DIGBY WELLS
ENVIRONMENTAL

Environmental Authorisation Application for Blyvoor Gold Mine

Rehabilitation and Closure Plan

Project Number:

BVG4880

Prepared for:

Blyvoor Gold Capital (Pty) Ltd

October 2018

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Project Name:	**Environmental Authorisation Application for Blyvoor Gold Mine**
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DECLARATION OF INDEPENDENCE

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I, Sibongile Chabalala as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Blyvoor Gold Capital (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the integrated environmental regulatory application process for authorisations required by Blyvoor Gold Mine.

Name and Surname:	Sibongile Chabalala
Title/ Position:	Assistant Mine Closure Consultant
Qualification(s):	BSc (Hons) Animal, Plant and Environmental Science
Experience (Years):	1

EXECUTIVE SUMMARY

Introduction

Blyvoor Gold Capital (Pty) Ltd (hereinafter Blyvoor Gold) appointed Digby Wells Environmental (hereinafter Digby Wells) to undertake an Environmental Impact Assessment (EIA) Process and Air Emission Licence (AEL) application in support of the required Environmental Authorisation (EA) application to return the former Blyvooruitzicht operations to production as the Blyvoor Gold Mine ("the Project") to comply with the National South African legislative framework. One of the required specialist studies includes a Rehabilitation and Closure Plan (RCP) for the Project.

The main aim in developing the RCP is to minimise and mitigate the impacts caused by mining and industrial activities and to restore land back to a satisfactory standard. It is best practice to develop the RCP as early as possible so as to ensure the optimal management of rehabilitation and closure issues that may arise. It is critical that a mine's RCP is defined and understood from before mining progresses and is complimentary to the objectives and goals set.

Study Area

The Project is located approximately 6km from Carletonville and 14km north of Fochville. This area falls within the jurisdiction of the Merafong City Local Municipality (MCLM) within the West Rand District Municipality (WRDM) in Gauteng Province.

Closure Objectives

Closure and rehabilitation is a continuous series of activities that begin with planning prior to the project's design and construction, and end with achievement of long-term site stability and the establishment of a self-sustaining ecosystem. Not only will the implementation of this concept result in a more satisfactory environmental outcome, but it will also reduce the financial burden of closure and rehabilitation. The following points outline the main objectives for rehabilitation and closure of Blyvoor Gold Mine:

- The overall closure objective is to leave behind a mining area that is safe, stable and non-polluting, aligned to the Merafong Magisterial District spatial development framework, as well as current agricultural, tourism and other economic initiatives of the region, towards leaving behind a positive post mining legacy;
  - The above closure goal is stated qualitatively and will become more specific as the more detailed closure measures are derived during the life of the mine.
- The main objective is to rehabilitate the TSFs, metallurgical plants and shaft infrastructure with the purpose of reintegrating these areas into a post-mining viable economy;

- Blyvoor Gold will ensure that the rehabilitated TSFs, metallurgical plants and shaft infrastructure sites are:
  - Neither a danger to public health and safety nor to animal health and safety;
  - Not a source of any pollution;
  - Stable (ecological and geophysical);
  - Rehabilitated to a state that is suitable for the predetermined and agreed land use;
  - Compatible with the surrounding biophysical environment;
  - A sustainable environment;
  - Aesthetically acceptable; and
  - Not an economic, social or environmental liability to the local community or the state now or in the future.
- Blyvoor Gold will ensure that the interest of all interested and affected parties (I&APs) are considered, and that all relevant legislation regarding mine closure is adhered to, and all relevant application procedures are followed.

Current and Proposed Land Use

The current land use in the vicinity of the Blyvoor Gold Mine is agriculture and mining. Agricultural practices include both animal production and cropping. However mining and mineral processing activities are more extensive, making them the major source of employment and the main driver of urban development in the entire area. The final end land use is currently set at grazing for certain areas and others will remain wilderness. All rehabilitation efforts adopted should aim to rehabilitate the site to a grazing and wilderness land capability

Financial Provision Estimate

The estimated overall financial provision required for the rehabilitation and closure of all three categories of rehabilitation provisioning is **R 366 295 665** (Excl. VAT). A summary of the financial provision estimate is presented in Table 1-1 below.

Table 1-1: Summary of the overall financial provision for the three entities of the Project

DIGBY WELLS ENVIRONMENTAL	**Digby Wells Environmental** **Blyvoor Gold (Pty) Ltd, Blyvoor Gold Mine – MR143GP, BVG4880** **Revision 0**
Description	**DMR Financial Provision Assessment**
Blyvoor Gold Capital	R 45 683 585
Blyvoor Gold Operations	R 221 378 324
"The Orphans"	R 109 233 756
GRAND TOTAL	**R 366 295 665**

Closing Statement and Recommendations

The following is recommended to assist Blyvoor Gold in successfully carrying out the rehabilitation and closure at the Blyvoor Gold Mine:

- Regular water monitoring must take place to determine possible changes in water quality of nearby natural sources;
- Concurrent rehabilitation must take place where possible;
- Invasive alien plants must be removed on an on-going basis; and
- Monitoring and maintenance of the rehabilitated areas must take place on an annual basis for at least 5 years post-closure

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1 Introduction

Blyvoor Gold Capital (Pty) Ltd (hereinafter Blyvoor Gold) acquired the Mining Right (MR) (MR143GP) for the former Blyvooruitzicht operations through a transfer and cession in terms of Section 11 of the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA). Blyvoor Gold intends to return these operations to production as the Blyvoor Gold Mine ("the Project") and as such requires Environmental Authorisation (EA) to comply with the National South African legislative framework. To achieve this, Blyvoor Gold must align existing documentation relating to the former Blyvooruitzicht operations with the requirements encapsulated in:

- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- The NEMA Environmental Impact Assessment (EIA) Regulations (Government Notice Regulations [GN R] 982 as amended by GN R 326); and
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM: AQA).

Blyvoor Gold appointed Digby Wells Environmental (hereinafter Digby Wells) to undertake an Environmental Impact Assessment (EIA) Process and Air Emission Licence (AEL) application in support of the required EA. Digby Wells submitted the Scoping Report to the Department of Mineral Resources (DMR), which was subsequently accepted[1] with the condition that certain specialist studies be undertaken to update the baseline and impact assessments included in the current and historical Environmental Management Plans (EMPs). One of the required specialist studies includes a Rehabilitation and Closure Plan (RCP) for the Project.

2 Project Details

2.1 Project location

The Blyvoor Gold Mine is the most westerly along the West Wits Line. The Project is located approximately 6 km from Carletonville and 14 km north of Fochville. This area falls within the jurisdiction of the Merafong City Local Municipality (MCLM) within the West Rand District Municipality (WRDM) in Gauteng Province. Table 2-1 and Table 2-2 provide a summary of the Project location and the relevant landowners respectively. Figure 2-1 shows the local setting and MR area with Figure 2-2 depicting the general site layout.

[1] Dated 12 March 2018, accepted 27 March 2018

Table 2-1: Project location details

Province	Gauteng
Street address or location (e.g.: Off R44)	No. 5 Shaft, unnamed road. South of the R501 and south-west of Carletonville. North of Fochville.
Erf or farm number/s	Blyvooruitzicht 116 IQ, Portion 10 (Tailings retreatment plant) Doornfontein 118 IQ, Portion 24 (Underground metallurgical treatment plant)
Coordinates of approximate centre of project area	26°25’36.12” S
	27°30’30.20”E
Town or District	Carletonville West Rand District Municipality
Responsible Municipality	Merafong City Local Municipality West Rand District Municipality
Maximum extent of proposed development	Approximately 32 hectares (ha) for both metallurgical treatment plants. Refurbishment of mining-related infrastructure to cover 510 ha.
Current use	Mining
Predominant land use/s of surrounding properties	Mining, agriculture, urban.

Table 2-2: Landowner details

Name	**Property**	**Notified**
Blyvoor Gold	Blyvooruitzicht 116 IQ, Portion 10	N/A
	Doornfontein 118 IQ, Remaining Extent (RE) of Portion 24	N/A

