Revised Final Rehabilitation, decommissioning and mine closure plan
Including Environmental Risk Assesment
Review February 2017

Rondawel Koalien CC
5Ha portion of Portion 1 Farm Rondawel 638 Namaqualand District
Reference NC30/5/1/3/2/10423MP

Contends

1 Introduction 2
1.1 Background 2
1.2 Issues that have guided the development of the plan 2
1.3 Context of the Rondawel Mining operation 3
1.3.1 Mining Permit 3
1.3.2 Project Description 3
1.3.3 Mine design map 4
1.3.4 Project layout 8
2 Regulatory Requirements 9
2.1 Legal requirements 9
2.2 Environmental Authorisation (EMP) requirements 10
3 Final Decommissioning and Closure of Mining Operation 10
3.1 Infrastructure and Logistics area 11
3.1.1 Basic rehabilitation methodology 11
3.1.2 Risk sources 11
3.2 Burrow Pit and waste dumps 11
3.2.1 Basic rehabilitation methodology 11
3.2.2 Risk sources 12
4 Risk Identification 12
4.1 Risks with regard to creating a Safe mining area 12
4.2 Risk of residual environmental impact 12
4.3 Risks with regard to changes in land use 13
4.4 Risks with regard to benefits for the social environment 13
4.5 Risks with regard to aesthetic impact 14
5 Aftercare and Maintenance 14
6 Risk Assessment 14
6.1 Risk impact rating 14
6.1.1 Evaluating the probability 15
6.1.2 Evaluating the severity 15
6.1.3 Evaluating the frequency 15
6.1.4 Evaluating the duration 15
6.2 Risk Mitigation and Closure objectives 16
6.2.1 Creating a Safe Post-mining environment with no residual environmental impact 17
6.2.2 Create a stable, free draining post mining landform, ... 20
6.2.3 Provide optimal post-mining social opportunities 22
7 Estimated cost for requirements to fully decommission the site 24
7.1 Assesment of financial provision 24
7.2 Quantified Closure elements 24
7.3 Calculation of Closure cost 25
7.4 Total estimated cost for requirements to fully decommissioned the mining site at final closure 27
8 The Public Participation Process 29
8.1 Principles and Objectives 29
8.2 Stakeholder Identification and Project Data Base 29
9 Way Forward 30

1 INTRODUCTION

1.1 Background

This final rehabilitation, decommissioning and mine closure plan was submitted in terms of regulations 53 and 54 relating to financial provision in the Mineral and Petroleum Resources Development Regulations, 2004 and approved as part of the Environmental Management Plan (EMP) submitted for the Rondawel Quarry operation of Rondawel Kaolien CC (Registration 2002/016403/23) under File Reference: NC30/5/1/3/2/10423MP. In terms of section 38B of the MPRDA, 2008 (Act 49 of 2008) the EMP is now deemed to have been approved, and an environmental authorisation been issued in terms of the National Environmental Management Act, 1998 (NEMA). In terms of the transitional arrangements of the Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations (NEMA Financial Regulation) that took effect on 20 November 2015 any actions undertaken in terms of regulations 53 and 54 relating to financial provision in the MPRDA Regulations, 2004 which can be undertaken in terms of a provision of the NEMA Financial Regulations must be regarded as having been undertaken in terms of the provision of these Regulations (Reg 17(1)). A financial provision approved in terms of the MPRDA Regulations, 2004 must also be regarded to be the financial provision approved in terms of the NEMA Financial Regulations (Reg 17(4)).

One of the conditions in terms of Regulation 17 (4) is that a holder that operates in terms of a financial provision approved in terms of the MPRDA at the time of the coming into operation of the NEMA Financial Regulations, must review and align such approved financial provision with the provisions of the NEMA Financial Regulations on an annual basis as set out in regulations 9 and 11, read with the necessary changes.

This document then serves to comply with regulation 11(1) of the NEMA Financial Regulations that states that the holder of a right or permit must ensure that a review is undertaken of the requirements for final rehabilitation, decommissioning and closure of the operations at the end of the life of operations as reflected in a final rehabilitation, decommissioning and mine closure plan; and remediation of latent or residual environmental impacts which may become known in the future, as reflected in an environmental risk assessment report.

The objectives of this final rehabilitation, decommissioning and mine closure plan is to to identify a post-mining land use that is feasible through-

- providing the vision (goals), objectives, targets and criteria for final rehabilitation, decommissioning and closure of the project;
- outlining the design principles for closure;
- explaining the risk assessment approach and outcomes and link closure activities to risk rehabilitation;
- detailing the closure actions that clearly indicate the measures that will be taken to mitigate and/or manage identified risks and describes the nature of residual risks that will need to be monitored and managed post closure;
- committing to a schedule, budget, roles and responsibilities for final rehabilitation, decommissioning and closure of each relevant activity or item of infrastructure;
- identifying knowledge gaps and how these will be addressed and filled;
- detailing the full closure costs for the life of project at increasing levels of accuracy as the project develops and approaches closure in line with the final land use proposed; and
- outlining monitoring, auditing and reporting requirements.

1.2 Issues that have guided the development of the plan

Three approaches were employed to identify the key aims for the closure process that form part of the approved Final Closure Plan submitted and approved in terms of the MPRDA:

- Technical assessments which involved the recording of the project activities over the full life cycle of the mining operation (including closure) and the consequent potential impacts on the environment (including cumulative impacts). This resulted in the compilation of a draft closure plan that facilitated discussions with the authorities as well as Interested and Affected Parties (I&APs).
- Identification and consultation with the relevant authorities to record their requirements as well as public meetings with I&APs to solicit/record their suggestions/issues/concerns.
- The collection of available/published environmental data, the review thereof for adequacy and hence the identification of the need for more comprehensive environmental studies/investigations and/or further information gathering.

Subsequent to the above activities/processes, advertisements of the mining operation were placed in local newspapers to notify I&AP's about the intended project and invitations to register and participate in the consultation process. As a result of the consultation and recommendations from the environmental studies/investigations completed the company identified three key closure goals for the final decommissioning and closure of the mining operation that are listed below.

