IMERYS (PTY) LTD

ANREF ANDALUSITE MINE CLOSURE LIABILITY UPDATE

EMP REFERENCE NO: NW30/5/1/2/2/522MR

June 2017

SHANGONI
Management Services (Pty) Ltd

MINE CLOSURE COST ASSESSMENT REPORT

IMERYS (PTY) LTD

ANREF MINE

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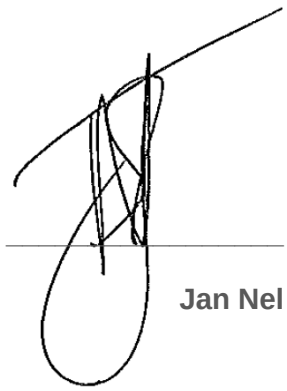
June 2017

SHANGONI Management Services (Pty) Ltd

PROJECT DETAILS

Department of Mineral Resources

Project Title:	**Anref Mine Closure Liability Update**
Project Number:	**IME-FIN-15-12-08**
Compiled by:	**Emma Fourie**
Date:	**June 2017**
Location:	**Groot Marico, North-West**
Technical Reviewer:	**Jan Nel**



Jan Nel

EXECUTIVE SUMMARY

Imerys (Pty) Ltd requested Shangoni Management Services (Pty) Ltd. to review the closure liability at their Anref Mine (Anref). The purpose of this document is to supply the Department of Mineral Resources (DMR) with the requested information pertaining to closure cost at Anref. The contents of this financial provisioning report are based on the requirements as stipulated under Government Notice Regulations 1147.

An assessment was conducted of all the infrastructure and activities taking place on site that fall within the responsibility of Anref. The infrastructure was classified in accordance with the tariffs list and the surface areas of the infrastructure were calculated to determine the volume or surface requiring rehabilitation or demolition. A detailed quantum calculation is attached as Appendix 1.

The financial provision for premature closure was calculated in March 2016 to the amount of **R 4 469 717.77**, including P&G and contingency, but excluding VAT. The financial provision according to the previous quantum calculation, completed in June 2017, is **R 841,785.81**, including P&G and contingency, but excluding VAT. The result is a decrease of R 3 627 931.96.

Reasons for the significant decrease in rehabilitation liability from March 2016 include:

- Rehabilitation of the mine has been completed, as illustrated in Appendix A of this report. The liability that remains is for monitoring and maintenance for the next year, as well as for the rehabilitation of access roads that are currently still in use as part of maintenance.

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REFERENCES

Department of Minerals and Energy. 2005. Guideline document for the evaluation of the quantum of closure-related financial provision provided by a mine. Government printer.

ABBREVIATIONS

DMR - Department of Mineral Resources
EMP - Environmental Management Programme
ha - Hectares
LOM - Life of Mine
MPRDA - Mineral and Petroleum Resource Development Act
MWP - Mining works programme
P&G - Preliminary and general

DEFINITIONS

Environment

The surroundings (biophysical, social and economic) within which humans exist and that are made up of

- the land, water and atmosphere of the earth;
- micro organisms, plant and animal life;
- any part or combination of (i) and (ii) and the interrelationships among and between them; and
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

Environmental Impacts

Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services.

Financial Provision

The insurance, bank guarantee, trust fund or cash that applicants for or holders of a right or permit must provide in terms of sections 41 and 89 of the MPRDA, guaranteeing the availability of sufficient funds to undertake the agreed work programmes and to rehabilitate the prospecting, mining, reconnaissance, exploration or production areas, as the case may be.

Land use

The various ways in which land may be employed or occupied. Planners compile, classify, study and analyse land use data for many purposes, including the identification of trends, the forecasting of space and infrastructure requirements, the provision of adequate land area for necessary types of land use, and the development or revision of comprehensive plans and land use regulations.

Pollution

means any change in the environment caused by -

(i) substances;

(ii) radioactive or other waves; or

(iii) noise, odours, dust or heat,

emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or wellbeing or on the composition, resilience and

productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.