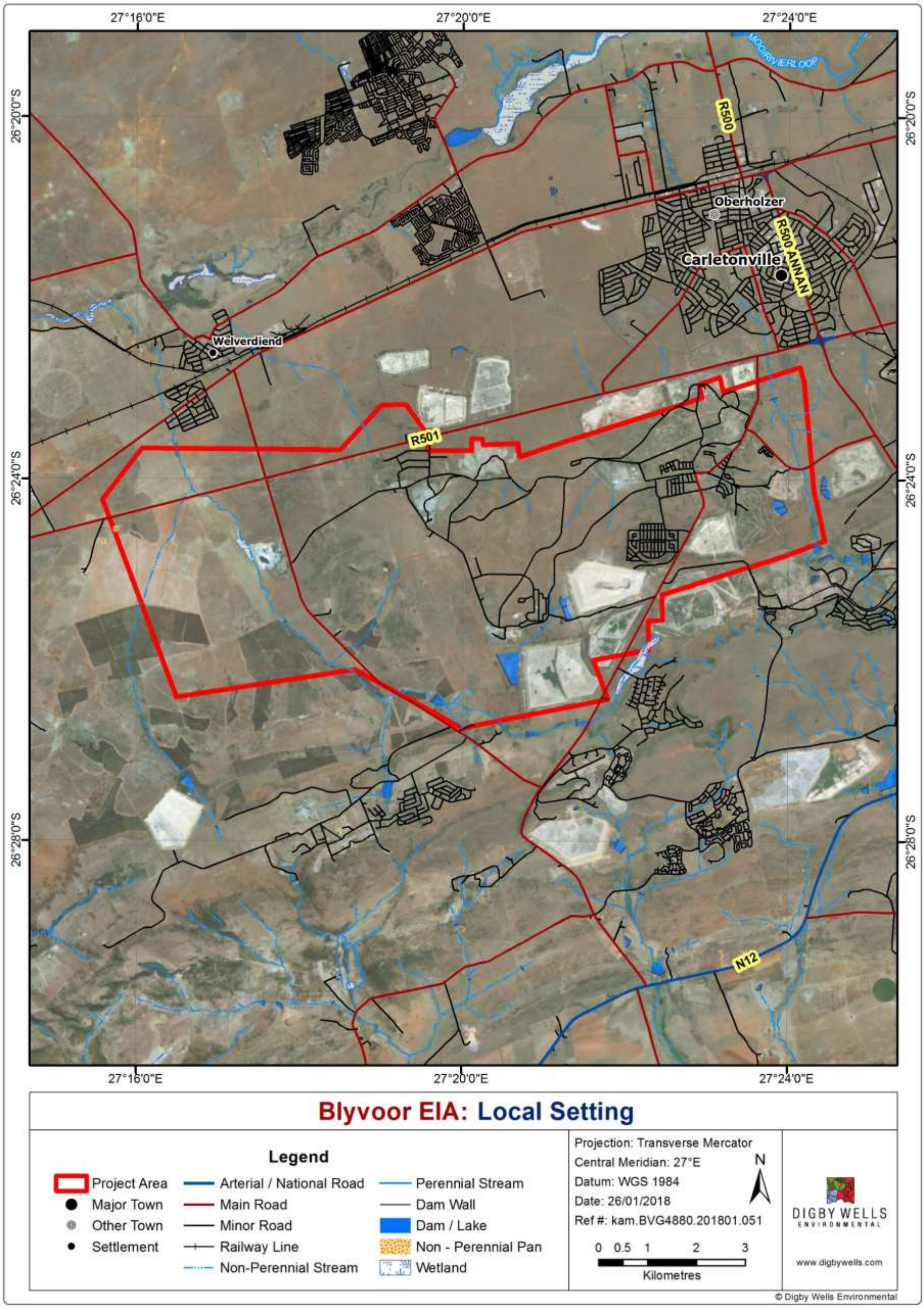

Figure 2-1: Local Setting

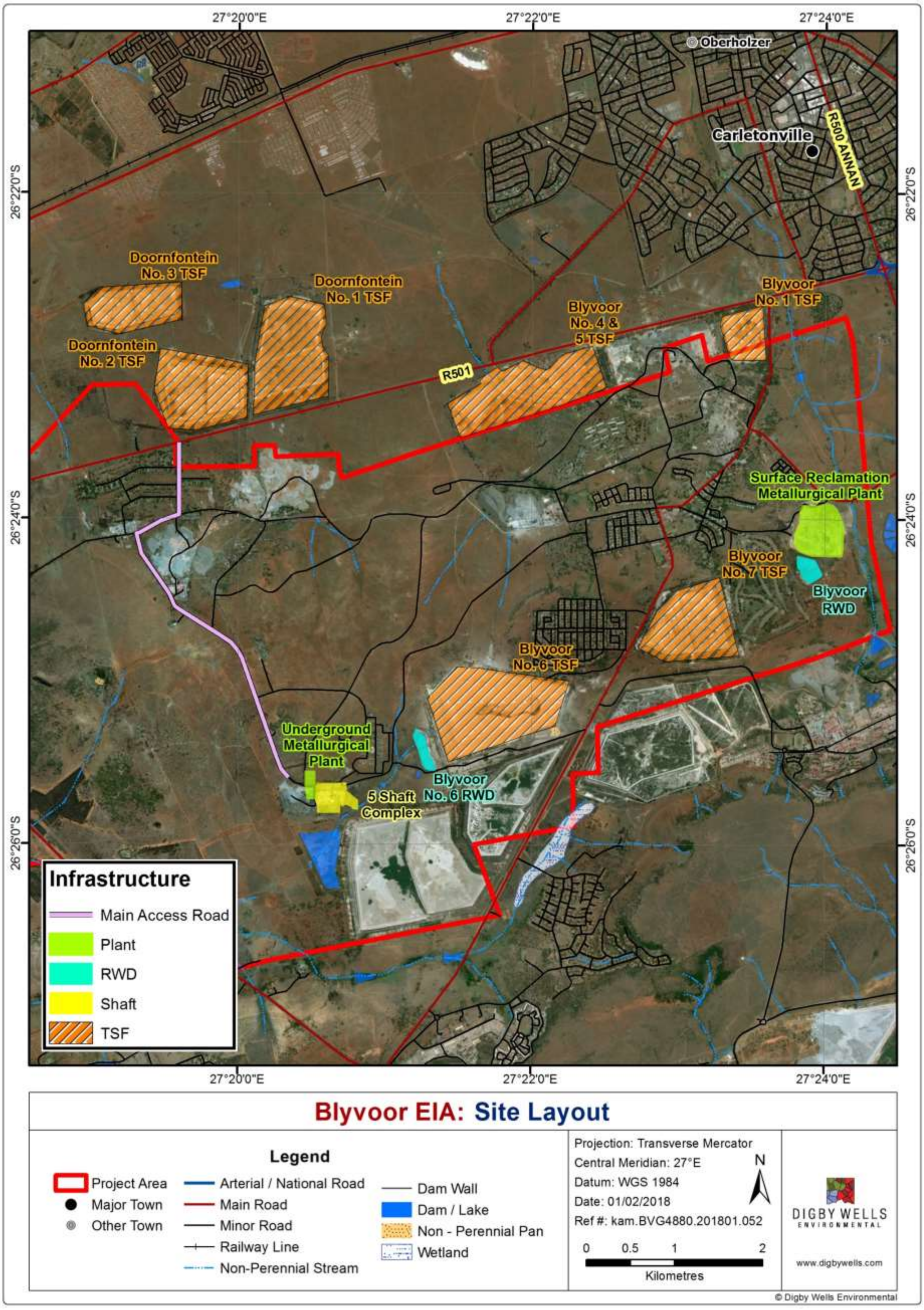

Figure 2-2: Site Infrastructure

2.2 Project background

Exploration activities at the Blyvooruitzicht operations began in the 1930s. The Blyvooruitzicht Gold Mining Company Limited (BGMC) was owned and managed initially by Rand Mines Limited, thereafter by DRD Gold Limited (DRD Gold) and later by Village Main Reef Limited (VMR). Mining activities continued until 2013, when BGMC was placed in liquidation. The mine premises and the plant were subsequently inundated by illegal artisanal miners (known colloquially as '*zama-zamas*'). Much of the operations infrastructure, including the shaft surface infrastructure and the metallurgical treatment plants, were damaged during these events, as structures were vandalised and the electrical infrastructure was stripped and stolen for re-sale as scrap. The subsequent non-utilisation of the installed infrastructure has resulted in additional degradation to the infrastructure.

Blyvoor Gold acquired the full MR relevant to the former BGMC operations ("Blyvooruitzicht operations") in 2016 but did not purchase all the assets associated with the Blyvooruitzicht operations. Blyvoor Gold is the owner of the underground mining operations and associated infrastructure, and the Blyvoor Gold Operations (Pty) Ltd is the owner of the surface mining operations which includes the

TSFs and associated infrastructure.In combination, these assets comprise the Blyvoor Gold Mine and are shown in Figure 2-2. The assets include:

- The BGMC No. 5 Shaft Complex;
- The Surface Reclamation metallurgical plant;
- The BGMC Tailings Storage Facilities (TSFs) Blyvoor No. 1, 4, 5, 6 and 7; and
- Doornfontein TSFs No. 1, 2 and 3.

The No. 5 Shaft itself provides access to the Carbon Leader and the Middelvlei reefs. These economic horizons occur within the Johannesburg Subgroup within the Central Rand Group of the Witwatersrand Supergroup. The sinking of No. 5 Shaft (formerly Doornfontein No. 3 Shaft) took place between February 1980 and October 1984. The shaft was operational in 1985 and the construction of the complex was completed in 1987.

Blyvoor Gold has not purchased all the assets associated with the previous Blyvooruitzicht operations. The assets that were not purchased by Blyvoor Gold and/or Blyvoor Gold Operations (Pty) Ltd ("Orphan Infrastructure") include but are not limited to:

- The numerous Waste Rock Dumps on the mining right area (which are operated by third parties);
- Various shafts and shaft infrastructure (No. 2, Shaft, No. 4 Shaft, No. 6 Shaft and Annan Shaft);
- The Blyvooruitzicht Village; and
- The Doornfontein Village.

The DMR considers the Orphan Infrastructure as Blyvoor Gold's liability, as they form part of the mining right. Consequently, these have been dealt with as part of this RCP, but have in all cases been separately identified.

2.3 Project Description

The estimated Life of Mine (LoM) for the Blyvoor Gold Mine underground operations currently exceeds 30 years and Blyvoor Gold has an operational plan for the first 15 years. Blyvoor Gold intends to recover gold through the No. 5 Shaft metallurgical treatment plant, constructed within the original footprint. Additionally, Blyvoor Gold intends to re-treat the existing TSFs at the Tailings retreatment plant throughout the LoM, commencing with Blyvoor TSF No. 4& 5 and 7.

Much of the work required to implement the Project will be characterised by refurbishment and repair work to return the mine to an operational state. Wherever possible, the required infrastructure will be installed or constructed within existing footprints. All support infrastructure (including power supply and roads), Water Use Licence (WUL) and stormwater and waste management strategies were approved in 2001.

2.3.1 Underground operations

The underground Project will require the recommissioning of shaft facilities, ventilation fans, compressors, re-establishing the No. 5 Shaft metallurgical treatment plant and renovating the offices at No. 5 Shaft and the surface complex. No. 5 Shaft provides access to the existing underground network of tunnels and stopes. Ore will be excavated in the stoped areas, beginning in the shallower reaches of the deposit above 29-Level. The current water level occurs at 30-Level. The production levels above 30-Level are accessible and will allow for an estimated minimum nine years of mining. Blyvoor Gold plans to implement a dewatering programme for 30-Level and below from the ninth year of mining.

The waste rock will be deposited at the existing WRD at No. 5 Shaft and the gold ore will be transported to the surface to be crushed and screened at the No. 5 Shaft metallurgical treatment plant.

The ore will be hoisted up the existing No. 5 Shaft infrastructure, discharged into the existing ore bins in the shaft headgear and then loaded onto the existing Conveyor 1. This conveyor will deposit the ore into Coarse ore Silo. Ore is drawn out of the Silo by an apron feeder and fed into a jaw crusher via a static grizzley. The fines and crushed ore report to a conveyor that delivers it to a screen. Screen oversize reports to a recirculation conveyor that delivers the ore to the cone crusher for secondary crushing. The secondary crushed ore also reports to the screen feed conveyor allowing secondary closed circuit crushing.

Screen undersize reports to the crushed ore silo feed conveyor and is delivered to the shuttle conveyor above the crushed ore silos. The shuttle conveyor is used to deposit ore into one of two silos. Ore is drawn out each crushed ore silo by a light duty apron feeder and

discharged onto the mill feed conveyor that delivers it to the mill. Each mill is therefore fed by its own independent silo, feeder and conveyor system.

The milling circuit includes a 100% mill discharge feed to a Falcon gravity concentrator. Concentrate from the concentrator passes over a magnetic separator to remove magnetics before it is leached in a concentrate leach reactor. The tails from the leach reactor reports back to the milling circuit.

Cyclone overflow from the milling circuit flows over a trash screen before it is thickened and delivered to a leach and Carbon in Pulp (CIP) pump cell circuit. The loaded carbon from the pump cells is acid washed, eluted using a Zadra process and electrowinning, and regenerated before being returned for CIP adsorption. The gold plated onto the electrowinning cathodes is washed off, caked in a filter press, then dried and calcined in a calcine oven before smelting into bullion bars for delivery to a refinery.

The plant tailings will pass through an INCO process[2] detox circuit prior to pumping to the tailings dam. Water recovered from the tailings penstock will be gravity and pump fed to the plant process water dam for reuse in the circuit.

Reagents utilised for the process will be stored and mixed on site. Cyanide will be stored and utilised within strict cyanide control requirements including a separate fenced and locked mixing and storage area within the plant boundary fence. Lime will be bulk delivered to a free standing silo from where it is delivered at a controlled rate for mixing and slaking with water prior to circulation around the plant for pH control. Caustic and Hydrochloric acid will be delivered in concentrated liquid form and stored in separate fenced areas within the plant prior to being diluted with water in storage tanks from which it is pumped for plant use.

Existing infrastructure includes the foundations and the coarse ore silo. The foundations will be modified to suit the designed plant layout. The crushed ore silo will be modified and reused. New plant fencing and a new laboratory, administration and security building will be erected for the plant.

2.3.2 Surface operations

Blyvoor Gold intends to reclaim the Blyvoor No. 7 TSF first and the other TSFs will remain in care and maintenance until they are reclaimed later in the LoM. The chosen method of reclamation is hydraulic mining and processing at the surface reclamation metallurgical plant situated near the old golf course.

The reclaimed tailings will be pumped to a reception tank via a trash screen on top of the reception tank. The clean slurry is pumped to a cyclone which diverts coarse ore to the milling circuit and size ore to the thickener feed trash screen. The thickened slurry is pumped to a preoxidation tank in which the ore is oxidised by oxygen injection into a leach reactor. The oxidised ore reports to a Carbon in Leach (CIL) circuit that leaches and adsorbs the gold

[2] A process for the destruction of sulphur dioxide cyanide to process tailings patented by INCO Ltd. This is one of two patented processes and this process has been used at over 80 mines globally.

in a preg robbing environment. The gold will then be recovered through the existing plant elution and smelting circuit. The residue from the CIL will be pumped and disposed of, onto TSF 6.

The plant and associated water pipeline servitude (which runs from the plant to Blyvoor No. 6 and No. 7 TSFs) are approved. Should this option be chosen, this will constitute a separate EA process and is not considered in this assessment.

Blyvoor Gold will continue to deposit material on the Blyvoor No. 6 TSF, as this TSF still has sufficient capacity for the fifteen years LoM. Should more deposition capacity be required, materials will be deposited onto the area of Blyvoor No. 7 TSF after those tailings have been reclaimed. Alternatively, Blyvoor Gold may consider a new site on Blyvoor TSF No. 4 and 5.

3 Details of Authors

The following is a list of the Digby Wells' staff who were involved in the compilation of the RCP for Blyvoor Gold Mine:

Sibongile Chabalala is an Assistant Mine Closure Consultant at Digby Wells. She completed her BSc. (Hons) in Animal, Plant and Environmental Sciences at the University of the Witwatersrand (Wits) in 2014. She joined Digby Wells in November 2017. She has been involved in conducting financial provision assessments and mine closure plans. Sibongile also completed an Environmental Law course based on National Environmental Management Act and associated legislation with E.O.H legal services in 2017. Her previous experience was gained in the field of GIS and Remote Sensing at the South African National Space Agency for a period of two years.