- To create a safe and healthy post-mining environment with no residual environmental impact.
- To create a stable, free draining post mining landform, which is compatible with the surrounding landscape and which is capable of a productive land use that achieves a land capability equal to that of pre mining conditions. It must be noted that the pre-mining land use form part of the laydown area of the companies HQ for earth moving operations.
- To provide optimal post-mining social opportunities

Each goal is supported by a suite of key objectives and activities which are elaborated on in section 2 and 3 of this review. This review also describes how these objectives are planned to be met and elaborate on the implementation of certain risk mitigation actions (section 5). With risk assessment and mitigation being integral to the planning and executing of the rehabilitation and closure of the mine. Aftercare and maintenance of rehabilitated sites is often the difference between the ultimate successes or failure of rehabilitation and monitoring of rehabilitation will determine whether rehabilitation objectives and requirements are being achieved (section 3).

1.3 Context of the Rondawel Mining operation

1.3.1 Mining Permit

This final rehabilitation, decommissioning and mine closure plan that include the environmental risk assessment is applicable to the mining permit issued to Rondawel Kaolien CC (Reg. No. 2002/016403/23) with reference NC30/5/1/3/2/10423MP.

The mining area consist of a 5Ha portion of Portion 1 of the farm Rondawel 638 situated in the Namakwa District Municipality and Kamiesberg local authority of the Namaqualand administrative district of the Northern Cape. The farm is registered in the name of Adriaan Allettus Nieuwoudt (Id 4505085037087) one of the members of Rondawel Kaolien CC by virtue of title deed T30303/2003. The area is situated along the secondary road between Garies and Groenrivier 40Km from Garies with an approximate locality Latitude S30.78464° and Longitude E17.79455° (Diagram 1).

1.3.2 Project Description

Mining will be in the form of an opencast mine and Kaolin (clay) are mined from a burrow pit. Processing will be in the form of screening making use of a static screening plant still under review and development as part of an application for a patent right.

The project can be divided in three phases as follow:

- Construction, including the planning and implementation phases, creation of infrastructure, mine or pit footprint, access ramps and haul roads, waste, residue and product stockpiles, handling areas, water reticulation and electrical power.
- Operation, including daily activities, mine development and expansion.
- Decommissioning and Closure, including scaling down of activities ahead of temporary or permanent closure, cessation of mining or production, implementation of rehabilitation programme, monitoring and maintenance for prescribed period after cessation of operations; and closure, including completion of rehabilitation goals, application for closure, transfer of liability to the State and agreed post-closure monitoring or maintenance

a) Construction phase

Due to the small scale of operations no permanent infrastructure will be developed and only existing farm tracks will be used. Upgrading of the existing tracks will be done as part of the construction phase. The infrastructure area (refer section 1.3.4) will only consist mobile containers and temporary logistical facilities including fuel supply and temporary waste storage facilities that form part of farm improvement. The workshop at the adjacent company headquarters will be utilized during this operation.

b) Operational phase

Due to the unconsolidated nature of the ore the burrow pit is mined as a truck-and-shovel operation. The Kaolin is loaded with a 25 ton excavator on haul trucks to be either backfilled (the pit operates a rollover backfill operation) or transport to the product drying area. No ripping and dozing are necessary and no explosives are used.

Mining start with the removal of the top layer of overburden and low grade ore about 50% of the deposit. Due to the presence of an existing mined out trench overburden and low grade product are backfilled immediately and no new overburden stockpiles will be created. A rollover backfill operation will be applied during future mining operations and all existing overburden and topsoil stockpiles will be backfilled as part of annual rehabilitation during the next reporting period.

The ore is transported by haul trucks to the drying area where the ore are spread out to be pulverize by driving over it with a tractor and disk plough.

The ore is then fed by conveyor into the processing plant that pulverises and screen the product to the required particle size, the normal particle size for kaolin is two micrometers. Filler grade is used, among other applications, in the manufacture of paper, paint, adhesives, rubber and pesticides.

Kaolin is inert and non-toxic, which makes it suitable for a range of different applications. In fact, kaolin is used in the making of medicine pills.

The burrow pit will be mined in blocks of ±1Ha with a maximum depth of 5 meter (refer section 1.3.4). As part of the operational phase training of personnel in the implementation of the EMP will be done and the implementation of the environmental awareness plan as part of the EMP will be an ongoing process.

c) Decommissioning phase

The decommissioning phase at the end of the life of the mine will consist of implementing this final rehabilitation, decommissioning and closure plan

1.3.3 Mine design map

The location of the different elements will be discussed in the next sections and the design and quantification of the closure elements will be discussed in section 7.

Diagram 1: Mine layout

MINING AREA:
The figure numbered 1 to 9 represent the new mining area of a 5Ha portion of Portion 1 of the Farm Rondawel No 638
District: Namaqualand

COORDINATES wgs 84:

1	S30.80963° E17.79978°
2	S30.80747° E17.80054°
3	S30.80748° E17.80160°
4	S30.80871° E17.80233°
5	S30.80969° E17.80223°
6	S30.80970° E17.80129°
7	S30.81013° E17.80131°
8	S30.81018° E17.80057°
9	S30.80991° E17.80050°