Pollution Prevention

Any activity that reduces or eliminates pollutants prior to recycling, treatment, control or disposal.

Topography

Topography, a term in geography, refers to the "lay of the land" or the physio-geographic characteristics of land in terms of elevation, slope and orientation.

Vegetation

All of the plants growing in and characterising a specific area or region; the combination of different plant communities found there.

Waste

As per the definition of the National Environmental Management: Waste Amendment Act, 2014 - means (a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to the Act; or

(b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the *Gazette*, but any waste or portion of waste, referred to in paragraphs *(a)* and *(b)*, ceases to be a waste:

(i) once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;

(ii) where approval is not required, once a waste is, or has been re-used, recycled or recovered;

(iii) where the Minister has, in terms of section 74, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or

(iv) where the Minister has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste.

1. INTRODUCTION

Imerys (Pty) Ltd contracted Shangoni Management Services (Pty) Ltd to review the closure cost related to those activities that Imerys (Pty) Ltd are responsible for at the Anref Mine (Anref). The closure cost review focused on the premature closure cost, i.e. the immediate closure should mine operations discontinue.

This report provides the necessary information to support the calculations of the closure cost assessments as detailed in table 4. A detailed assessment was conducted of all the infrastructure and activities taking place on site that fall within the area of responsibility of the Anref mining operations.

1.1 Applicant

Table 1: Details of the applicant

Name of Applicant	Imerys (Pty) Ltd: Anref Andalusite Mine
Postal Address	Sanlameerzicht 259 West Street Centurion 0157
Telephone No.	+27 (0)12 643 5880
Fax No.	+27 (0)12 643 1966
Farm name and portion on which the activities take place	Portions 12, 13 and the remainders of Portion 8 & 11 of the Farm Kleinfontein 260 JP, Portion 1 and the former Portions 24, 39, 41, 42 and 44 of the Farm Driefontein 259 JP and the remainder of Portion 9 and the Mineral Area 2 of the Farm Wonderfontein 258 JP
Co-ordinates of operation	25°35'58.14"S, 26°20'37.09"E

1.2 Appointed reviewer

Table 2: Details of the reviewer

Name of firm	Shangoni Management Services
Postal address	P.O. Box 74726 Lynnwood Ridge 0040
Telephone No.	(012) 807 7036
Fax	(012) 807 1014

E-mail	emma@shangoni.co.za	
Team of Environmental Assessment Practitioners on project		
Name	**Qualifications**	Responsibility
Jan Nel	M.Sc. Env. Man (UFS)	Project lead
Emma Fourie	B.Sc. (Hons) Env. Man. (NWU)	Quantum review & report compilation

1.3 Mining activities and associated infrastructure

The mineral mined at Anref is andalusite. The following structures are present on the site:

- Five (5) existing quarries.
- Two (2) waste rock dumps (WRD's).
- One slimes dam, originating from historical mining activities.
- No mining takes place and there is no plant at the mine.
- There are access roads between the quarries and WRD's.
- Two sheds at the mine entrance, utilised by a farmer for agricultural purposes.

Figure 1 indicates the site layout of the mining area.

Figure 1: Site layout plan

1.4 Assumptions

As part of the calculation of the closure cost certain assumptions needs to be made. The assumptions supporting the costing are the following:

- The review of the quantum has been based on existing information and measurement from the general surface plan, provided by the mine.
- The provision was determined considering all the successfully completed concurrent rehabilitation. Maintenance was included for all rehabilitated areas.
- No additional structures are planned for the mining site. The two existing buildings will be used by farmers. Therefore, the decommissioning will not involve the demolishing of buildings or structures.
- All the roads on the mining area will be ripped and re-vegetated.

2. LEGISLATION AND GUIDELINES APPLICABLE

National Environmental Management Act, 1998 (act 107 of 1998) NEMA.