Michelle van Niekerk is the Manager of the Mine Closure Unit at Digby Wells. She obtained her B Tech: Civil Environmental Engineering in 2014 from Tshwane University of Technology. She has four years' experience in closure costing and has compiled assessments for Sibanye, Sasol, Total Coal and First Quantum. Michelle is a registered Environmental Engineering Technologist.

Siphamandla Madikizela is a Soil Scientist, completed his MSc in Soil Science at University of KwaZulu-Natal and is a Professional Natural Scientist. Prior to his employment at Digby Wells Environmental, Siphamandla worked as an Assistant Plantation Manager at EcoPlanet Bamboo SA. He is the part of the Closure, Rehab and Soils Department at Digby Wells Environmental. His role involves conducting soil surveys; soil, land capability and land use environmental impact assessments; soil and agricultural potential studies; soil contamination assessments; interpreting results of soil samples; soil management plans and writing detailed scientific reports in accordance to local legislation and with the International Finance Corporation (IFC). Siphamandla has worked in projects in South Africa, Democratic Republic of the Congo and Mali.

Leon Ellis is the divisional manager of the Mine Closure and Rehabilitation Services Division at Digby Wells. Leon completed his BSc. (Hons) in Geography and Environmental Management at the University of Johannesburg (UJ) in 2009. He joined Digby Wells in

January 2013. When Leon joined Digby Wells, he was part of the Environmental Management Services (EMS) Department and since joined the Mine Closure Unit. He has eight years' experience in the environmental services sector with specialised focus on Environmental Liability Assessments, Mine Closure Plans, Performance Assessments and Risk Assessments, locally and internationally. He has also been involved in the undertaking of Environmental Impact Assessments (EIAs) and Environmental Management Programmes (EMPs). Leon also completed the Environmental Risk Assessment and Management course based on ISO 31000 at the Centre of Environmental Management (North West University) in 2016.

4 Terms of Reference

The intent of the RCP is to ensure that it meets the minimum requirements stipulated by the relevant regulations. In general, the RCP should contain amongst other information the following:

- Providing vision, objectives, targets and criteria for final rehabilitation;
- Legal and governance framework;
- Assessment of post closure options that are practical and within the socio-economic and environmental opportunities;
- Proposed final land use and mapping;
- Ongoing research on closure and rehabilitation options;
- Detailed description of assumptions made;
- Detail of full financial provision for the life of the project;
- Information on the organisational capacity to implement the rehabilitation plan; and
- Outline of monitoring, auditing and reporting requirements.

5 Limitations and Assumptions

The compilation of this RCP is based on the assumption that the information contained within this RCP is based on the current and newly proposed additional infrastructure plans provided by Blyvoor Gold. If there is a significant change or addition of other infrastructure area the RCP will need to be updated to cater for this change.

6 Closure Design Principles

Mine closure is an ongoing programme designed to restore the physical, chemical and biological quality or potential of air, land and water regimes disturbed by mining to a state acceptable to the regulators and to post mining land users. The activities associated with mine closure are designed to prevent or minimise adverse long term environmental impacts, and to create a self-sustaining natural ecosystem or alternate land use based on an agreed set of objectives. The objective of mine closure is to obtain legal (government) and

community agreement that the condition of the closed operation meets the requirements of those entities, whereupon the companies' legal liability is terminated.

Rehabilitation can be divided into two different streams, namely concurrent rehabilitation and final rehabilitation. Concurrent rehabilitation must continue to be carried out along with mining. Concurrent rehabilitation activities should decrease the final closure liability that the mine will carry at the time of closure. This concurrent rehabilitation must be carried out within the context of the approved EMP as well as the RCP. Final rehabilitation will be carried out once the mine goes into its decommissioning and closure phase.

The primary concerns for decommissioning and rehabilitation are to ensure public safety and health, and environmentally stable conditions compatible with the surrounding environment, and consequently minimize the environmental impacts caused by mining. The overall objective is to have socially, economically, and environmentally sustainable development.

The objectives of mine closure as set out in the DMR policies are:

- Safety and health of animals and humans must be safeguarded;
- Environmental damage and residual impacts must be minimized to a level acceptable to all parties, i.e. avoidance of future pollution;
- Land must be rehabilitated to as close to natural state as possible, i.e. creation of a stable land surface;
- Physical and chemical stability of remaining structures must be such that they are not affected by natural elements;
- Mines are closed effectively and cost efficiently; and
- Mines are not abandoned, but closed in terms of policy.

7 Closure Objectives

Closure and rehabilitation is a continuous series of activities that begin with planning prior to the project's design and construction, and end with achievement of long-term site stability and the establishment of a self-sustaining ecosystem. Not only will the implementation of this concept result in a more satisfactory environmental outcome, but it will also reduce the financial burden of closure and rehabilitation. The following points outline the main objectives for rehabilitation and closure of the Blyvoor Gold Mine:

- The overall closure objective is to leave behind an ex-mining area that is safe, stable and non-polluting, aligned to the Merafong Magisterial District spatial development framework, as well as current agricultural, tourism and other economic initiatives of the region, towards leaving behind a positive post mining legacy;
    - The above closure goal is stated qualitatively and will become more specific as more detailed closure measures are derived during the life of the mine.

- The main objective is to rehabilitate the TSFs, metallurgical plants and shaft infrastructure with the purpose of reintegrating these areas into a post-mining viable economy;
- Blyvoor Gold will ensure that the rehabilitated TSFs, metallurgical plants and shaft infrastructure sites are:
  - Neither a danger to public health and safety nor to animal health and safety;
  - Not a source of any pollution;
  - Stable (ecological and geophysical);
  - Rehabilitated to the state that is suitable for predetermined and agreed land use;
  - Compatible with the surrounding biophysical environment;
  - A sustainable environment;
  - Aesthetically acceptable; and
  - Not an economic, social or environmental liability to the local community or the state now or in the future.
- Blyvoor Gold will ensure that the interest of all interested and affected parties (I&APs) are considered, and that all relevant legislation regarding mine closure is adhered to, and all relevant application procedures are followed.

8 Legal Requirements

Relevant legislation governing mine rehabilitation, closure cost assessment (closure provision) and closure planning are described in the MRPDA and the NEMA Regulations. The definition for environmental management plan as stated in the MPRDA is '*a plan to manage and rehabilitate the environmental impact as a result of prospecting, reconnaissance, exploration or mining operations conducted under the authority of a reconnaissance permission, prospecting right, reconnaissance permit, exploration right or mining permit, as the case may be*.'

Specific sections include for the following:

- Section 38 on 'Integrated environmental management and responsibility to remedy';
- Section 39 on 'Environmental management programme and environmental management plan';
- Supporting MPRDA Regulations include sections 53 – 57 and 60 – 62; and
- Financial Provision with respect to NEMA as included in Government Notice Regulation 1147 (GNR 1147).

For rehabilitation purposes, these regulations stipulate what information will be required for the final rehabilitation plan.

9 Land Use Plan

9.1 Current Land Use

The current land use in the vicinity of the Blyvoor Gold Mine is agricultural practices and mining. Agricultural practices include both animal production and cropping. However mining and mineral processing activities are more extensive, making them the major source of employment and driver of urban development in the entire area.

9.2 Post Rehabilitation Land Use

The post closure Land Use Plan (LUP) defines the desired end use of mining affected land. The closure objectives set as part of this report aim to ensure the final LUP is implemented and that the area is sustainable in the long term from an environmental and social point of view.

The final end land use is currently set at grazing for certain areas and others will remain wilderness. All rehabilitation efforts adopted should rehabilitate the site to a grazing and wilderness land capability.

10 Closure Environmental Management Plan

The main aim in developing the RCP is to minimise and mitigate the impacts caused by mining activities and to restore land back to a satisfactory standard. It is best practice to develop the RCP as early as possible so as to ensure optimal management of rehabilitation and closure issues that may arise. It is critical that a mine's RCP is defined and understood before mining progresses and is complimentary to the objectives and goals set. Table 10-1 below sets out the rehabilitation and closure actions required for the Blyvoor Gold Mine to achieve the desired end land use-

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Table 10-1: Summary of Rehabilitation and Closure Actions

Target Area	Main Actions
Blyvoor Gold Capital (Underground Operations)	
No. 5 Shaft Complex	▪ Infrastructure such as the offices, administration buildings and workshops should be removed, unless legally transferred or sold to another party; ▪ If complete infrastructure removal is chosen, all infrastructure should be demolished to 1m below surface and the demolition rubble removed and taken to the nearest waste facility; ▪ After all infrastructure has been removed, a soil assessment should be done. If soil contamination is discovered around the infrastructure areas, this soil should be removed and disposed of in the appropriate waste disposal facility; ▪ Areas that have been disturbed or where infrastructure has been removed will have to be shaped and ripped to alleviate compaction and to assist with vegetation establishment; ▪ When shaping of the area is undertaken, reshaping must be free draining and should resemble the surrounding topography; ▪ Appropriate topsoil should be replaced on the rehabilitated areas; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and ▪ Remove alien invasive vegetation.
No. 5 Shaft metallurgical treatment plant	▪ All power and water services to be disconnected and certified as safe prior to commencement of any demolition works; ▪ Electrical, water and other services that are more than 0.4 m below ground surface will remain; ▪ All concrete below 1 m depth will remain in situ with the invert of all structures broken/sealed to prevent possible ingress and ponding of water; ▪ Salvageable equipment will be removed and transported offsite prior to the commencement of demolition; ▪ Remove all the surface infrastructure associated with the metallurgical plant from site at closure of the mining operation; ▪ After all infrastructure has been removed, a soil assessment should be done .If soil contamination is discovered around the metallurgical plant areas, this soil should be removed and disposed of in the appropriate waste disposal facility; ▪ The footprint area should be ripped to alleviate compaction and to assist with vegetation establishment; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; and ▪ Remove alien invasive vegetation.
No. 5 Shaft Underground	▪ All salvageable equipment is to be removed at closure of operations; ▪ All tanks, pipes and sumps containing hydrocarbons or any other fluids to be flushed or emptied prior to removal or abandonment once underground mine is sealed off; ▪ All power and water services to be disconnected and certified as safe. Where practicable cabling containing copper is to be brought to surface; ▪ Surface openings (air vents, shafts, portals, etc.) will be sealed with a steel or concrete cover that attaches to the existing concrete collar; and ▪ The seals between the underground workings and the backfill or surface, will be engineered to withstand potential pressure exerted on the seal from water as the workings fill up during groundwater rebound.

Target Area	Main Actions
Blyvoor Gold Operations (TSFs)	
Blyvoor TSF 1	In the event that the TSF has been used for deposition of tailings, or has been partially reclaimed, prior to mine closure: ▪ Remove paddocks infrastructure prior to closure; ▪ Construct spillway into existing upslope storm water channel; ▪ Place a breaker layer on side slopes; ▪ Place rock grid for placement of waste rock cross walls; ▪ Transport of remnant waste rock for construction of upper surface cross walls (a waste rock inventory needs to be done to determine if there is enough material available); ▪ Facilitate drainage from upper surfaces of TSF to storm water channels; ▪ Conduct routing of storm water flow along dump toe; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and ▪ Remove alien invasive vegetation. In the event that the TSF has been fully reclaimed prior to mine closure: ▪ Where the tailings have been reclaimed, a soil assessment should be done. If soil contamination is discovered around the area, this soil should be removed and disposed of in the appropriate waste disposal facility; ▪ Areas that have been disturbed or where tailings have been removed will have to be shaped and ripped to alleviate compaction and to assist with vegetation establishment; ▪ When shaping of the area is undertaken, reshaping must be free draining (to avoid ponding and creating hydraulic head to drive pollution plumes) and should resemble the surrounding topography; ▪ Appropriate topsoil should be replaced on the rehabilitated areas; ▪ Establish vegetation on TSF footprint after reclamation; ▪ Monitor and maintain vegetation establishment; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and ▪ Remove alien invasive vegetation.
Blyvoor TSF No. 4	In the event that the TSF has been used for deposition of tailings, or has been partially reclaimed, prior to mine closure: ▪ Remove paddocks infrastructure prior to closure; ▪ Construct spillway into existing upslope storm water channel; ▪ Place a breaker layer on side slopes; ▪ Place rock grid for placement of waste rock cross walls; ▪ Transport remnant waste rock for construction of upper surface cross walls (a waste rock inventory needs to be done to determine if there is enough material available); ▪ Facilitate drainage from upper surfaces of TSF to storm water channels; ▪ Conduct routing of storm water flow along dump toe; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and ▪ Remove alien invasive vegetation. In the event that the TSF has been fully reclaimed prior to mine closure: ▪ Where the tailings have been reclaimed, a soil assessment should be done. If soil contamination is discovered around the area, this soil should be removed and disposed of in the appropriate waste disposal facility; ▪ Areas that have been disturbed or where tailings have been removed will have to be shaped and ripped to alleviate compaction and to assist with vegetation establishment; ▪ When shaping of the area is undertaken, reshaping must be free draining (to avoid ponding and creating hydraulic head to drive pollution plumes) and should resemble the surrounding topography; ▪ Establish vegetation on TSF footprint after reclamation; ▪ Monitor and maintain vegetation establishment; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and Remove alien invasive vegetation.