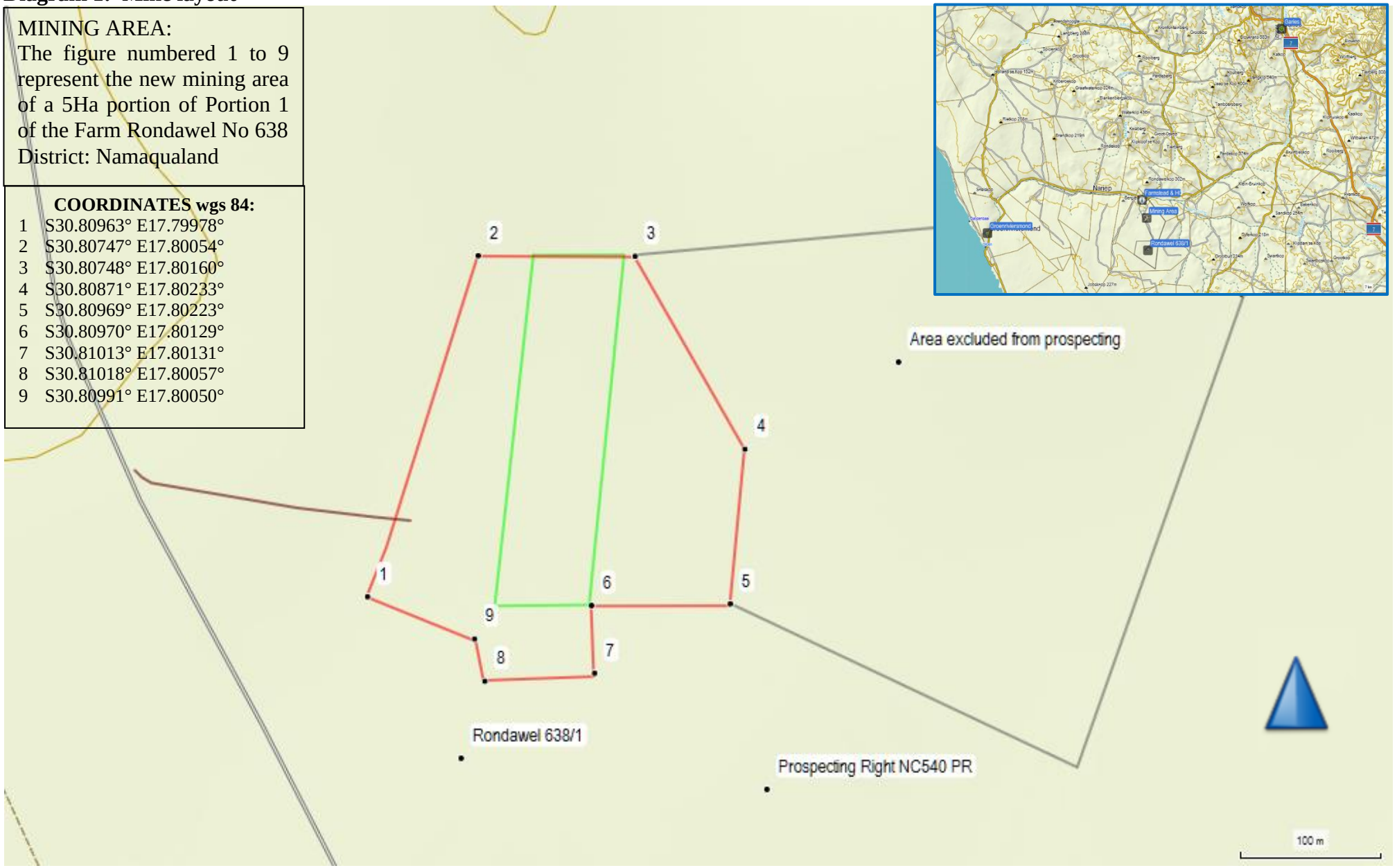


Diagram 2: Mine locality in relation to prospecting operation company HQ and access

