Impact Assessment and Environmental Management Plan*. Johannesburg.

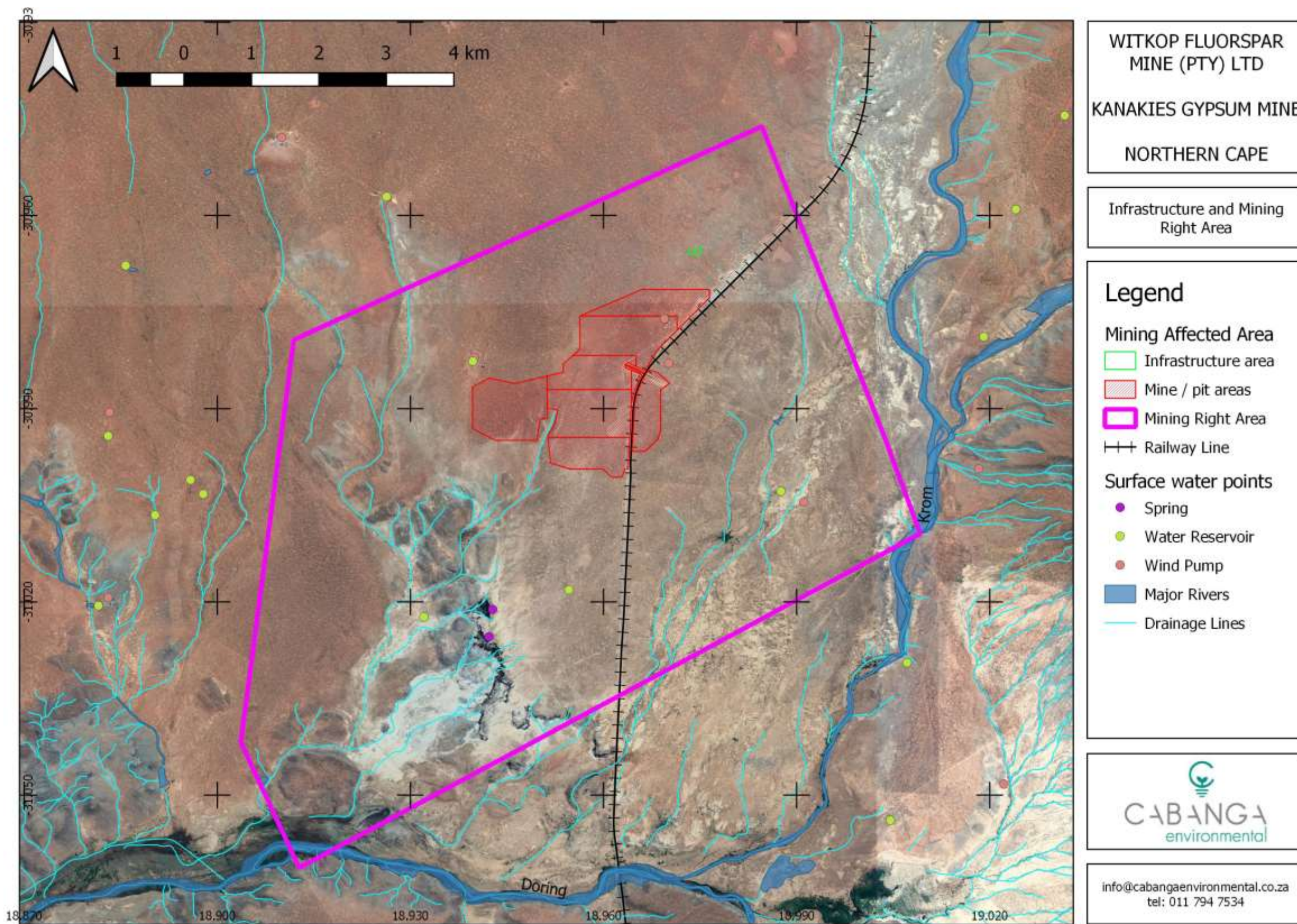
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SD Hydrological Services. (April 2018). *Surface Water Hydrology Report*. Johannesburg.

Sturgeon Consulting. (June 2018). *Traffic Impact Study*. Melkboststrand.

Witkop Fluorspar Mine (Pty) Ltd. (2018). *Mining Works Programme*. Stellenbosch.