Target Area	Main Actions
Blyvoor TSF No. 5	In the event that the TSF has been used for deposition of tailings, or has been partially reclaimed, prior to mine closure: ▪ Remove paddocks infrastructure prior to closure; ▪ Construct spillway into existing upslope storm water channel; ▪ Place a breaker layer on side slopes; ▪ Place rock grid for placement of waste rock cross walls; ▪ Transport of remnant waste rock for construction of upper surface cross walls (a waste rock inventory needs to be done to determine if there is enough material available); ▪ Facilitate drainage from upper surfaces of TSF to storm water channels; ▪ Conduct routing of storm water flow along dump toe; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; and ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and ▪ Remove alien invasive vegetation. In the event that the TSF has been fully reclaimed prior to mine closure: ▪ Where the tailings have been reclaimed, a soil assessment should be done. If soil contamination is discovered around the area, this soil should be removed and disposed of in the appropriate waste disposal facility; ▪ Areas that have been disturbed or where tailings have been removed will have to be shaped and ripped to alleviate compaction and to assist with vegetation establishment; ▪ When shaping of the area is undertaken, reshaping must be free draining (to avoid ponding and creating hydraulic head to drive pollution plumes) and should resemble the surrounding topography; ▪ Appropriate topsoil should be replaced on the rehabilitated areas; ▪ Establish vegetation on TSF footprint after reclamation; ▪ Monitor and maintain vegetation establishment; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and Remove alien invasive vegetation.
Blyvoor TSF 6	In the event that the TSF has been used for deposition of tailings, or has been partially reclaimed, prior to mine closure: ▪ Remove paddocks infrastructure prior to closure; ▪ Construct spillway into existing upslope storm water channel; ▪ Place a breaker layer on side slopes; ▪ Place rock grid for placement of waste rock cross walls; ▪ Transport of remnant waste rock for construction of upper surface cross walls (a waste rock inventory needs to be done to determine if there is enough material available); ▪ Facilitate drainage from upper surfaces of TSF to storm water channels; ▪ Conduct routing of storm water flow along dump toe; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and ▪ Remove alien invasive vegetation. In the event that the TSF has been fully reclaimed prior to mine closure: ▪ Where tailings have been reclaimed, a soil assessment should be done. If soil contamination is discovered around the area, this soil should be removed and disposed of in the appropriate waste disposal facility; ▪ Areas that have been disturbed or where tailings have been removed will have to be shaped and ripped to alleviate compaction and to assist with vegetation establishment; ▪ When shaping of the area is undertaken, reshaping must be free draining (to avoid ponding and creating hydraulic head to drive pollution plumes) and should resemble the surrounding topography; ▪ Appropriate topsoil should be replaced on the rehabilitated areas; ▪ Establish vegetation on TSF footprint after reclamation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion; and ▪ Remove alien invasive vegetation

Target Area	Main Actions
Blyvoor TSF 7	In the event that the TSF has been used for deposition of tailings, or has been partially reclaimed, prior to mine closure: ▪ Remove paddocks infrastructure prior to closure; ▪ Construct spillway into existing upslope storm water channel; ▪ Place a breaker layer on side slopes; ▪ Place rock grid for placement of waste rock cross walls; ▪ Transport of remnant waste rock for construction of upper surface cross walls (a waste rock inventory needs to be done to determine if there is enough material available); ▪ Facilitate drainage from upper surfaces of TSF to storm water channels; ▪ Conduct routing of storm water flow along dump toe; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and ▪ Remove alien invasive vegetation. In the event that the TSF has been fully reclaimed prior to mine closure: ▪ Where tailings have been reclaimed, a soil assessment should be done. If soil contamination is discovered around the area, this soil should be removed and disposed of in the appropriate waste disposal facility; ▪ Areas that have been disturbed or where tailings have been removed will have to be shaped and ripped to alleviate compaction and to assist with vegetation establishment; ▪ When shaping of the area is undertaken, reshaping must be free draining (to avoid ponding and creating hydraulic head to drive pollution plumes) and should resemble the surrounding topography; ▪ Establish vegetation on TSF footprint after reclamation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion; and ▪ Remove alien invasive vegetation.
Doornfontein TSF No. 1	In the event that the TSF has been used for deposition of tailings, or has been partially reclaimed, prior to mine closure: ▪ Remove paddocks infrastructure prior to closure; ▪ Construct spillway into existing upslope storm water channel; ▪ Place a breaker layer on side slopes; ▪ Place rock grid for placement of waste rock cross walls; ▪ Transport of remnant waste rock for construction of upper surface cross walls (a waste rock inventory needs to be done to determine if there is enough material available); ▪ Facilitate drainage from upper surfaces of TSF to storm water channels; ▪ Conduct routing of storm water flow along dump toe; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and ▪ Remove alien invasive vegetation. In the event that the TSF has been fully reclaimed prior to mine closure: ▪ Where tailings have been reclaimed, a soil assessment should be done. If soil contamination is discovered around the area, this soil should be removed and disposed of in the appropriate waste disposal facility; ▪ Areas that have been disturbed or where tailings have been removed will have to be shaped and ripped to alleviate compaction and to assist with vegetation establishment; ▪ When shaping of the area is undertaken, reshaping must be free draining (to avoid ponding and creating hydraulic head to drive pollution plumes) and should resemble the surrounding topography; ▪ Establish vegetation on TSF footprint after reclamation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion; and ▪ Remove alien invasive vegetation.

Target Area	Main Actions
Doornfontein TSF No. 2	In the event that the TSF has been used for deposition of tailings, or has been partially reclaimed, prior to mine closure: ▪ Remove paddocks infrastructure prior to closure; ▪ Construct spillway into existing upslope storm water channel; ▪ Place a breaker layer on side slopes; ▪ Place rock grid for placement of waste rock cross walls; ▪ Transport of remnant waste rock for construction of upper surface cross walls (a waste rock inventory needs to be done to determine if there is enough material available); ▪ Facilitate drainage from upper surfaces of TSF to storm water channels; ▪ Conduct routing of storm water flow along dump toe; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and ▪ Remove alien invasive vegetation. In the event that the TSF has been fully reclaimed prior to mine closure: ▪ Where tailings have been reclaimed, a soil assessment should be done. If soil contamination is discovered around the area, this soil should be removed and disposed of in the appropriate waste disposal facility; ▪ Areas that have been disturbed or where tailings have been removed will have to be shaped and ripped to alleviate compaction and to assist with vegetation establishment; ▪ When shaping of the area is undertaken, reshaping must be free draining (to avoid ponding and creating hydraulic head to drive pollution plumes) and should resemble the surrounding topography; ▪ Establish vegetation on TSF footprint after reclamation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion; and ▪ Remove alien invasive vegetation.
Doornfontein TSF No. 3	In the event that the TSF has been used for deposition of tailings, or has been partially reclaimed, prior to mine closure: ▪ Remove paddocks infrastructure prior to closure; ▪ Construct spillway into existing upslope storm water channel; ▪ Place a breaker layer on side slopes; ▪ Place rock grid for placement of waste rock cross walls; ▪ Transport of remnant waste rock for construction of upper surface cross walls (a waste rock inventory needs to be done to determine if there is enough material available); ▪ Facilitate drainage from upper surfaces of TSF to storm water channels; ▪ Conduct routing of storm water flow along dump toe; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and ▪ Remove alien invasive vegetation. In the event that the TSF has been fully reclaimed prior to mine closure: ▪ Where tailings have been reclaimed, a soil assessment should be done. If soil contamination is discovered around the area, this soil should be removed and disposed of in the appropriate waste disposal facility; ▪ Areas that have been disturbed or where tailings have been removed will have to be shaped and ripped to alleviate compaction and to assist with vegetation establishment; ▪ When shaping of the area is undertaken, reshaping must be free draining (to avoid ponding and creating hydraulic head to drive pollution plumes) and should resemble the surrounding topography; ▪ Appropriate topsoil should be replaced on the rehabilitated areas; ▪ Establish vegetation on TSF footprint after reclamation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion; and ▪ Remove alien invasive vegetation

Target Area	Main Actions
"The Orphans"	
No. 4 Shaft Complex Infrastructure Area	▪ Infrastructure such as the offices, administration buildings and workshops should be removed, unless legally transferred or sold to another party; ▪ If complete infrastructure removal is chosen, all infrastructure should be demolished to 1m below surface and the demolition rubble removed and taken to the nearest waste facility; ▪ After all infrastructure has been removed, a soil assessment should be done. If soil contamination is discovered around the infrastructure areas, this soil should be removed and disposed of in the appropriate waste disposal facility; ▪ Areas that have been disturbed or where infrastructure has been removed will have to be shaped and ripped to alleviate compaction and to assist with vegetation establishment; ▪ When shaping of the area is undertaken, reshaping must be free draining and should resemble the surrounding topography; ▪ Appropriate topsoil should be replaced on the rehabilitated areas; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and ▪ Remove alien invasive vegetation.
No. 4 Shaft Underground.	▪ All salvageable equipment is to be removed at closure of operations; ▪ All tanks, pipes and sumps containing hydrocarbons or any other fluids to be flushed or emptied prior to removal or abandonment once underground mine is sealed off; ▪ All power and water services to be disconnected and certified as safe. Where practicable cabling containing copper is to be brought to surface; ▪ Surface openings (air vents, shafts, portals, etc.) will be sealed with a steel or concrete cover that attaches to the existing concrete collar; and ▪ The seals between the underground workings and the backfill or surface, will be engineered to withstand potential pressure exerted on the seal from water as the working fill up during groundwater rebound.
No. 6 Shaft Complex Infrastructure Area	▪ Infrastructure such as the offices, administration buildings and workshops should be removed, unless legally transferred or sold to another party; ▪ If complete infrastructure removal is chosen, all infrastructure should be demolished to 1m below surface and the demolition rubble removed and taken to the nearest waste facility; ▪ After all infrastructure has been removed, a soil assessment should be done. If soil contamination is discovered around the infrastructure areas, this soil should be removed and disposed of in the appropriate waste disposal facility; ▪ Areas that have been disturbed or where infrastructure has been removed will have to be shaped and ripped to alleviate compaction and to assist with vegetation establishment; ▪ When shaping of the area is undertaken, reshaping must be free draining and should resemble the surrounding topography; ▪ Appropriate topsoil should be replaced on the rehabilitated areas; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and ▪ Remove alien invasive vegetation.
No. 6 Shaft Underground.	▪ All salvageable equipment is to be removed at closure of operations; ▪ All tanks, pipes and sumps containing hydrocarbons or any other fluids to be flushed or emptied prior to removal or abandonment once underground mine is sealed off; ▪ All power and water services to be disconnected and certified as safe. Where practicable cabling containing copper is to be brought to surface; ▪ Surface openings (air vents, shafts, portals, etc.) will be sealed with a steel or concrete cover that attaches to the existing concrete collar; and, ▪ The seals between the underground workings and the backfill or surface, will be engineered to withstand potential pressure exerted on the seal from water as the working fill up during groundwater rebound.