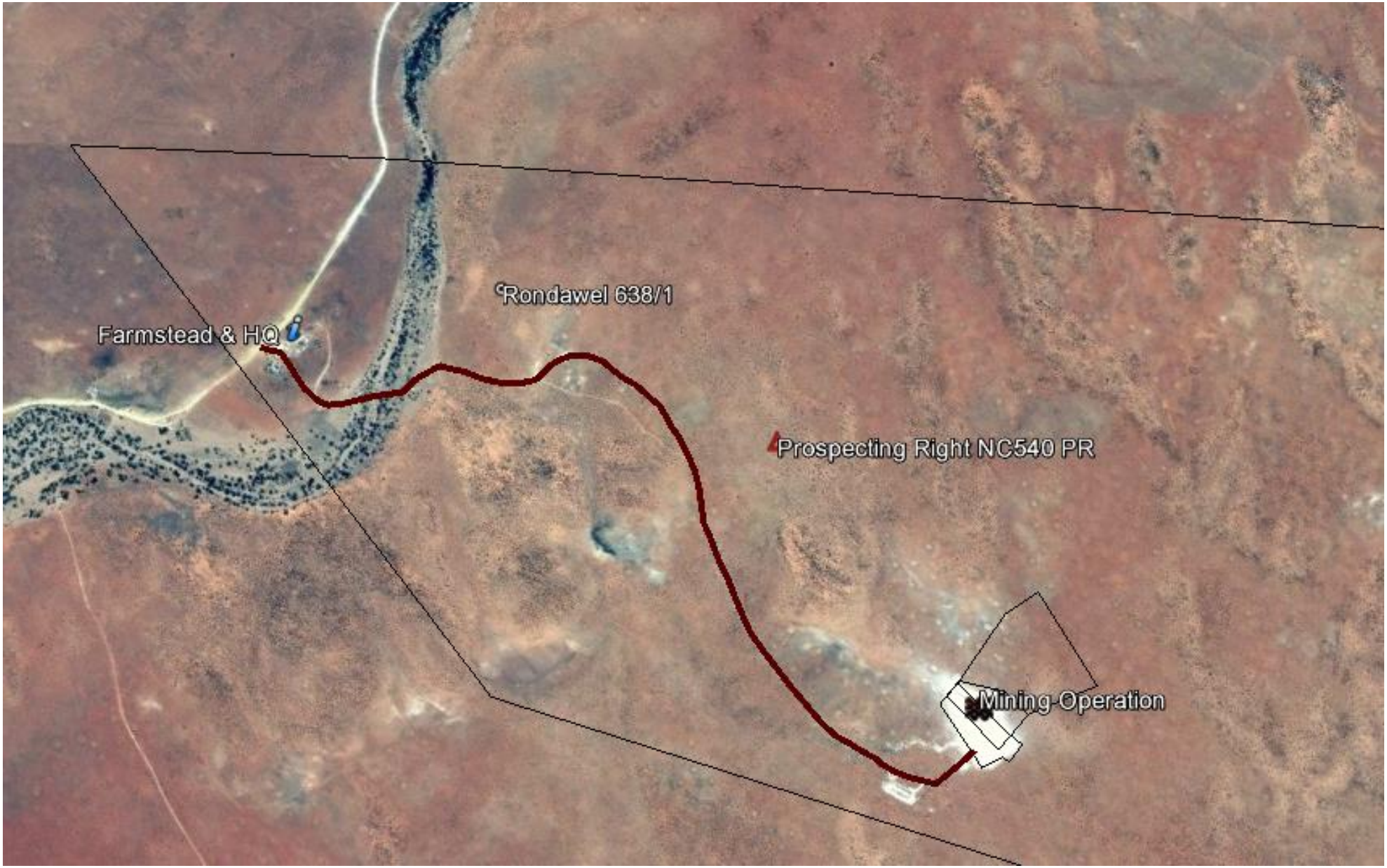
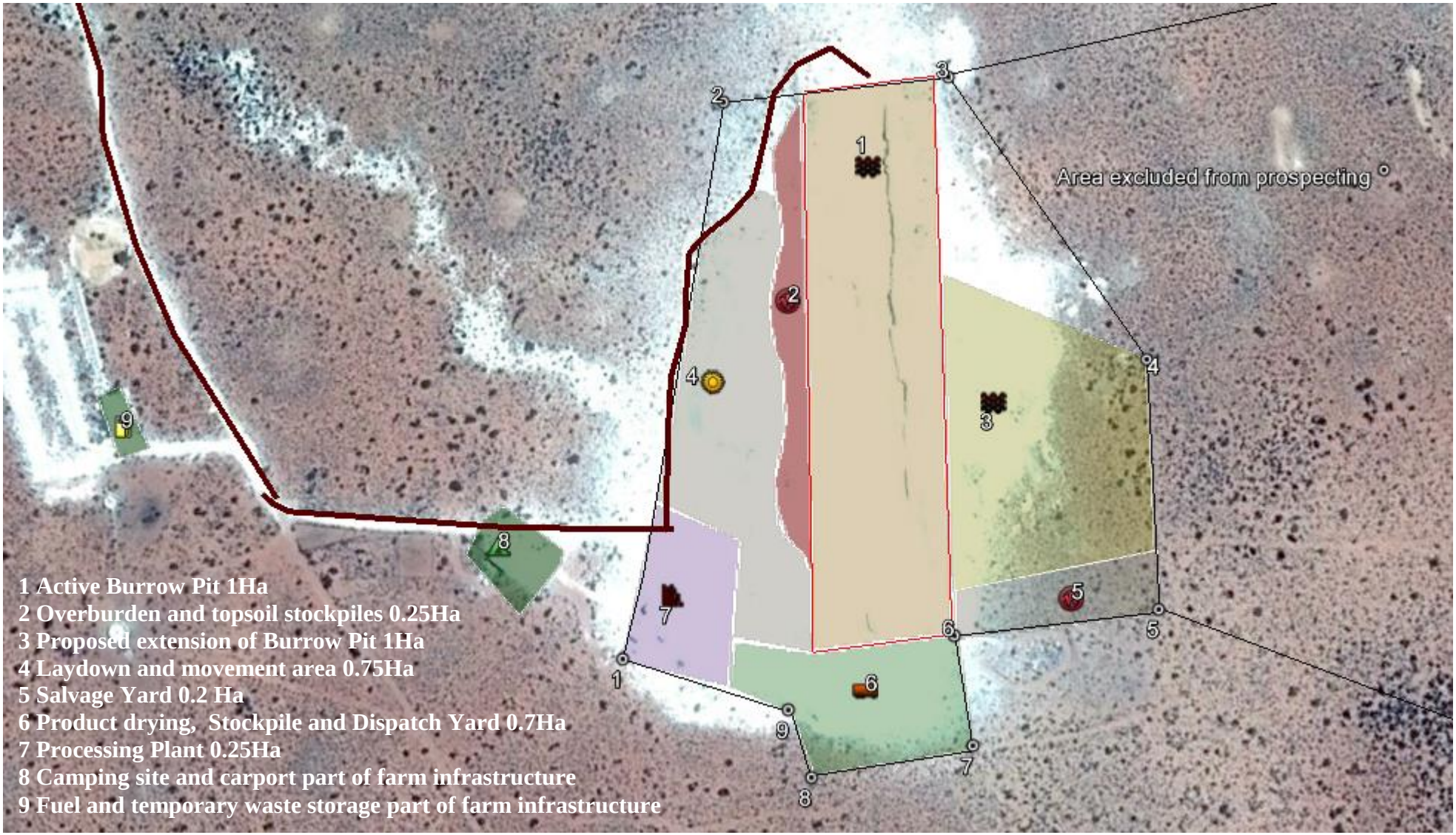


Diagram 3: Mine layout according to new footprint indicating logistical area and active mining area



1.3.4 Project layout

a) Infrastructure (Refer Diagram 3)

- Access and service roads

- The secondary public road system provide excellent access to the mine HQ. The turn-off from the Garies - Groenrivier road to the mine 40km outside of Garies (Diagram 1).
- Access from the HQ to the mine workings is via existing farm tracks.
- Existing tracks will be used as haul roads and will only be upgraded to facilitate haul trucks by applying dust suppression and/or hardening compound such as Macadamite if needed.
- The service roads will remain as part of farm improvement and the mine is only responsible for the maintenance of the road.

- Services and associated infrastructure

- Potable water for the two employees at the mine is obtained from collection of rainwater from the carport roof.
- No process water is used during mining or processing operations.
- Storage consisting of two 5 000 liter plastic tank that form part of farm infrastructure and can be re-used on another location.
- Electrical supply are generated by a mobile genset to be supplied with generator bay and spill prevention measures.

- Accommodation and Logistics

- Upgrading of infrastructure and accommodation are still in progress.
- Only one Wendy house and a caravan will be available on site for the two personnel employed at the mine.
- Other infrastructure include a carport and container for storage of plastic sheets used to cover the product stockpiles to protect it from moisture.
- The screening and milling operation is contained within a makeshift structure.
- No steel or reinforced concrete buildings and structures are present on the mining area that will require demolition.
- Workshops and secure storage infrastructure is available as part of the farm infrastructure that also doubled up as company HQ.

- Waste management facilities

- Upgrading of waste management facilities are still in progress.
- Temporary waste storage areas were developed as part of the farm infrastructure.
- Petrochemical and hazardous waste including contaminated/used spares, filters and used oil are collected and stored in special containers with spill containment measures for disposal at a registered disposal site.
- Domestic waste are collected in plastic containers and transported weekly to the company HQ refuse site.
- A small salvage yard is provided for temporary storage of scrap prior to movement to the company HQ.