The promulgation of GN 1147 on the 20th of November 2015 has resulted in a number of new requirements regarding closure and rehabilitation planning and financial provision. The purpose of these regulations is to regulate the determination and making of financial provision as contemplated in the Act for the costs associated with the undertaking of management, rehabilitation, and remediation of environmental impacts from prospecting, exploration, mining or production operations through the lifespan of such operations and latent or residual environmental impacts that may become known in the future.

3. DEMOLITION AND REHABILITATION RATES

The CES Group was contracted by Shangoni to acquire rates for demolition and rehabilitation of mining activities (Table 3). Procurement of budget pricing approached by identifying reputable demolition companies, various sites of varying sizes at various locations and identifying local companies in the study area with ability to work on similar scale project. A bill of quantities (BoQ) was distributed to the various companies. The table below indicates the number of contractors to which the BoQ was distributed and the number of tenders received afterwards.

Table 3: Results of rate acquisition process

Area	Number of contractors identified	Tenders received
National	6	1
North West	6	3
Free State	5	1
Northern Cape	7	2
Limpopo	5	3 (One joint venture with national based company)
Total	29	10

The prices received from contractors were reviewed by the CES Group, after which average and meridian rates were drawn rates to correctly establish a baseline rate. The following methods to establish the baseline rates were followed:

- Price A - Average if priced – across the board average of rates received per category;
- Price B - Median pricing – “middle” rate of all rates in series per category;
- Price C - Average between Price A & B;
- Price D - Average rate excluding top and bottom rates per category.
- Price D - rate category that was used in the closure cost calculation, unless otherwise indicated in the closure cost spreadsheet “Rate” sheet.

The closure budget consists of the following areas:

- Physical - Demolition of infrastructure where infrastructure does not form part of end land use. Potential to transfer to third party was identified.
- Biophysical - Actions to safeguard (making safe and stable) and re-establish the biophysical to ensure a sustainable landform and mitigate identified risks. This includes levelling of the dumps, seeding of the trees and grass.

4. CLOSURE COMMITMENTS

4.1 Closure objectives in the current EMP

The proposed end-use for this site is cattle or game farming/grazing. Large portions of the area is already utilised by cattle farmers making use of the quarry to the east for livestock watering. All rehabilitation activities should be conducted with the end land use in mind. The list below contains the closure objectives as described within the approved EMP (2012).

Topography

1. During the decommissioning phase all slopes need to be finished to the prescribed 1:3 slope.
2. Reduce the visual impact of the altered topography by a process of sloping, benching and rehabilitation.

Soils

1. The re-introduction of the topsoil will return the land to its previous land capability.
2. Remove contaminated soil.

Land capability and land use

1. The land will be returned to cattle/game farming or utilised for other purposes that may become viable in the time of operation.
2. The decommissioning process must take the final use into account in order to achieve a sustainable use.

Natural vegetation

1. During the decommissioning phase the final portions of the mined area must be vegetated and care should be taken to investigate the total area previously mined to identify areas where the progressive rehabilitation and vegetation has not been totally successful.
2. Special care should be given to:
    - Quality of vegetation;
    - Any noxious plants and exotic plants that have established themselves and that have to be removed; and
    - Any signs of erosion.
    - Corrective measures need to be taken depending on the problems identified.

Animal life

1. Animal life will start returning throughout the process of continuous rehabilitation and it is important that disturbance in rehabilitated areas be limited to the minimum.

Surface water

1. Landscaping should facilitate surface runoff and result in free draining areas.

Air quality

1. To remove any forms of dust generation due to mining activities.

The following objectives were identified for the different mining areas:

1) Old slimes dam

a) Although the slimes dam walls are very steep, it is already well vegetated and further disturbance will not add value.

2) Large waste rock dump

a) Visually, the southern side wall is the most significant as it is visible from the national road. The objective is to decrease the height and reduce the slope in order to successfully re-vegetate.
b) Material from the waste rock dump will also be used to fill the depression to the north of the WRD and the eastern quarry.
c) The mine may also consider selling some of the waste rock material to use during construction or upgrading of roads.