Target Area	Main Actions
No. 2 Shaft Complex Infrastructure Area	▪ This shaft is believed to have been competently sealed by the previous owners and the shaft infrastructure is no longer in use; ▪ Areas that have been disturbed or where infrastructure has been removed will have to be shaped and ripped to alleviate compaction and to assist with vegetation establishment; ▪ When shaping of the area is undertaken, reshaping must be free draining and should resemble the surrounding topography; ▪ Appropriate topsoil should be replaced on the rehabilitated areas; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and ▪ Remove alien invasive vegetation.
Annan Shaft Complex Infrastructure Area	▪ This shaft is believed to have been competently sealed by the previous owners and the shaft infrastructure is no longer in use; ▪ Areas that have been disturbed or where infrastructure has been removed will have to be shaped and ripped to alleviate compaction and to assist with vegetation establishment; ▪ When shaping of the area is undertaken, reshaping must be free draining and should resemble the surrounding topography; ▪ Appropriate topsoil should be replaced on the rehabilitated areas; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion; and ▪ Remove alien invasive vegetation.
All Waste Rock Dumps	▪ The waste rock dump will be used as source of rock to create breaker layers on side slopes and to create rock grids for placement of waste rock cross walls on the TSFs and for other remediation work that requires land fill; ▪ After all waste rock dump has been removed, a soil assessment should be done .If soil contamination is discovered around the area, this soil must be removed and disposed of in the appropriate waste disposal facility or rehabilitated in-situ; ▪ If there is any waste rock dump material left at closure, it can be used in rehabilitation efforts (in-filling of shafts)Areas that have been disturbed or where waste rock dumps have been partially removed will have to be shaped and ripped to alleviate compaction; ▪ When shaping of the area is undertaken, reshaping must be free draining and should, where possible, resemble the surrounding topography; ▪ Appropriate topsoil should be placed on the rehabilitated areas; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; ▪ Prevent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion; and ▪ Remove alien invasive vegetation.
Access Roads	▪ Mine roads that are not needed for closure and post-closure uses at the site (e.g. security and monitoring) will be closed; ▪ Removal of all signage, fencing, shade structures, traffic barriers, etc.; ▪ All 'hard top' surfaces to be ripped and concrete removed along with any culverts and concrete structures; ▪ All potentially contaminated soils are to be identified 'and demarcated for later remediation; ▪ Appropriate topsoil should be replaced on the rehabilitated areas; ▪ Establish vegetation; ▪ Monitor and maintain vegetation establishment; and ▪ Remove any alien invasive vegetation.
Redundant Power Lines	▪ Establish redundancy in the power line; ▪ All power services to be disconnected and certified as safe; ▪ Remove power lines and supporting structures as well as foundations and other associated infrastructure; ▪ Structures should be demolished to 1 m below surface and the demolition rubble removed and any re-usable items should be removed from the site; ▪ Appropriate topsoil should be replaced on the rehabilitated areas; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; and ▪ Remove alien invasive vegetation.

Target Area	Main Actions
Water Pipelines	▪ Remove supporting plinths for pipeline as well as foundations and other associated pipeline infrastructure; ▪ Remaining structures should be demolished to 1 m below surface and the demolition rubble removed and any re-usable items should be removed from the site; ▪ Soil should be tested for contamination. If contamination is discovered, this soil should be removed and disposed of in the appropriate waste disposal facility; ▪ Appropriate topsoil should be replaced on the rehabilitated areas; ▪ Establish vegetation; ▪ Monitor and maintain established vegetation; and ▪ Remove alien invasive vegetation.

10.1 Rehabilitation Strategy

10.1.1 Soil Management

Soil management measures typically include the following:

- The rehabilitated area will be profiled to replicate, as far as possible, the natural landform;
- When there is insufficient soil material for use, select suitable sub surface materials (i.e. those that are neither saline nor sodic) as a substitute for soil when covering rehabilitated areas; and
- Ensuring organic content is sufficient to sustain microbial activity, encourage infiltration, limit runoff and improve soil stability. As far as is practicable, mulch with grass clippings (cut when seed content is at its highest) as an attempt to provide a seed bank.

10.1.2 Shaping and Levelling

Disturbed areas should, where possible, be shaped and levelled back to original pre-construction ground level and should be free draining.

10.1.3 Soil Compaction Alleviation

To alleviate or reduce soil compaction the following will take place:

- Rip all disturbed footprints and heavily compacted areas (hard pans, access roads) to a depth of 0.3 m;
- Soil will be ripped when moist to allow for maximum alleviation of compaction; and
- Soils must be de-compacted and/or replaced when they are dry to minimise compaction.

10.1.4 Soil Amelioration

Soil amelioration should be done as follows:

- Following de-compaction, an acceptable seed-bed should be produced through surface tillage;
- Soil must be sampled and analysed for pH, exchangeable cations, phosphorus, soil texture, soil organic carbon and heavy metals once placed on rehabilitated areas; and
- Fertiliser (mainly Nitrogen, Phosphorus and Potassium) based on soil condition, must be applied, where required, to raise the soil nutrient content to the desired levels and maintenance should continue.

10.1.5 Erosion Control

The following should be done as part of erosion control on rehabilitated land:

- Unnecessary disturbance and vegetation removal should be avoided and prevented;
- If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place;
- Restriction of vehicle movement over sensitive and rehabilitated areas to reduce compaction
- Pre-development drainage patterns should be reinstated as far possible; and
- Rehabilitated areas must be monitored monthly for erosion.

10.1.6 Vegetation Establishment

The establishment of natural vegetation is a necessary component of the decommissioning and rehabilitation phase. The overall objectives for the establishment of natural vegetation of reshaped areas are to:

- Prevent erosion;
- Avoid soil loss;
- Restore the land to the agreed land capability;
- Reduce sedimentation into aquatic ecosystems such as rivers and streams;
- Re-establish eco-system processes (succession) to ensure that a sustainable land use can be established without requiring excessive fertiliser additions; and
- Restore the biodiversity of the area as far as possible.

To ensure vegetation establishment, the following should be done:

- Rehabilitated areas should be properly prepared;
- Shaped areas must be covered with suitable growth medium; and
- Growth properties should be improved by the addition of organic matter and fertilizer, where required.

To ensure successful rehabilitation at Blyvoor Gold Mine, it is important to note vegetation types such as the Carletonville Dolomite Grassland and Gauteng Shale Mountain Bushveld so that these can be replaced to some extent once operations have been completed.

10.2 Alien Invasive Species Management

Alien invasive species tend to out-compete the indigenous vegetation; this is due to the fact that they are vigorous growers that are adaptable and able to invade a wide range of

ecological niches (Bromilow, 2010). They are tough, can withstand unfavourable conditions and are easily spread which is detrimental to rehabilitation of vegetation.

Alien Invasive Plants (AIPs) directly compete with rehabilitating vegetation and could result in increasing costs of revegetation in the long term. In addition, various invasive species are required by law to be removed. Methods should be used that are appropriate for the species concerned, as well as for the ecosystem in which they occur.

When performing the controlling methodology for weeds and invaders, damage to the environment must be limited to a minimum. One of the most cost-effective and sustainable options is to utilise biocontrol. Biocontrol makes use of a natural enemy of the AIP in its native country to help reduce the population in the country it invades (see the Agricultural Research Council website for more information on Biocontrol). If mechanical and chemical means need to be used, AIPs must be continually removed after rehabilitation has occurred for at least three growing seasons to ensure the seed bank is depleted. Continual monitoring will be needed for seeds that are likely to be blown in from adjacent areas.

Blyvoor Gold must take note of the following to manage AIP:

- There must be no planting of alien plants (e.g. *Nicotiana glauca* (Wldetabak); *Asclepias fruticose* (Melkbos, Wildekapok); *Pennisetum setaceum* (Fountain grass) and *Sutherlandia frutescens* (Kankerbossie).) anywhere within the project area;
- The transportation of soils or other substrates infested with alien species should be strictly controlled; and
- It is essential that appropriate veld management (particularly appropriate grazing levels and burning frequencies) should be applied to areas of secondary indigenous vegetation (e.g. secondary grassland of historically cultivated areas), and especially the grassland and wetland vegetation of untransformed habitats. Appropriate grazing levels and burning frequencies will not only ensure that good vegetation condition and biodiversity levels are maintained, but will also serve to control the spread and increase in cover of palatable alien species such as *Paspalum dilatatum*.

To manage alien invasive species the following is recommended:

- Mechanical methods including tree felling, hand-pulling and ring barking must be implemented;
- Chemical control methods including selective/ non-selective, contact/ systemic herbicides as per regulations must be implemented;
- Category 1(a), and 1(b) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) listed species must be targeted for eradication;
- Preventative measures should be undertaken within the mine site area where natural vegetation occurs to combat bush encroachment and invasion of alien species which may result in the deterioration of natural resources; and
- Regular vegetation monitoring of the site must take place.

10.3 Threats Opportunities and Uncertainties

The following was identified, with respect to threats, opportunities and uncertainties to the compilation of this plan and to define any additional work that is needed to reduce the level of uncertainty:

- Complete a numerical or analytical groundwater model for the Blyvoor Gold Mine with closure in mind;
- Ongoing surface water and groundwater quality monitoring during the operational LoM to determine trends over time and to monitor changes in water quality over time to determine if the mine is impacting on water quality and/or quantity within the vicinity of the mine;
- The water sampling results should inform the groundwater model, to refine the model and more accurately predict post closure impacts based on actual data obtained during the operational phase;
- Adopting closure recommendations as identified in the respective specialist reports[3], with particular emphasis on social, water and biodiversity related aspects.

11 Financial Provision

Digby Wells calculated the financial provision for Blyvoor Gold Mine according to the Department of Mineral Resources (DMR) guidelines set out in the 2005 *"Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine"*. The guidelines outline the methods for infrastructure removal and rehabilitation required for closure.

11.1 Methodology

The DMR calculation model was compiled using Microsoft Excel. The standard DMR unit rates were escalated with consumer price index (CPI) from 2005 to 2018 (refer Table 11-1)

Table 11-1: Annual Escalation Rates

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
CPI X (%)	4.70 %	7.10 %	11.5 %	7.10 %	4.30 %	5.00 %	5.60 %	5.70 %	6.10 %	4.60 %	6.40 %	5.28 %	4.46 %

The DMR Guideline Document classifies a mine according to a number of factors which allows one to determine the appropriate weighting factors to be used during the quantum calculation. The following factors are considered:

- The mineral mined;

[3] The most recent Addendum Social Impact Assessment, Air Quality Impact Assessment Report, Biodiversity Report, Groundwater Impact Assessment, and Surface Water Impact Assessment

- The risk class of the mine;
- Environmental sensitivity of the mining area;
- Type of mining operation; and
- Geographic location.

The Blyvoor Gold Mine classification was done with a risk rating table as specified in the DMR guidelines (refer Table 11-2 to Table 11-6 below).

Table 11-2: Primary Risk Class for Type of Mineral Mined (Blyvoor Gold Mine Risk Class Highlighted in Red)

Mineral	Ore	Size: Large if > than (tpm)	Primary Risk Class			
			Large Mine		Small Mine	
			Mine and Mine waste	Mine, Mine Waste, Plant and Plant Waste	Mine and Mine Waste	Mine, Mine Waste, Plant and Plant Waste
Antimony		1000	A	A	C	C
Asbestos		0	A	A	A	A
Base metals (Copper, Cadmium, Cobalt, Iron ore, Molybdenum, Nickel, Tin, Vanadium)	Sulphide	10 000	A	A	C	A
	Oxide	10 000	C	A	C	A
Coal		0	A	A	A	A
Chrome		10 000	C	A	C	C
Diamonds and precious stones		10 000	C	B	C	C
Gold, silver, uranium		10 000	B	A	B	A
Phosphate		10 000	C	B	C	C
Platinum		10 000	C	B	C	B

Mineral	Ore	Size: Large if > than (tpm)	Primary Risk Class			
			Large Mine		Small Mine	
			Mine and Mine waste	Mine, Mine Waste, Plant and Plant Waste	Mine and Mine Waste	Mine, Mine Waste, Plant and Plant Waste
Mineral sands (Ilmenite, Titanium, Rutile, Zircon)		10 000	C	B	C	C
Zinc and Lead		10 000	C	A	C	A
Industrial Minerals (Andalusite, Barite, Bauxite, Cryolite, Fluorspar)		10 000	C	C	C	C

Table 11-3: Criteria Used to Determine the Area Sensitivity

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

Sensitivity	Sensitivity criteria		
	Biophysical	**Social**	**Economic**
Medium	▪ Mix of natural and exotic fauna and flora, ▪ Development is a mix of disturbed and undisturbed areas, within an overall planned framework, ▪ Water resources are well controlled.	▪ The local communities are in the proximity of the mining operation (within sighting distance), ▪ Peri-urban area with density aligned with a development framework, ▪ Area developed with an established infrastructure.	▪ The area has a balanced economic development where a degree of income for the local communities is derived from the area, ▪ The economic activity could be influenced by indiscriminate development.
High	▪ Largely in natural state, ▪ Vibrant fauna and flora, with species diversity and abundance matching the nature of the area, ▪ Well planned development, ▪ Area forms part of an overall ecological regime of conservation value, ▪ Water resources emulate their original state.	▪ The local communities are in close proximity of the mining operation (on the boundary of the mine), ▪ Densely inhabited area (urban/dense settlements), ▪ Developed and well-established communities.	▪ The local communities derive the bulk of their income directly from the area, ▪ The area is sensitive to development that could compromise the existing economic activity

Table 11-4: Weighting Factor 1 – Nature of Terrain

	Flat	Undulating	Rugged
Weighting factor 1: Nature of the terrain/ accessibility	1.00	1.10	1.20

Note:

- Flat - Generally flat over the mine area;
- Undulating - A mix of sloped and undulating areas within the mine area; and

- Rugged - Steep natural ground slopes (greater than 1:6) over the majority of the mine area.