- Oil/grease/diesel management systems

- Fuel storage with bund wall is provided as part of existing farm infrastructure
- The cement structures for the fuel supply including service apron/wash bay will remain as part of farm improvement and the mine will only be responsible for maintenance and waste management.

b) Burrow pit and waste dumps (Refer Diagram 3)

- Excavations

- Mining will be in the form of a roll over operation and mining blocks will be restricted to 0.5 Ha and maximum 10 meter deep
- High wall will be developed in benches not exceeding 3 m high
- Only one TLB for loading and movement of ore are used on a permanent basis

- Large scale excavations and ore stockpiling is done with a 25 ton excavator and one ADT that is on site on an ad hoc basis.
- Residue deposits overburden and spoils
- Overburden and low grade ore about 50% of the deposit placed in temporary stockpiles adjacent to the original excavation is still in the process of being backfilled
- No new overburden dumps will be created as operations will follow a cut and fill approach in future.
- No spoils are generated at the processing plant
- Product stockpiles form part of the drying area that also serve as a dispatch yard
- Surface disturbance (compacted areas)
- The movement area also serves as general laydown area and parking for stationary vehicles.
- Parking areas to be provided with drip trays for stationary equipment

2 REGULATORY REQUIREMENTS

2.1 Legal requirements

The original Final rehabilitation, decommissioning and mine closure plan was submitted in terms of regulations 53 and 54 relating to financial provision in the Mineral and Petroleum Resources Development Regulations, 2004 and approved as part of the Environmental Management Plan (EMP) submitted for the prospecting operation. In terms of the transitional arrangements of the Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations (NEMA Financial Regulation) that took effect on 20 November 2015 any actions undertaken in terms of regulations 53 and 54 relating to financial provision in the MPRDA Regulations, 2004 which can be undertaken in terms of a provision of the NEMA Financial Regulations must be regarded as having been undertaken in terms of the provision of these Regulations (Reg 17(1)). A financial provision approved in terms of the MPRDA Regulations, 2004 must also be regarded to be the financial provision approved in terms of the NEMA Financial Regulations (Reg 17(4)).

One of the conditions in terms of Regulation 17 (4) is that a holder that operates in terms of a financial provision approved in terms of the Mineral and Petroleum Resources Development Act, 2002 at the time of the coming into operation of the NEMA Financial Regulations, must review and align such approved financial provision with the provisions of the NEMA Financial Regulations on an annual basis as set out in regulations 9 and 11, read with the necessary changes.

This review fulfils the requirements of both the Final Rehabilitation, Decommissioning and Mine Closure Plan and the Environmental Risk Assessment Report required in terms of the NEMA (Act 107 of 1998) regulations and applicable MPRDA (Act No. 28 of 2002) regulations as indicated in the table below.

MPRDA Regulations 2004	**NEMA EIA Regulations 2014**	**NEMA Financial Regulations 2015**
Closure plan Must forms part of the EMP Reg. 62	Closure plan May be combined with the EMP Reg. 19	Final rehab., decommissioning and mine closure plan Must forms part of the EMP Reg. 11(2)
Environmental risk report Reg. 60 & Sect 43(4)	Provided for as part of Closure Plan Reg. 19(5) and 19(6)	Environmental risk assessment Must forms part of the EMP Reg. 10(3)

Several pieces of legislation are applicable to mine closure. Importantly, public participation is an integral part of mine closure and the process followed needs to fulfil the requirements of all relevant legislation. The following government departments have been identified amongst others as playing a key role in the closure process:

- Department of Minerals Resources (DMR). Lead agent, facilitator of closure inspections and issues the closure certificate,
- Department of Water and Sanitation (DWAS). Lead agent for potential water related issues and signs off on the mine closure certificate. Cancellation of Water Use license.
- Provincial Department of Environment and Nature Conservation (DENC). Gives input into the closure plan and guides and monitors protection of the natural environment.
- The local municipality and district municipality. Gives input into the mine closure plan and interfacing thereof with their integrated development plan (IDP) of the local area.

2.2 Environmental Authorisation (EMP) requirements

The key closure objective described in the plan submitted as part of the EMP is to leave the site in as safe and self-sustaining a condition as possible and in a situation where no post-closure intervention is required to ensure that the rehabilitation measures prove successful. The aim is to ensure a stable environment that will not be detrimental to the safety and health of humans and animals and that will not pollute the environment or lead to the degradation.

This will be achieved by leaving the area even, and in a natural state containing no foreign debris or other materials. All scrap and other foreign materials will be removed from the area and disposed of as in the case of other refuse, whether these accrue directly from the mining operation or are brought on to the site. The excavations will be backfilled with overburden and profiled to form an even depression without any unsafe high walls before the topsoil is returned and the area prepared for natural re-vegetation.

The closure objectives and mitigating activities stated below are still in agreement with those in the original closure plan with the latter having the added objective of a safe and healthy post-mining environment.

The objectives to meet the set goals as applied to the final decommissioning and mine closure discussed in section 3 below can be summarised as follow:

- Objective 1 - To create a safe and healthy post-mining environment
  - Safe excavations
  - Limited residual environmental impact
- Objective 2 - To create a stable, free draining post mining landform, which is compatible with the surrounding landscape
  - Economically viable and sustainable land, as close as possible to its natural or pre-mining state.
- Objective 3 – To provide optimal post-mining social opportunities
  - Optimised benefits for the social environment
  - Minimal negative aesthetic impact

3 FINAL DECOMMISSIONING AND CLOSURE OF MINING OPERATION

Concurrent or progressive rehabilitation is good practice and has advantages for the company as it reduces its overall financial exposure. Concurrent rehabilitation and remediation are provided for in the annual rehabilitation plan and contain information that defines activities on an annual basis and how these relate to the Final closure vision, as detailed in this final rehabilitation, decommissioning and mine closure plan.

Annual reviews in terms of regulations 6(a) and 11(1)(a) of the NEMA Financial Regulations, that form part of the Annual Environmental Audit, assesses what closure objectives and criteria are being achieved through the implementation of the plan.