3) Topsoil stockpiles east and west

Material from the topsoil stockpiles will mainly be used for final sloping and cover to promote vegetation growth. Unused topsoil will be sloped into low lying cavities to allow gradual topography with free drainage.

4) Quarry east

a) Benches will be sloped using cut and fill techniques.
b) The water body to the east will remain intact while the floor to the west of this quarry will be filled with material from the north and south slopes.
c) Rocky contours are proposed within main drainage lines to reduce runoff velocity and prevent siltation of the water body.

5) Quarry west

a) Benches will be sloped using cut and fill techniques.
b) The water body will remain intact with sloping of the surrounding high walls limited to the current footprint of the water body.
c) Prevention of siltation is again proposed using rocky bund walls within the main drainage lines towards the water body.
d) Final slopes around both quarries should allow at least one section with safe and easy access for animals to reach the water.

6) Quarry north

a) The only objective for the northern quarry is to make it safe by sloping the benches using cut and fill techniques.

5. CURRENT CLOSURE PROVISION

The financial provision according to the previous quantum calculation, completed in March 2016 as per DMR quantum calculation guideline, is **R 4,469,717.77**, including P&G and contingency, but excluding VAT**.** This provision is provided by Imerys (Pty) Ltd. by means of a bank guarantee.

The re-calculated quantum using Quantity Survey rates (November 2015), has been calculated as **R 841 785.81**, including P&G's and contingency, excluding VAT. The result is an decrease of R 3 627 931.96.

Reasons for the significant decrease in rehabilitation liability from March 2016 include:

- Rehabilitation of the mine has been completed, as illustrated in Appendix A of this report. The liability that remains is for monitoring and maintenance for the next year, as well as for the rehabilitation of access roads that are currently still in use as part of maintenance.

6. INFORMATION USED FOR CALCULATING THE QUANTUM

A site visit was conducted on the 14th of June 2017. Site survey data and latest Google Earth imagery was used to identify and mark the mining related infrastructure. Once this was complete a list of the infrastructure was compiled. The infrastructure was classified in accordance with the tariffs list and the surface areas of the infrastructure were calculated to determine the volume or surface requiring rehabilitation or demolition.

6.2 Tariffs

Table 4: Tariffs used for quantum determination

Description	List reference	Unit	Rate	Rate used
No cost incurred	No cost incurred	n/a	R 0.00	n/a
Ripping of dirt road	Ripping	m²	R 15.78	Lowest ave (top and bottom removed)
Break-up and remove paving bricks	Paving removal: Bricks	m²	R 37.04	Lowest ave (top and bottom removed)
Break-up and remove concrete paving	Paving removal: Concrete	m²	R 32.34	Lowest ave (top and bottom removed)
Earthworks, break-up and level	Fresh water earth dams	m³	R 47.70	Lowest ave (top and bottom removed)
Levelling slopes between 18-30 degrees with Bulldozer	Dump levelling: Bulldozer	m³	R 44.50	Lowest ave (top and bottom removed)
Levelling slopes between 18-30 degrees with Grader	Dump levelling: Grader	m³	R 41.23	Lowest ave (top and bottom removed)
20 Litre Bag	Planting trees 20l	no	R 207.84	Lowest ave (top and bottom removed)
50 Litre Bag	Planting trees 50l	no	R 635.47	Lowest ave (top and bottom removed)
Traditional seeding	Seeding	m²	R 12.67	Lowest ave (top and bottom removed)
Rehabilitation of overburden and spoils	DMR 8(a)	ha	R 142 361.29	DMR rate 2016 8a
Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	DMR 8(b)	ha	R 177 308.40	DMR rate 2016 8b
2 year post closure maintenance	DMR maintenance	ha	R 14 158.44	DMR rate 2016 (including CPI)