Table 11-5: Weighting Factor 2 – Proximity to Urban Area

	Urban	Peri-urban	Remote
Weighting factor 2: Proximity to urban area where goods and services are to be supplied	1.00	1.05	1.10

Note:

- Urban - Within a developed urban area;
- Peri-urban - Less than 150 km from a developed urban area; and
- Remote - Greater than 150 km from a developed urban area.

Quantities for certain defined items e.g. plant and related infrastructure, are then inserted and the cost for closure is calculated. Contingencies and VAT are applied to the cost.

The classification of Blyvoor Gold Mine has been summarised in Table 11-6 below.

Table 11-6: Mine classification

Mine	Risk Class	Sensitivity	Terrain	Proximity to Urban Area
Blyvoor Gold Mine	A	High	Flat	Peri-Urban

11.2 Assumptions and Limitations

Digby Wells made assumptions and noted limitations as part of estimating the Financial Provision (“FP”). These assumptions and limitations are as reflected in Table 11-7 below:

Table 11-7: Assumptions and limitations

Description	Consequence
Assumptions	
The calculations do not account for any value recovered from sale of plant, steel or other material.	Value recovered from sale of the mine`s operational infrastructure can be used for any other purpose but cannot be offset against financial provision as per the DMR Guideline document.

Description	Consequence
All pipelines and powerlines are not Blyvoor Gold`s responsibility; hence have not been included in this assessment. The old staff housing has been vandalised; hence Digby Wells allowed for demolition of 75% of the footprint area of the remaining old staff housing at No. 5 Shaft only.	Positive financial implications
The financial provision estimate is based on: ▪ The infrastructure layout plan (Ref: Blyvoor Shapefiles WGS84 20171018). ▪ The conceptual No. 5 Shaft metallurgical treatment plant layout plan (Ref: 00-AU00'au-01'001-00 Plant GA 18-08-23.pdf) received from Blyvoor Gold. ▪ The conceptual surface Tailings retreatment plant layout Plan (Ref: Plant Layout DRA.pdf). ▪ The scheduled LoM exceeds 30 years, with an operational strategic plan for the first 15 years. ▪ The 6 m average height of the infrastructure of two metallurgical plants. ▪ The width of overland conveyors of 0.5 m. ▪ All buildings at No.4, 5 and 6 Shaft complexes are brick buildings. ▪ The carports at No. 5 and 6 Shaft complexes have an Inverted Box Rib (IBR)/ Steel covering. ▪ The Project area is owned by separate entities, thus Digby Wells divided the calculated FP into three main entities namely: Blyvoor Gold Capital, Blyvoor Gold Operations and "The Orphans".	These are deemed accurate and up to date. Any change (addition or removal) in the mine layout plans and information will have implications on the financial provision estimate.

Description	Consequence
Blyvoor Gold will: ▪ Demolish or remove all surface infrastructures from the mine at closure, unless it has been transferred to a third party for sustainable future use. ▪ Dispose all inert waste (i.e. building rubble on site used as backfill material in the shafts or by burying it 1 m underground during decommissioning. ▪ Remove all fences at the end of the life of the mine aside from those that assist in preventing access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and to reduce erosion. ▪ Removal of all temporary structures from site prior to closure.	Listed components removed prior to closure or transferred to a third party have not been considered as part Blyvoor Gold Capital and/or Blyvoor Gold Operations FP calculations.
Digby Wells allowed for a contingency of 10% on the FP as per the DMR Guideline document.	Price fluctuations with regard to plant hire, fuel prices and possible omissions from the assessment have been accounted for.
Digby Wells included an allowance of 12% for Blyvoor Gold Capital and “The Orphans” and 6% for Blyvoor Gold Operations for project management fees as per the DMR Guideline document.	The costs required to manage the closure and rehabilitation phase as well as provision for personnel to monitor and maintain the rehabilitated areas after closure has been accounted for.
The FP estimate includes VAT.	VAT does not have to be calculated separately.
Digby Wells : ▪ Calculated the FP estimate for the LoM of the Project. ▪ Included the maintenance and aftercare costs of surface rehabilitated areas for 2-3 years.	Potential adequate budget for rehabilitation of current and future planned disturbed area
Limitations	
No due diligence was undertaken to determine Blyvoor Gold’s extent of responsibility.	Areas outside of those specified in this FP report may influence the accuracy of the calculated FP estimate, should additional areas be found to be the responsibility of Blyvoor Gold.

Description	Consequence
At the time that this assessment was conducted, there was limited information on the ownership of the perimeter fences within the MR area.	The previous financial provision done in 2016 allowed for 3483 m of fences. Digby Wells divided this liability equally amongst the three entities under the Blyvoor Gold MR area.
Limited information was available on the water monitoring points on site.	Digby Wells did not include any water monitoring costs
Limited information was available on the ventilation shafts of the remaining active vertical shafts within the MR area.	Digby Wells allowed for sealing of two ventilation shafts per active vertical shaft that is left on the MR area.
Limited information was available on the extent to which all the WRDs have been reclaimed.	Digby Wells allowed for rehabilitation of 50% of the footprint area and 50% of the WRDs.

11.3 Financial Provision Estimate

The estimated overall FP required for the rehabilitation and closure of all three categories of rehabilitation provisioning is **R 366 295 665** (Excl. VAT). A summary of the FP estimate is presented in Table 11-8 below. A detailed cost model for each entity of the Project is provided in Table 11-9 to Table 11-11

Table 11-8: Summary of the overall financial provision for the three entities of Blyvoor Gold

	Digby Wells Environmental
	Blyvoor Gold (Pty) Ltd, Blyvoor Gold Mine – MR143GP, BVG4880 **Revision 1**
Description	**DMR Financial Provision Assessment**
Blyvoor Gold Capital	R 45 683 585
Blyvoor Gold Operations	R 221 378 324
“The Orphans”	R 109 233 756
GRAND TOTAL	**R 366 295 665**

Table 11-9: Blyvoor Gold Capital - Detailed financial provision estimate (underground operations)

	DIGBY WELLS ENVIRONMENTAL **Description:** **Class A (High risk)**	**Unit:**	**A** **Quantity**	**B** **Master rate**	**C** **Multiplication Factor**	**D** **Weighting factor 1**	**E=A*B*C*D** **Amount (Rands)**
Component			**Step 4.5**	**Step 4.3**	**Step 4.3**	**Step 4.4**	
1	Dismantling of No. 5 Shaft metallurgical treatment plant and related structures (incl. overland conveyors and Power lines)	m3	7 944	R 14.50	1.00	1.00	R 115 169
2 (A)	Demolition of steel buildings and Structures	m2	2 518	R 201.95	1.00	1.00	R 508 526
2 (B)	Demolition of reinforced concrete buildings and structures	m2	55 070	R 297.61	1.00	1.00	R 16 389 489
3	Rehabilitation of access roads	m2	-	R 36.14	1.00	1.00	R 0
4(A)	Demolition and rehabilitation of electrified railway lines	m	-	R 350.76	1.00	1.00	R 0
4(B)	Demolition and rehabilitation of non-electrified railway lines	m	-	R 191.32	1.00	1.00	R 0
5	Demolition of housing and/or administration facilities	m2	24 980	R 403.90	1.00	1.00	R 10 089 461
6	Opencast rehabilitation including final voids and ramps	ha	-	R 205 564.55	1.00	1.00	R 0
7	Sealing of shafts, adits and inclines	m3	115	R 108.42	1.00	1.00	R 12 428
8(A)	Rehabilitation of overburden and spoils	ha	-	R 141 152.91	1.00	1.00	R 0
8(B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt producing waste)	ha	-	R 175 803.39	1.00	1.00	R 0
8(C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	ha	-	R 510 616.38	1.00	1.00	R 0
9	Rehabilitation of subsided areas	ha	-	R 118 194.30	1.00	1.00	R 0
10	General surface rehabilitation	ha	32	R 111 816.91	1.00	1.00	R 3 622 825
11	River diversions	ha	0	R 111 816.91	1.00	1.00	R 0
12	Fencing	m	1161	R 127.55	1.00	1.00	R 148 083
13	Water management	ha	0	R 42 515.94	1.00	1.00	R 0
14	2 to 3 years of maintenance and aftercare	ha	8	R 14 880.58	1.00	1.00	R 124 836
15(A)	Specialist studies	m					
							R 31 010 817
	Weighting Factor 2 (step 4.4)			1,05		Sub Total 1	R 32 561 358
	Preliminary and General			12% of Sub Total 1			R3 907 362.96
	Contingency			10% of Sub Total 1			R3 256 135.80
						Sub Total 2	R 39 724 857
	VAT (15%)						R5 958 728.51
	GRAND TOTAL						**R 45 683 585**

Table 11-10: Blyvoor Gold Operations - Detailed financial provision estimate (surface operations)

	Description: Class A (High risk)	Unit:	A Quantity	B Master rate	C Multiplication Factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
Component			**Step 4.5**	**Step 4.3**	**Step 4.3**	**Step 4.4**	
1	Dismantling of Tailings retreatment plant and related structures (incl. overland conveyors and Power lines)	m3	102 040.8	R 14.50	1.00	1.00	R 1 479 381
2 (A)	Demolition of steel buildings and Structures	m2	-	R 201.95	1.00	1.00	R 0
2 (B)	Demolition of reinforced concrete buildings and structures	m2	-	R 297.61	1.00	1.00	R 0
3	Rehabilitation of access roads	m2	18 907.0	R 36.14	1.00	1.00	R 683 271
4(A)	Demolition and rehabilitation of electrified railway lines	m	-	R 350.76	1.00	1.00	R 0
4(B)	Demolition and rehabilitation of non-electrified railway lines	m	-	R 191.32	1.00	1.00	R 0
5	Demolition of housing and/or administration facilities	m2	-	R 403.90	1.00	1.00	R 0
6	Opencast rehabilitation including final voids and ramps	ha	-	R 205 564.55	1.00	1.00	R 0
7	Sealing of shafts, adits and inclines	m3	-	R 108.42	1.00	1.00	R 0
8(A)	Rehabilitation of overburden and spoils	ha	-	R 141 152.91	1.00	1.00	R 0
8(B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt producing waste)	ha	359.1	R 175 803.39	1.00	1.00	R 63 129 240
8(C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	ha	-	R 510 616.38	1.00	1.00	R 0
9	Rehabilitation of subsided areas	ha	-	R 118 194.30	1.00	1.00	0
10	General surface rehabilitation	ha	579.6	R 111 816.91	1.00	1.00	R 64 805 132
11	River diversions	ha	-	R 111 816.91	1.00	1.00	R 0
12	Fencing	m	1 161.0	R 127.55	1.00	1.00	R 148 083
13	Water management	ha	359.1	R 42 515.94	1.00	1.00	R 15 267 047
14	2 to 3 years of maintenance and aftercare	ha	362.7	R 14 880.58	1.00	1.00	R 5 396 908
15	Specialist studies						
							R 150 909 063
	Weighting Factor 2 (step 4.4)			**1,05**		**Sub Total 1**	**R 158 454 516**
	Preliminary and General			6% of Sub Total 1			R9 507 270.94
	Contingency			10% of Sub Total 1			R15 845 451.57
						Sub Total 2	**R 183 807 238**
	VAT (15%)						**R27 571 085.73**
	GRAND TOTAL						**R 221 378 324**