Areas that are not covered during concurrent rehabilitation as described in the Annual rehabilitation plan that require specific intervention as part of this final rehabilitation, decommissioning and mine closure plan are discussed below.

3.1 Infrastructure and Logistics area

3.1.1 Basic rehabilitation methodology

At the quarry only satellite infrastructure will be supplied as all logistics together with waste management facilities will be supplied at the company HQ that is shared with the agricultural activities.

The main post closure objective for the infrastructure area is to leave the site in as safe and self-sustaining a condition as possible and in a situation where no post-closure intervention is required.

The aim is to ensure that the affected environment is maintained in a stable condition that will not be detrimental to the safety and health of humans and animals and that will not pollute the environment or lead to the degradation thereof. The aesthetic value of the area will also be reinstated.

The general approach adopted is the complete removal of all infrastructure and equipment and to reuse all infrastructures and equipment at another location by the company or as agricultural infrastructure.

Redundant structures, buildings and civil foundations (down to one meter below surface for subsurface infrastructure) will be demolished and discarded.

All steel structures and reinforcing will be discarded or sold as scrap.

Building rubble will be used to fill remaining excavations and covered with overburden and topsoil.

All redundant power lines and cable associated with power supply will be removed.

Service roads needs to be maintained and handed over to the landowner in a good state of repair and all redundant fences needs to be removed. Waste material of any description, including receptacles, scrap, rubble and tyres, will be removed entirely from the complete mining area and disposed of at the company HQ to be dealt with as part of the waste streams of the agricultural activities. No waste except building rubble will be buried and no waste will be burned on the site.

3.1.2 Risk sources

Upgrading of infrastructure and logistics including waste management facilities are still in progress. The risk sources in the context of the receiving environment within the infrastructure and logistical area are shown in diagram 3 and include the following:

- Access and Haul Roads
- Services and associated infrastructure
- Accommodation and Logistics
- Waste management
- Oil/grease/diesel management systems

The risks identified from these sources are discussed in section 5 and risk mitigation is covered in section 6.2 with a quantification of the closure elements in section 7.2.

3.2 Burrow Pit and waste dumps

3.2.1 Basic rehabilitation methodology

Kaolin clay to be mined is an inert material that is nontoxic. The post closure objective according to the approved EMP is to restore the land to its pre-mining land use taking into account the altered landform outside the mining area due to historic washing plant now used by the mine as part of logistical facilities.

Post mining topography for the area will follows the original landform and all overburden will be backfilled before the area is profiled to form an even depression. Topsoil will be replaced on the back filled areas and re-vegetation of the disturbed areas will follow a process of natural plant succession starting with pioneer plants

The main closure objective therefore is to leave the site in as safe and self-sustaining a condition as possible and in a situation where no post-closure intervention is required. The aim is to ensure that the affected environment is maintained in a stable condition that will not be detrimental to the safety and health of humans and animals and that will not pollute the environment or lead to the degradation thereof. The aesthetic value of the area will also be reinstated.
The basic rehabilitation methodology will therefore only include reinstating the original profile of the natural topography by backfilling of all overburden and product stockpiles. Post mining topography for the area will follows the original landform shape and no waste dumps will or stockpiles will remain on site.
The compacted movement areas and dispatch yard will be screened for petrochemical spills and cleaned before it is ripped and leveled.

3.2.2 Risk sources

No underground workings will take place only quarrying and the final footprint of the burrow pit will be 2 Ha. Kaolin is non-toxic and an inert material which are not affected by weathering and Kaolin residues are typically benign from a pollution point of view.
No permanent high walls will be created as backfilling and sloping or the burrow pit to form an even depression will take place as part of production. The risk sources in the context of the receiving environment with regard to the mine pit and waste dumps are shown in diagram 3 and include the following:

- Opencast workings (including final voids and ramps)
- Overburden, cover, and/or “soft" material including topsoil;
- Other non-specification waste such as sub-economic lower grade ore:
- Surface disturbance

The risks identified from these sources are discussed in section 5 and risk mitigation is covered in section 6.2 with a quantification of the closure elements in section 7.2.

4 RISK IDENTIFICATION

The risks arising from the above sources are listed below and the impact rating and mitigation actions of each risk is addressed in the risk assessment section 6.

4.1 Risks with regard to creating a Safe mining area

- No significant risks were identified.
- Insignificant risks relate to
  - Mine pit not in a stable condition can be detrimental to the safety and health of humans and animals.
  - Affected environment not in a stable condition can be detrimental to the safety and health of humans and animals.
  - Collapsing slope(s) of mine pit.
  - Potentially dangerous areas like deep mine pit or equipment left behind.
  - Unsafe erosion gulley’s
  - Post mining topography not compatible with original landform.
  - Uncontrolled access to a potentially unsafe post-mining area

4.2 Risk of residual environmental impact

- No significant risks were identified.
- Insignificant risks relate to
  - Post mining landscape that increase the requirement for long term monitoring and management.

- Unwanted ruins, buildings, foundations, footings and waste management practices creating or leaving legacies.
- Sub-surface infrastructure remaining behind, limiting the intended post closure land use including footings and foundations and power supply installations.
- Unwanted ruins, buildings, foundations, footings not demolished or rubble left behind.
- Equipment and other items used during the mining operation left behind.
- Incomplete removal of waste
- Stockpiles and leftover product left behind
- Oil fuel leaks onto virgin soil through the earthmoving and transport mobile plant
- The spillage of fuel during transfer from fuel bowser to equipment in the field
- Unwanted ruins, buildings, foundations, footings and waste management practices creating or leaving legacies.
- Sub-surface infrastructure remaining behind, limiting the intended post closure land use including footings and foundations and power supply installations.

4.3 Risks with regard to changes in land use

- No significant risks were identified.
- Insignificant risks relate to
  - Uncontrolled expansion of mining footprint by not restricting the area disturbed by mining and the associated activities/infrastructure - loss of land with agricultural or industrial potential
  - Post mining landform not compatible with the surrounding landscape and not capable of a productive land use that achieves a land capability equal to that of pre mining conditions
  - Long term changes in land use that cannot revert back to mainly industrial use caused by not implementing prompt rehabilitation and maintenance of disturbances when possible.
  - Disturbance of ecology due to loss of habitat.
  - Soil compaction due to hauling and development of stockpiles- limiting re-vegetation.
  - Uncontrolled development of roads and new roads not kept to a minimum - existing farm roads not used for mining operations.