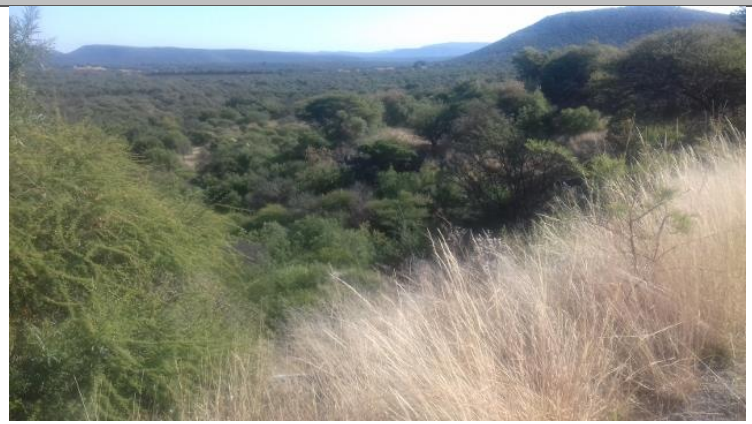
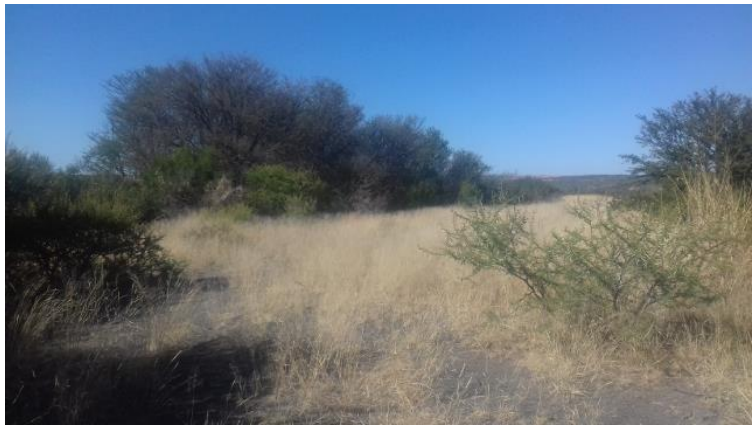
6.3 Closure cost calculation

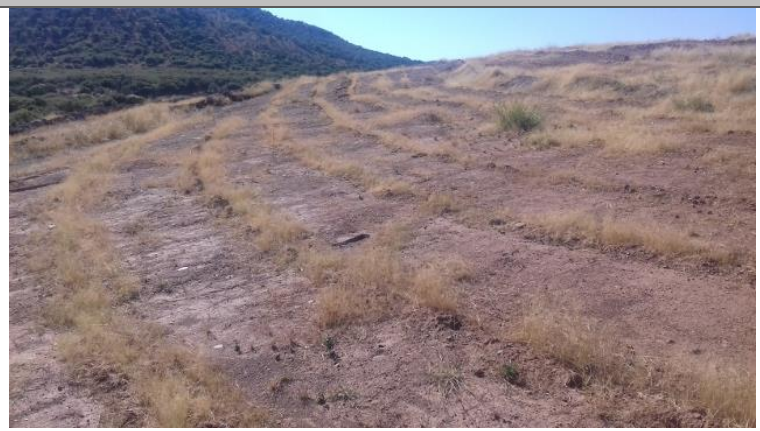
The following table contains the closure liability calculations. Refer to the table in Appendix A for the rehabilitation evaluation.