Table 11-11: “The Orphans” Detailed financial provision estimate

	Description: Class A (High risk)	Unit:	A Quantity	B Master rate	C Multiplication Factor	D Weighting factor 1	E=A*B*C*D Amount (Rands)
Component			**Step 4.5**	**Step 4.3**	**Step 4.3**	**Step 4.4**	
1	Dismantling of processing plant and related structures (incl. overland conveyors and Power lines)	m3	-	R 14.50	1.00	1.00	R 0
2 (A)	Demolition of steel buildings and Structures	m2	3 058.0	R 201.95	1.00	1.00	R 617 565
2 (B)	Demolition of reinforced concrete buildings and structures	m2	64 801.7	R 297.61	1.00	1.00	R 19 285 734
3	Rehabilitation of access roads	m2	-	R 36.14	1.00	1.00	R 0
4(A)	Demolition and rehabilitation of electrified railway lines	m	-	R 350.76	1.00	1.00	R 0
4(B)	Demolition and rehabilitation of non-electrified railway lines	m	-	R 191.32	1.00	1.00	R 0
5	Demolition of housing and/or administration facilities	m2	25 144.1	R 403.90	1.00	1.00	R 10 155 737
6	Opencast rehabilitation including final voids and ramps	ha	-	R 205 564.55	1.00	1.00	R 0
7	Sealing of shafts, adits and inclines	m3	205.7	R 108.42	1.00	1.00	R 22 300
8(A)	Rehabilitation of overburden and spoils	ha	-	R 141 152.91	1.00	1.00	R 0
8(B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt producing waste)	ha	77.2	R 175 803.39	1.00	1.00	R 13 567 486
8(C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	ha	-	R 510 616.38	1.00	1.00	R 0
9	Rehabilitation of subsided areas	ha	-	R 118 194.30	1.00	1.00	0
10	General surface rehabilitation	ha	230.6	R 111 816.91	1.00	1.00	R 25 784 955
11	River diversions	ha	-	R 111 816.91	1.00	1.00	R 0
12	Fencing	m	1 161.0	R 127.55	1.00	1.00	R 148 083
13	Water management	ha	77.2	R 42 515.94	1.00	1.00	R 3 281 133
14	2 to 3 years of maintenance and aftercare	ha	86.5	R 14 880.58	1.00	1.00	R 1 286 792
15	Specialist studies	m			1.00	1.00	
							R 74 149 785
	Weighting Factor 2 (step 4.4)			1,05		Sub Total 1	**R 77 857 274**
	Preliminary and General			12% of Sub Total 1			R9 342 857.91
	Contingency			10% of Sub Total 1			R7 785 727.42
						Sub Total 2	**R 94 985 875**
	VAT (15%)						**R 14 247 881**
	GRAND TOTAL						**R 109 233 756**

12 Monitoring, Auditing and Reporting

The monitoring measures for the post-closure phase at the Blyvoor Gold Mine are provided in Table 12-1 and primarily consist of environmental monitoring. Monitoring provides information on whether rehabilitation methods employed are functioning correctly or not. Monitoring should provide an early indication of problems arising so that corrective management actions can be taken.

The post closure monitoring period will begin once scheduled decommissioning and rehabilitation activities for the site have been completed. The duration of post closure monitoring will be determined based on environmental performance and until it can be demonstrated that the rehabilitation work has achieved the agreed objectives. At present, it has been assumed that post closure monitoring will not continue for more than 5 years. It is important that the data obtained during monitoring is used to gauge the success of rehabilitation. Negative monitoring findings should be clearly linked to specific corrective actions.

The purpose of monitoring is to ensure that the objectives of rehabilitation are met and that the rehabilitation process is followed. The physical aspects of rehabilitation should be carefully monitored during the operational phase as well as during the progress of establishment of the desired final land use.

Table 12-2 sets out the proposed monitoring plan and audit requirements for Blyvoor Gold Mine.

Table 12-1: Post Closure Monitoring Programme

Component / Aspect	Monitoring		Performance / success criteria	Corrective action
	Methodology	Frequency / duration		
Soil Management				
Soil fertility	▪ Undertake a visual assessment and delineate areas where poor vegetation growth has occurred; ▪ Submit soil samples to an accredit soils laboratory to conduct soil fertility analysis.	As and where required until soil fertility supports the final land use or for at least 3 years post-closure	▪ Soil analysis results comply with remediation targets at a 95 percentile level; and ▪ Self-sustaining vegetation establishment.	▪ Apply amelioration where required as informed by sampling undertaken.
Erosion	▪ Conduct a visual assessment to determine areas of potential erosion; and ▪ Undertake field investigations, fixed point photography to document the significance of the erosion occurring on site	Twice yearly for at least 3 years post-closure.	▪ No evidence of significant erosion; and ▪ Good vegetation cover and species composition.	As required: ▪ Re-shape areas to ensure that they are free-draining; ▪ Establish vegetation on bare patches; and ▪ Repair and stabilisation of erosion gullies and sheet erosion.
Post-mining end land use	▪ Assess activities completed, as well as legal and related documentation completed and signed-off; and ▪ Ensure rehabilitation measures are aligned to the end land use.	Continuously during decommission and closure phase.	▪ Area has been rehabilitated to an aesthetic quality not to compromise potential tourism; ▪ Transfer to third party operator has taken place once the area has been proven to be safe for redevelopment; ▪ Legal and zoning issues have been addressed; and ▪ Vegetation re-establishment, cover and composition are sustainable.	▪ Refer back to end land use approach and refine measures to be implemented in achieving the desired final land use.
Topography	▪ Conduct a visual assessment to determine areas of potential erosion; and ▪ Undertake regular digital surveys of rehabilitated areas to confirm that final topography is aligned with landform designs.	During rehabilitation phase	▪ No evidence of significant erosion. ▪ No evidence of water pooling on rehabilitated areas. ▪ The final profile achieved should be acceptable in terms of surface water drainage requirements and the end land use objectives.	As required: ▪ Re-shape areas to ensure that they are free-draining; and ▪ Refer back to end land use approach and refine measures to be implemented in achieving the desired final land use.
Vegetation establishment	▪ Determine whether re-established vegetation communities are on a trajectory of achieving a stable self-sustaining community dominated by species typical of the climax-species present in the adjacent areas: ▪ Inspect rehabilitated areas to assess vegetation establishment and provide for early detection of erosion in recently	Quarterly for at least 3 years post-closure.	▪ Limited to no erosion; and ▪ Self-sustaining vegetation ecosystem.	As required: ▪ Re-vegetate poorly established rehabilitated areas; ▪ Re-seed bare patches; and ▪ Apply additional fertiliser and/or organic matter, depending on the condition of the vegetation and the initial organic material application.

Component / Aspect	Monitoring		Performance / success criteria	Corrective action
	Methodology	Frequency / duration		
	planted/seeded areas (monthly); ▪ Undertake fixed point photography at specific points at the rehabilitated sites to obtain a long term directly comparable method of determining changes in the landscape; and ▪ Conduct evaluation of rehabilitated areas by means of field inspections. During these assessments measurement of growth performance and species abundance will be carried out to determine: i. Plant basal cover and species abundance in the grassed areas. Estimates of vegetation canopy and ground cover as well as height; ii. Distribution, growth and survival of woody species; iii. Dominant plant species (woody and herbaceous); iv. Presence of exotic invasive species, and degree of encroachment; v. Browsing or grazing intensity; vi. Notes regarding erosion, such as, type, severity, degree of sediment build-up; and vii. Species composition and richness.			
Invasive alien species	▪ Visually inspect areas where invasive species have been previously eradicated and areas prone to invasive species (e.g. eroded/degraded areas, along drainage lines, etc.); and ▪ Undertake surveys on relevant sites where bush encroachment has previously been identified to determine the status quo of invasive vegetation.	Yearly for at least 3 years post-closure.	▪ Limit and/or prevent declared Category 1, 2 and 3 invader species establishing; ▪ Minimise extended threat to ecosystems, habitats or other species; ▪ Increase the potential for natural systems to deliver goods and services; and ▪ Minimise economic or environmental harm or harm to human health.	▪ Revisit mitigation measures; and ▪ Continue control and management.
General site status	▪ Conduct a visual assessment with respect to compliance of the afore-mentioned closure measures and to ensure that the site is aesthetically neat and tidy, and that no health or safety risks exist on site.	Once-off following implementation of rehabilitation measures.	▪ Waste/rubble free sites.	As required: ▪ Clear remnant rubble and dispose of in open pit as backfill material.

Component / Aspect	Monitoring		Performance / success criteria	Corrective action
	Methodology	Frequency / duration		
Surface Water Quantity	▪ Visually assess the functionality of the surface water drainage systems feeding surface water runoff from rehabilitated areas. ▪ Undertake field investigations, fixed point photography to document the significance of the erosion occurring on site.	After the first major rains of the season and after any major storm.	▪ No evidence of significant erosion; and ▪ No evidence of water pooling on rehabilitated areas.	As required: ▪ Re-shape areas to ensure that they are free-draining; and ▪ Refer back to end land use approach and refine measures to be implemented in achieving the desired final land use.
Surface Water and Groundwater Quality	▪ Sample and monitor surface and groundwater quality.	Quarterly for at least 5 years post-closure.	▪ Water quality results within ranges of the WUL and/or DWS standards.	As required: ▪ Increase monitoring frequency and detect point sources. ▪ Optimise monitoring plan if needed.

Table 12-2: Monitoring Plan and Audit Requirements

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	Type of Requirement (Monitoring, Auditing and/or Reporting)
Flora	Establishment of alien plant species	Alien plant monitoring	Qualified botanist	Quarterly monitoring for 3 years	Monitoring
Dust	TSFs	Dust monitoring using the ASTM Method. Monitoring must meet the South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013).	A designated air quality officer to collect data/analyse and reporting to regulatory authorities on compliance.	Monthly at existing locations where baseline dust deposition data were collected	Monitoring
		Continuous PM_{10} monitoring. Monitoring must meet the South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013).	A designated air quality officer to collect data/analyse and reporting to regulatory authorities on compliance.	At a sensitive receptor location (i.e. neighbouring farmer, etc.)	Monitoring

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	Type of Requirement (Monitoring, Auditing and/or Reporting)
Groundwater & Surface water	Groundwater and surface water quality	▪ Macro Analysis i.e. Ca, Mg, Na, K, SO_4, NO_3, F, Cl; ▪ Initial full suite metals and then Al, Fe, Mn and other metals identified according to results of the initial analyses; ▪ pH and Alkalinity; and TDS and EC. ▪ Total Coliforms, E.coli, F coli and Heterotrophic plate count	Samples should be collected by an independent water consultant, using best practice guidelines and should be analysed by a SANAS accredited laboratory.	It is suggested that quarterly samples be collected, extending to at least 5 years post closure. Post closure monitoring should continue until a sustainable situation is reached and after it has been signed off by the authorities.	Monitoring and Reporting

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	Type of Requirement (Monitoring, Auditing and/or Reporting)
	Groundwater levels	Groundwater levels must be recorded using an electrical contact tape or pressure transducer, to detect any changes or trends in groundwater elevation and flow direction.	Samples should be collected by an independent groundwater consultant, using best practice guidelines and should be analysed by a SANAS accredited laboratory.	It is suggested that quarterly samples be collected, extending to at least 2 years post closure. Post closure monitoring should continue until a sustainable situation is reached and after it has been signed off by the authorities.	Monitoring and Reporting
Soils	Erosion, loss of soil fertility, compaction	The rehabilitated area must be assessed for compaction, fertility and erosion.	The soils must be assessed by a soil specialist yearly (during the dry season so that recommendations can be implemented before the start of the wet season) so as to correct any nutrient deficiencies.	The rehabilitated area must be assessed once a year for compaction, fertility, and erosion during the dry season.	Monitoring

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	Type of Requirement (Monitoring, Auditing and/or Reporting)
Audit Reports	EMP/ RCP Conditions	Auditing against the conditions outlined within the approved EMP and EA (EMP Performance Assessment) or RCP at time of mine closure. To determine compliance to EMP or RCP conditions.	Environmental Officer/Independent Third Party.	Every two years Performance Assessment	Audit Report
	Financial Provision Update.	To ensure that the mine is compliant with the financial provision regulations and that there is sufficient funding provided by the mine for closure and rehabilitation cost and meets the requirements as stipulated in Regulation 11 of the Financial Provision Regulations.	Environmental Officer/Independent Third Party	Annually and must be audited by an independent auditor.	Financial Provision Report submitted to the DMR

13 Closing Statement

Rehabilitation and closure objectives have been tailored to the project at hand with the objective of assisting Blyvoor Gold in carrying out successful rehabilitation.