4.4 Risks with regard to benefits for the social environment

- No significant risks were identified.
- Insignificant risks relate to
  - Staff losing their jobs
  - Job losses of secondary industries, businesses and contractors
  - Contractual agreements with service providers surpassing mine closure date
  - Closure standards not accepted and/or are changing
  - Mine closure being jeopardised by other land uses
  - Poorly defined transition from mining to farming activities within different legislation
  - No positive and transparent relationships with stakeholders and not maintaining communication channels – not providing stakeholders including government authorities with relevant information as per legislative requirements.
  - Not undertaking environmental management according to approved EMP and plans and no auditing of the environmental management system.

- Mine closure stalled due to non-compliance with South African legislation (national, provincial and local)
- Insufficient funds for complete rehabilitation

4.5 Risks with regard to aesthetic impact

- No significant risks were identified.
- Insignificant risks relate to
  - Visual disturbance from the public road views – excavations or overburden dumps blocking the view
  - Nuisance effects of air emissions (dust) no implementation and maintenance of dust monitoring programs accompanied by dust suppression activities if required.
  - Noise disturbance and light pollution as a result of night activities.
  - Disturbance of archaeological sites not implement mitigating measures according to the archeological assessment.

5 AFTERCARE AND MAINTENANCE

Maintenance of rehabilitated sites is often the difference between the ultimate successes or failure of rehabilitation and monitoring of rehabilitation will determine whether rehabilitation objectives and requirements are being achieved.

As the final phase in the project cycle, decommissioning may present positive environmental opportunities associated with the return of the land for alternative use and the cessation of impacts associated with operational activities. However, depending on the nature of the operational activity, the need to manage risks and potential residual impacts may remain well after operations have ceased. Examples of potential residual impacts and risks include erosion, slow recovery of vegetation, stock that has been abandoned (e.g. oil drums, scrap equipment) and old (unserviceable) structures.

The main closure objective is to hand back the rehabilitated properties to the respective landowners in a state that is fit for grazing or other agreed to landform, as close as possible to the original carrying capacity and to ensure that the affected environment is maintained in a stable condition that will not be detrimental to the safety and health of humans and animals and that will not pollute the environment or lead to the degradation thereof. The rehabilitation strategy is based on reinstating the original profile of the landscape. The aim therefore is to leave the site in as safe and self-sustaining a condition as possible and in a situation where no post-closure intervention is required.

Due to the specific nature of the mining operation no aftercare and maintenance were identified except for monitoring of erosion event over a period of 2 years.

6 RISK ASSESSMENT

6.1 Risk impact rating

Following risk identification (section 3), the impact of each risk was evaluated. One way of evaluating the impact of a risk is to determine the probability, severity, frequency and duration of the risk. These are all valuated separately and then combined to produce a risk impact; insignificant (1, green), medium (2, yellow) or significant (3, red). In some instances the impact of a risk was classified as uncertain due to lack of information.

For a risk with a rating of 3 (i.e. significant), strategies are put in place to reduce the risk to 1 (insignificant) or 2 (medium, provided that the risk can be controlled with management actions). To maintain the rating at 1 or 2, monitoring is implemented for a period of time to enable the confirmation of the risk as insignificant or as medium and under control.

Each risk is furthermore assessed for, decommissioning conditions (DC), and post-mining conditions (PM). Where a risk is only applicable to decommissioning (DC) related activities, a rating for the post-mining period is not provided. At the time of final mine closure an application will be made to DMR for a mine closure certificate only when all risks have been confirmed as insignificant or medium and under control via management actions.

6.1.1 Evaluating the probability

The probability of a (detrimental) environmental impact occurring depends on the controls which are in place to prevent or mitigate the impact (for example, monitoring, instructions and procedures, etc.) and the nature of substance which contributes to the impact. Combinations of descriptions for what are considered to be different levels of importance for controls and substances involved can be integrated in the evaluation of the probability of an activity taking place, which can then be assessed.

There are no standard methods of evaluating the probability of occurrence. All methods used rely on some form of subjective judgment and, therefore, agreed criteria have to be used in the evaluation. Values are assigned for the probability of occurrence of the relative strength of the factors involved to each of the criteria. Three evaluation ratings are used, viz. 1 for unlikely, 2 for could be/could happen/unknown, and 3 for definite/has happened/highly likely.

6.1.2 Evaluating the severity

In evaluating the severity of a potential impact there are various criteria that can be applied to determine the level of risk associated with the consequences of an action occurring. These are the quantity of material/substance released and the probable size of the covered area or possible spread of impact. Combinations of descriptions for what are considered to be different levels of importance for the criteria listed above can be integrated.

Values are assigned for the severity of the relative strength of the factors involved to each of the criteria. Three evaluation ratings are used, viz. 1 for insignificant, 2 cause for no mine closure certificate to be issued/hazard to quality of life/unknown, and 3 for loss of life/permanent environmental impact.

6.1.3 Evaluating the frequency

When evaluating the frequency of a potential impact any repetitive, continuous or time-linked characteristics of the impacts are taken into account. Values are assigned for the frequency of the factors involved to each of the criteria. Three evaluation ratings are used, viz. 1 for once off, 2 for intermittent, and 3 for ongoing/continuing/usually.

6.1.4 Evaluating the duration

The duration of a potential impact is based on the duration of the impact should the risk realise, i.e. the duration could be short-term, medium-term, long-term or permanent. Values are assigned for the duration of the factors involved to each of the criteria. Three evaluation ratings are used, viz. 1 for an instant/point in time, 2 for temporary/ intermittent, and 3 for forever.

The final risk evaluation is a combination of the probability, severity, frequency and duration ratings. The risk rating for the different risks in the mine closure process may be determined in each case for a particular impact.

Values are calculated, as a function of the probability, severity, frequency and duration for different risks. The individual scores are added and a risk impact is assigned. The calculated sums of the possible permutations of probability, severity, frequency and duration range from 4 to 12. Combinations with a sum total of 6 and less were rated as insignificant, while those rating 10 and higher were defined as significant. Risks with ratings in between 6 and 10 have medium outcomes.