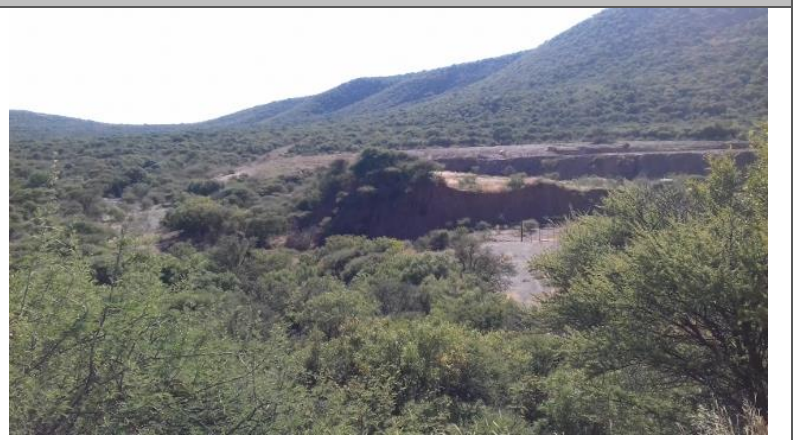
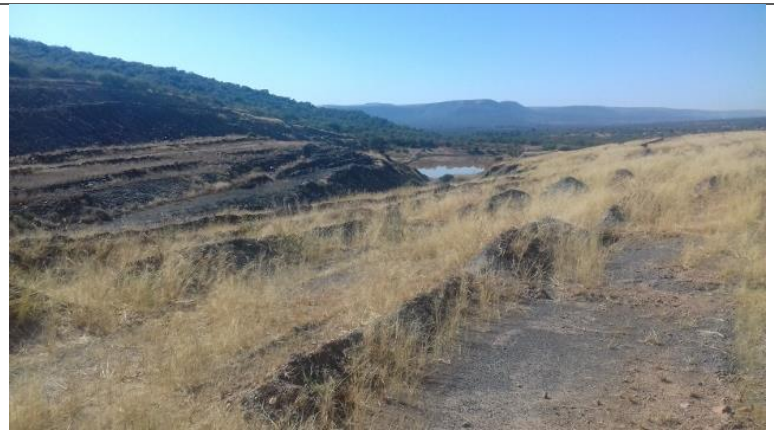
Table 5: Closure cost calculation

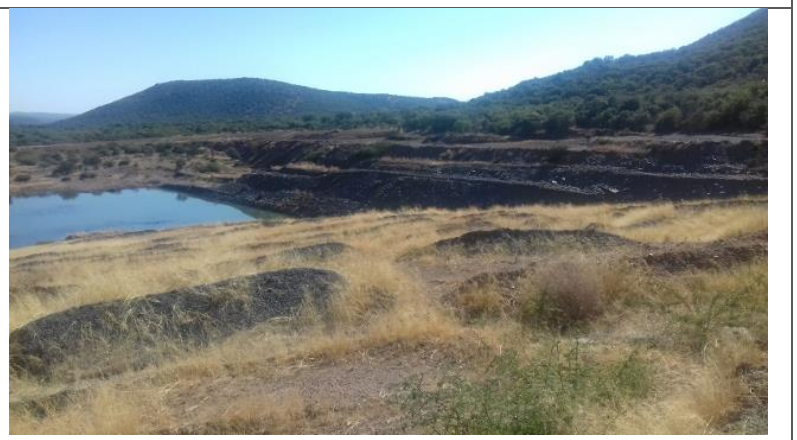
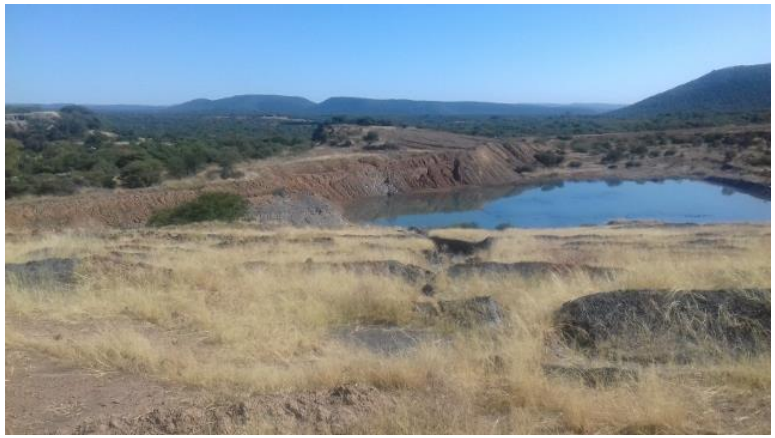
No.	Main area	Description	Rate category	Number / other/ factor	Total Size	Rates	Final cost
1	Waste dumps	Waste dumps & tailings	DMR 8(b)		0	R 177 308.40	R -
2	Topsoil spreading	Eastern side	Dump levelling: Grader	1	0	R 41.23	R -
3	Topsoil spreading	Middle	Dump levelling: Grader	1	0	R 41.23	R -
4	Roads	Access roads	Ripping	1	15000	R 15.78	R 236 751.00
5	Roads	Access roads	Seeding	1	15000	R 12.67	R 190 005.00
6	Mine wide	Maintenance	DMR maintenance		18	R 14 158.44	R 254 851.94
Subtotal							R 681 607.94
P&G (13.5%)							R 92 017.07
Contingency (10%)							R 68 160.79
Grand total							R 841 785.81