The overall closure objective for Blyvoor Gold is to leave behind a rehabilitated mining area that is safe, stable and non-polluting, aligned to the Merafong City Magisterial District spatial development framework, as well as current agricultural, tourism and other economic initiatives of the region, towards leaving behind a positive post mining legacy

The estimated overall financial provision required for the rehabilitation and closure of all three entities of Blyvoor Gold is **R 366 295 665** (Excl. VAT).

The following is recommended to assist Blyvoor Gold in successfully carrying out the rehabilitation and closure at the Blyvoor Gold Mine:

- Regular water monitoring must take place to determine possible changes in water quality of nearby natural sources;
- Concurrent rehabilitation must take place where possible;
- Invasive alien plants must be removed on an ongoing basis; and
- Monitoring and maintenance of the rehabilitated areas must take place on an annual basis for at least 5 years post-closure.

14 References

Bromilow, C. (2010) *Problem Plants of South Africa*. Briza Publications, Pretoria.

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Golder Associates(February 2017) *EMP Update for Tailings Reclaimation & Underground Mining at Blyvooruitzicht Gold Mine,* Report Number 1656096-307570-3, Menlyn, South Africa.

Appendix A: Financial Provision

Component	Description	Capital Total Cost	Operations Total Cost	Orphans Total Cost	Overall Total Cost
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	R 115 169	R 1 479 381	R 0	R 1 594 549
2 (A)	Demolition of steel buildings & Structures	R 508 526	R 0	R 617 565	R 1 126 091
2 (B)	Demolition of reinforced concrete buildings & structures	R 16 389 489	R 0	R 19 285 734	R 35 675 223
3	Rehabilitation of access roads	R 0	R 683 271	R 0	R 683 271
4(A)	Demolition & rehabilitation of electrified railway lines	R 0	R 0	R 0	R 0
4(B)	Demolition & rehabilitation of non-electrified railway lines	R 0	R 0	R 0	R 0
5	Demolition of housing &/or administration facilities	R 10 089 461	R 0	R 10 155 737	R 20 245 197
6	Open pit rehabilitation including final voids & ramps	R 0	R 0	R 0	R 0
7	Sealing of shafts, adits & inclines	R 12 428	R 0	R 22 300	R 34 728
8(A)	Rehabilitation of overburden & spoils	R 0	R 0	R 0	R 0
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	R 0	R 63 129 240	R 13 567 486	R 76 696 726
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	R 0	R 0	R 0	R 0
9	Rehabilitation of subsided areas	R 0	R 0	R 0	R 0
10	General surface rehabilitation	R 3 622 825	R 64 805 132	R 25 784 955	R 94 212 912
11	River diversions	R 0	R 0	R 0	R 0
12	Fencing	R 148 083	R 148 083	R 148 083	R 444 249
13	Water management	R 0	R 15 267 047	R 3 281 133	R 18 548 181
14	2 to 3 years of maintenance & aftercare	R 124 836	R 5 396 908	R 1 286 792	R 6 808 536
15(A)	Specialist studies	R 0	R 0	R 0	R 0
		R 31 010 817	R 150 909 063	R 74 149 785	R 256 069 665
	Total cost + Weighting Factor 2 (Subtotal 1)	R 32 561 358	R 158 454 516	R 77 857 274	**R 268 873 148**
	Preliminary and General (6% and 12%)	R 3 907 363	R 9 507 271	R 9 342 873	R 22 757 507
	Contingency (10%)	R 3 256 136	R 15 845 452	R 7 785 727	R 26 887 315
	Subtotal 2	R 39 724 857	R 183 807 238	R 94 985 875	R 318 517 970
	VAT (15%)	R 5 958 729	R 27 571 086	R 14 247 881	R 47 777 695
	Grand Total (Incl. VAT)	R 45 683 585	R 211 378 324	R 109 233 756	**R 366 295 665**

	Digby Wells Environmental
	Blyvoor Gold (Pty) Ltd, Blyvoor Gold Mine – MR143GP, BVG4880
	Revision 0
Description	**DMR Financial Provision Assessment**
Blyvoor Gold Capital	R 45 683 585
Blyvoor Gold Operations	R 211 378 324
"The Orphans"	R 109 233 756
GRAND TOTAL	**R 366 295 665**

Digby Wells Environmental

Blyvoor Gold (Pty) Ltd, Blyvoor Gold Mine, BVG4880

DMR Financial Provision Assessment, 2018, Rev 0

Calculation of the Quantam, Capital, 2018

Class A (High Risk)		Unit:	A	B	C	D	E=A*B*C*D
Component	Description:		Quantity	Master rate	Multiplication factor	Weighting factor 1	Amount (Rands)
			Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	m^3	7943.8	R 14.50	1.00	1.00	R 115 169
2 (A)	Demolition of steel buildings & Structures	m^2	2518.1	R 201.95	1.00	1.00	R 508 526
2 (B)	Demolition of reinforced concrete buildings & structures	m^2	55070.1	R 297.61	1.00	1.00	R 16 389 489
3	Rehabilitation of access roads	m^2	0.0	R 36.14	1.00	1.00	R 0
4(A)	Demolition & rehabilitation of electrified railway lines	m	0.0	R 350.76	1.00	1.00	R 0
4(B)	Demolition & rehabilitation of non-electrified railway lines	m	0.0	R 191.32	1.00	1.00	R 0
5	Demolition of housing &/or administration facilities	m^2	24980.0	R 403.90	1.00	1.00	R 10 089 461
6	Opencast rehabilitation including final voids & ramps	ha	0.0	R 205 564.55	**1.00**	1.00	R 0
7	Sealing of shafts, adits & inclines	m^3	114.6	R 108.42	1.00	1.00	R 12 428
8(A)	Rehabilitation of overburden & spoils	ha	0.0	R 141 152.91	1.00	1.00	R 0
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	0.0	R 175 803.39	1.00	1.00	R 0
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	0.0	R 510 616.38	**1.00**	1.00	R 0
9	Rehabilitation of subsided areas	ha	0.0	R 118 194.30	1.00	1.00	0
10	General surface rehabilitation	ha	32.4	R 111 816.91	1.00	1.00	R 3 622 825
11	River diversions	ha	0.0	R 111 816.91	1.00	1.00	R 0
12	Fencing	m	1161.0	R 127.55	1.00	1.00	R 148 083
13	Water management	ha	0.0	R 42 515.94	**1.00**	1.00	R 0
14	2 to 3 years of maintenance & aftercare	ha	8.4	R 14 880.58	1.00	1.00	R 124 836
15(A)	Specialist studies						
							R 31 010 817
Weighting Factor 2 (step 4.4)			**1.05**		**Sub Total 1**		**R 32 561 358**
				Preliminary and General	12% of Sub Total 1		R3 907 362.96
				Contingency	10% of Sub Total 1		R3 256 135.80
					Sub Total 2		**R 39 724 857**
					VAT (15%)		**R5 958 728.51**
					GRAND TOTAL		**R 45 683 585**

Digby Wells Environmental

Blyvoor Gold (Pty) Ltd, Blyvoor Gold Mine, BVG4880

DMR Financial Provision Assessment, 2018, Rev 0

Calculation of the Quantam, Operations, 2018

Class A (High Risk)		Unit:	A	B	C	D	E=A*B*C*D
Component	Description:		Quantity	Master rate	Multiplication factor	Weighting factor 1	Amount (Rands)
			Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	m^3	102 040.8	R 14.50	1.00	1.00	R 1 479 381
2 (A)	Demolition of steel buildings & Structures	m^2	-	R 201.95	1.00	1.00	R 0
2 (B)	Demolition of reinforced concrete buildings & structures	m^2	-	R 297.61	1.00	1.00	R 0
3	Rehabilitation of access roads	m^2	18 907.0	R 36.14	1.00	1.00	R 683 271
4(A)	Demolition & rehabilitation of electrified railway lines	m	-	R 350.76	1.00	1.00	R 0
4(B)	Demolition & rehabilitation of non-electrified railway lines	m	-	R 191.32	1.00	1.00	R 0
5	Demolition of housing &/or administration facilities	m^2	-	R 403.90	1.00	1.00	R 0
6	Opencast rehabilitation including final voids & ramps	ha	-	R 205 564.55	**1.00**	1.00	R 0
7	Sealing of shafts, adits & inclines	m^3	-	R 108.42	1.00	1.00	R 0
8(A)	Rehabilitation of overburden & spoils	ha	-	R 141 152.91	1.00	1.00	R 0
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	359.1	R 175 803.39	1.00	1.00	R 63 129 240
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	-	R 510 616.38	**1.00**	1.00	R 0
9	Rehabilitation of subsided areas	ha	-	R 118 194.30	1.00	1.00	0
10	General surface rehabilitation	ha	579.6	R 111 816.91	1.00	1.00	R 64 805 132
11	River diversions	ha	-	R 111 816.91	1.00	1.00	R 0
12	Fencing	m	1 161.0	R 127.55	1.00	1.00	R 148 083
13	Water management	ha	359.1	R 42 515.94	**1.00**	1.00	R 15 267 047
14	2 to 3 years of maintenance & aftercare	ha	362.7	R 14 880.58	1.00	1.00	R 5 396 908
15(A)	Specialist studies						
							R 150 909 063
	Weighting Factor 2 (step 4.4)		**1.05**		**Sub Total 1**		**R 158 454 516**
				Preliminary and General	6% of Sub Total 1		R9 507 270.94
				Contingency	10% of Sub Total 1		R15 845 451.57
					Sub Total 2		**R 183 807 238**
					VAT (15%)		**R27 571 085.73**
					GRAND TOTAL		**R 211 378 324**

Digby Wells Environmental

Blyvoor Gold (Pty) Ltd, Blyvoor Gold Mine, BVG4880

DMR Financial Provision Assessment, 2018, Rev 0

Calculation of the Quantam, The Orphans, 2018

Class A (High Risk)		Unit:	A	B	C	D	E=A*B*C*D
Component	Description:		Quantity	Master rate	Multiplication factor	Weighting factor 1	Amount (Rands)
			Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	m^3	-	R 14.50	1.00	1.00	R 0
2 (A)	Demolition of steel buildings & Structures	m^2	3 058.0	R 201.95	1.00	1.00	R 617 565
2 (B)	Demolition of reinforced concrete buildings & structures	m^2	64 801.7	R 297.61	1.00	1.00	R 19 285 734
3	Rehabilitation of access roads	m^2	-	R 36.14	1.00	1.00	R 0
4(A)	Demolition & rehabilitation of electrified railway lines	m	-	R 350.76	1.00	1.00	R 0
4(B)	Demolition & rehabilitation of non-electrified railway lines	m	-	R 191.32	1.00	1.00	R 0
5	Demolition of housing &/or administration facilities	m^2	25 144.1	R 403.90	1.00	1.00	R 10 155 737
6	Opencast rehabilitation including final voids & ramps	ha	-	R 205 564.55	**1.00**	1.00	R 0
7	Sealing of shafts, adits & inclines	m^3	205.7	R 108.42	1.00	1.00	R 22 300
8(A)	Rehabilitation of overburden & spoils	ha	-	R 141 152.91	1.00	1.00	R 0
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	77.2	R 175 803.39	1.00	1.00	R 13 567 486
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	-	R 510 616.38	**1.00**	1.00	R 0
9	Rehabilitation of subsided areas	ha	-	R 118 194.30	1.00	1.00	0
10	General surface rehabilitation	ha	230.6	R 111 816.91	1.00	1.00	R 25 784 955
11	River diversions	ha	-	R 111 816.91	1.00	1.00	R 0
12	Fencing	m	1 161.0	R 127.55	1.00	1.00	R 148 083
13	Water management	ha	77.2	R 42 515.94	**1.00**	1.00	R 3 281 133
14	2 to 3 years of maintenance & aftercare	ha	86.5	R 14 880.58	1.00	1.00	R 1 286 792
15(A)	Specialist studies						
							R 74 149 785
	Weighting Factor 2 (step 4.4)		**1.05**		**Sub Total 1**		**R 77 857 274**
				Preliminary and General	12% of Sub Total 1		R9 342 872.91
				Contingency	10% of Sub Total 1		R7 785 727.42
					Sub Total 2		**R 94 985 875**
					VAT (15%)		**R 14 247 881**
					GRAND TOTAL		**R 109 233 756**