**Appendix B: Detailed Closure Cost Calculations**

Title:		Year end Environmental Liabilities for next 10 yrs				July	Assessed By:	KC van Rooyen			Mine Manager:		
Environ Co:	Cabanga Environmental				2018		Signed:				Signed:		
Mine:	Kanakies Pty Ltd	Location:	Louriesfontein				Surveyed by:				Engineer:		
Owner:	SA Lime	Co-ord XY:					Signed:				Signed:		
Areas	Item	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
		Yr 0											
Offices	Concrete	R 0.00										R 0.00	
	Material handling	R 0.00										R 0.00	
	Mining	R 0.00										R 0.00	
	Parking Area	R 0.00										R 0.00	
	Rail	R 0.00										R 0.00	
	Rehabilitation	R 1,392.00										R 1,392.00	
	Roads	R 0.00										R 0.00	
	Structures and Buildings	R 54,750.00										R 54,750.00	
	Waste facilities	R 0.00										R 0.00	
	Water Management	R 700.00										R 700.00	
Plant & Stores	Concrete	R 0.00										R 0.00	
	Material handling	R 0.00										R 0.00	
	Mining	R 0.00										R 0.00	
	Parking Area	R 0.00										R 0.00	
	Rail	R 0.00										R 0.00	
	Rehabilitation	R 0.00										R 0.00	
	Roads	R 0.00										R 0.00	
	Structures and Buildings	R 15,000.00										R 15,000.00	
	Waste facilities	R 0.00										R 0.00	
	Water Management	R 0.00										R 0.00	
Workshop	Concrete	R 636.30										R 636.30	
	Material handling	R 0.00										R 0.00	
	Mining	R 0.00										R 0.00	
	Parking Area	R 0.00										R 0.00	
	Rail	R 0.00										R 0.00	
	Rehabilitation	R 208,254.50										R 208,254.50	
	Roads	R 0.00										R 0.00	
	Structures and Buildings	R 5,600.00										R 5,600.00	
	Waste facilities	R 0.00										R 0.00	
	Water Management	R 0.00										R 0.00	
Access	Concrete	R 0.00										R 0.00	
	Material handling	R 0.00										R 0.00	
	Mining	R 0.00										R 0.00	
	Parking Area	R 0.00										R 0.00	
	Rail	R 0.00										R 0.00	
	Rehabilitation	R 1,355.05										R 1,355.05	
	Roads	R 0.00										R 0.00	

		Structures and Buildings	R 0.00										R 0.00		
		Waste facilities	R 0.00										R 0.00		
		Water Management	R 0.00										R 0.00		
Rail & yard	R 512,190.00	Concrete	R 0.00										R 0.00		
		Material handling	R 512,190.00										R 512,190.00		
		Mining	R 0.00										R 0.00		
		Parking Area	R 0.00										R 0.00		
		Rail	R 0.00										R 0.00		
		Rehabilitation	R 0.00										R 0.00		
		Roads	R 0.00										R 0.00		
		Structures and Buildings	R 0.00										R 0.00		
		Waste facilities	R 0.00										R 0.00		
		Water Management	R 0.00										R 0.00		
		Mining area	R 1,259,435.00	Concrete	R 0.00										R 0.00
				Material handling	R 585,360.00										R 585,360.00
Mining	R 0.00												R 0.00		
Parking Area	R 0.00												R 0.00		
Rail	R 0.00												R 0.00		
Rehabilitation	R 674,075.00			-2.37%	-2.78%	-2.83%	-2.89%	-2.95%	-3.01%	-3.07%	-3.13%	-3.19%	R 850,817.47		
Roads	R 0.00												R 0.00		
Structures and Buildings	R 0.00												R 0.00		
Waste facilities	R 0.00												R 0.00		
Water Management	R 0.00												R 0.00		
			<b>R 2,059,312.85</b>										<b>R 2,236,055.32</b>		
			Current Area										Future Areas		



**Table 17 Rates used in the closure cost calculations**

Mine:	Kanakies		Loeriesfontein	
Activity	Item		Estimated Volume	Contractors average
			2018	Units Size
Concrete	Concrete Re-inforced	R/m <sup>3(thick)</sup>	3.03	R 350.00
Material handling	Material - Stockpile <b>volume</b>	R/m <sup>3</sup>	21000.00	R 24.39
	Material - Sub Soils <b>Volume</b>	R/m <sup>3</sup>	24000.00	R 24.39
Rehabilitation	Clean up - Dirty area	R/m <sup>2</sup>	3592.00	R 25.75
	Rehab - Vegetate areas	R/ha	10.00	R 50 000.00
	Rehab - Maintenance (L %)	R/ha	10.18	R 50 000.00
	Rehab & Closure Monitoring	Annual	10.00	R 20 000.00
	Rehab - Contour drains	R/m	100.00	R 12.58
	Roads - Haul	R/m <sup>2</sup>	25000.00	R 11.50
Structures and Buildings	Buildings - Brick	R/m <sup>2</sup>	300.00	R 100.00
	Buildings - Car ports	R/m <sup>2</sup>	62.50	R 300.00
	Buildings - Portable cabins	R/m <sup>2</sup>	72.00	R 500.00
	Structures Steel	R/m <sup>3(heavy)</sup>	3.00	R 5 000.00
	Structures Steel	R/m <sup>3(light)</sup>	1.00	R 5 000.00
	Water - Conservancy/septic tanks	N <sup>0</sup>	1.00	R 700.00