Appendix A: Rehabilitation completed

Aspect	Closure objective	Success criteria	Further action required	Photograph (if applicable)
Old slimes dam	Although the slimes dam walls are very steep, it is already well vegetated and further disturbance will not add value.	Indigenous vegetation has established on the slimes dam rehabilitated surfaces. Alien species should not be dominating plant cover and indigenous species should be present. Water drainage flows naturally without pooling or flooding. Minimal erosion where water flows from drainage structures.	Biodiversity survey to verify that adequate vegetation cover has been achieved and that the balance between indigenous and alien species is acceptable. Mitigate areas where erosion is visible through redirecting storm water.	 
Large waste rock dump	Visually, the southern side wall is the most significant as it is	The dump has been sloped per closure objectives.	Re-seed the dump, as seeds that were sowed was washed away	

Aspect	Closure objective	Success criteria	Further action required	Photograph (if applicable)
	visible from the national road. The objective is to decrease the height and reduce the slope in order to successfully re-vegetate.	Vegetation has established on shaped slopes which limits visual impact.	during March 2017 storm. After completion of this step, monitoring will be conducted until the end of 2018 to verify establishment of vegetation.	
	Material from the waste rock dump will also be used to fill the depression to the north of the WRD and the eastern quarry	N/A	N/A	
	The mine may also consider selling some of the waste rock material to use during construction or upgrading of roads.	N/A	N/A	

Aspect	Closure objective	Success criteria	Further action required	Photograph (if applicable)
Topsoil stockpiles east and west	Material from the topsoil stockpiles will mainly be used for final sloping and cover to promote vegetation growth. Unused topsoil will be sloped into low lying cavities to allow gradual topography with free drainage.	Any remaining topsoil stockpiles have been sloped as per objective.	One topsoil stockpile was observed during the site visit (14 June 2017). This stockpile w.il be sloped as per objective.	
Quarry east	Benches will be sloped using cut and fill techniques.	Benches have been sloped.	None.	
	The water body to the east will remain intact while the floor to the west of this quarry will be filled with material from the north and south slopes.	Infilling was done where required.	None.	
	Rocky contours are proposed within main drainage lines to reduce runoff velocity	Berms / sediment traps are installed where necessary to reduce sediment loads.	None.	

Aspect	Closure objective	Success criteria	Further action required	Photograph (if applicable)
	and prevent siltation of the water body.	No evidence of siltation of nearby natural drainage lines.		
Quarry west	Benches will be sloped using cut and fill techniques.	Benches have been sloped.	None.	
	The water body will remain intact with sloping of the surrounding high walls limited to the current footprint of the water body.	The high-walls do not exceed the footprint of the water body.	None.	
	Prevention of siltation is proposed using rocky bund walls within the main drainage lines towards the water body.	Berms / sediment traps are installed where necessary to reduce sediment loads. No evidence of siltation of nearby natural drainage lines.	None.	
	Final slopes around both quarries should allow at least one section with safe and easy access for	Cattle and other fauna on site has safe access to the water.	None.	

Aspect	Closure objective	Success criteria	Further action required	Photograph (if applicable)
	animals to reach the water.			
Quarry north	The only objective for the northern quarry is to make it safe by sloping the benches using cut and fill techniques	Quarry is fenced off, restricting access.	None