6.2 Risk Mitigation and Closure objectives

Internationally, there seem to be three schools of thought:

- "What the affected community wants, the affected community gets" – that is, the key focus is on providing the end product requested by the affected communities, rather than focusing on the previous status quo of the receiving environment
- "Restoration of previous land use capability" – the original thought process in the South African context, because mining often occurs on land with high agricultural potential
- "No net loss of biodiversity" – the focal point in the ICMM/IUCN dialogue sponsored guidelines for mining and biodiversity, and of many mining corporate policies.

The thought process for the closure of this operation is based on the last two. In addition to the goals and objectives for final decommissioning and mine closure as documented in section 2 the vision for the post closure land form is to leave the site in as safe and self-sustaining a condition as possible and in a situation where no post-closure intervention is required. The vision is to ensure that the affected environment is maintained in a stable condition that will not be detrimental to the safety and health of humans and animals and that will not pollute the environment or lead to the degradation thereof and that the aesthetic value of the area will be reinstated.

For the vision to be realised the objectives and associated risk management strategies and mitigating measures described below needs to implemented, monitored and evaluated.

Risk management strategies were identified for the potentially significant risks, while data collection and analysis programmes were pursued to evaluate the uncertain risks.

The aim with risk mitigation actions is to over time manage significant (red) and medium (yellow) risks to become insignificant (green), or at least medium and under control with management actions. Once achieved, a risk will continue to be monitored to confirm its insignificance rating of green (1) medium and controlled rating of yellow (2) as part of aftercare and maintenance as discussed in section 5.

The closure process involves a series of actions, executed over a number of years as indicated in the annual closure plans, with continual monitoring, review and remedial actions (if required). Identified and assessed risks feed into mitigation actions (or primary tasks) of which successful implementation result in achievement of the mine closure goals and objectives.

The three key mine closure objectives are elaborated on in more detail and in context of the relevant risks below (each of the objectives are supported by several key aims):

- Objective 1 - To create a safe and healthy post-mining environment
  - Safe excavations
    - Slope stability of remaining excavation
    - No potentially dangerous areas; secured if required
  - Limited residual environmental impact
    - Develop a landscape that reduces the requirement for long term monitoring and management
    - No surface and/or groundwater contamination
    - Waste management practices not creating or leaving legacies
- Objective 2 - To create a stable, free draining post mining landform, which is compatible with the surrounding landscape
  - Economically viable and sustainable land, as close as possible to its natural or pre-mining state.
    - Prepare area to promote natural re-establishment of vegetation that is self-sustaining, perpetual and provides a sustainable habitat for local fauna and successive flora species

- Objective 3 – To provide optimal post-mining social opportunities
  - Optimised benefits for the social environment
  - Minimal negative aesthetic impact

The legal framework within which all the above lies entails:

- Defining and meeting closure standards.
- Complying with legislation.
- Sufficient financial provision for mine closure activities.
- Monitoring and plan for latent environmental impact.

The closure process involves a series of actions, with continual monitoring, review and remedial actions (if required). Identified and assessed risks feed into mitigation actions (or primary tasks) of which successful implementation result in achievement of the mine closure objectives and aims.

Risks associated with each closure objectives are discussed below with their mitigation actions and believed impact rating at closure. In addition, the closure standard for each key aim is listed and quantified. Financial provision is made in section 7 to deal with these mitigating measures in case of temporary closure or sudden closure during the normal operation of the project or at final planned closure.

6.2.1 Creating a Safe Post-mining environment with no residual environmental impact

a) Risks with regard to creating a Safe mining

Implementation of the following tasks to manage the risks associated with mine pit and high wall stability will ensure a safe post mining landscape without the requirement for long term monitoring and management. Regular inspections and audits will be used as management system to ensure compliance.

- After backfilling of overburden the sides of the burrow pit will be sloped as part of production to form an even depression without any high walls
- The post-mining topography will be adjusted where possible to minimise the effect on water flow and increase potential for re-vegetation.
- Actions to mitigate the risk of erosion will be through implementation of practices such as leaving the profiling contours.

b) Risks with regard to limiting residual environmental impact relates to:

Implementation of the following tasks to manage the risks associated with Final Closure and demolition activities will ensure that waste management practices do not create and/or leave legacies and will limit the residual impact of mine closure. Regular inspections and audits will be used as management system to ensure compliance.

- Distinguished between farming and mining infrastructure and waste in consultation with landowner
- Separation of wastes into classes will ensure that waste is disposed of safely and according to the correct procedure.
- In order to ensure that waste classes are kept in separate streams, communication will be passed on and people will be trained on the different waste classes.
- Training of personnel in the implementation of the Closure Plan will done and the implementation of the environmental awareness plan will be an ongoing process.
- Domestic waste - Separated at source into recyclable products. These must then be removed and recycled by recognised contractors. (Note that the mine is responsible for the waste from cradle to grave).

- Disposal at a registered and officially permitted commercial or municipal landfill site is the most cost effective option for materials that cannot be recycled.
- Domestic waste generated by workers needs to be sorted and all biodegradable waste must be stored in separate drums provided for.
- This biodegradable will be dumped in a landfill provided for onsite.
- Unwanted steel, sheet metal and equipment needs to be stored in a demarcated salvage yard.
- Unwanted steel, sheet metal and equipment in the salvage yard will be sold or disposed of as scrap metal. Recycling and reusing materials may reduce garbage haul fees or generate income through the sale of scrap metal and old equipment.
- All equipment and other items used during the mining operation needs to be removed from the site.
- Waste material of any description, including receptacles, scrap, rubble and tyres, must be removed entirely from the mining area and disposed of at a recognised landfill facility. It will not be buried or burned on the site.
- All temporary waste storage areas needs to be cleaned out and waste removed.
- Tyres to be return to supplier or a company that uses old tyres for making door mats, shoes, swings, etc.
- Batteries to be return to supplier or dispose at a permitted hazardous waste facility.
- Fluorescent tubes to be collected in sealed containers (stored on concrete slabs) and removed from site for disposal at a permitted hazardous waste facility.
- Chemical containers to be returned to supplier or disposed of at a legal, permitted facility that is capable of disposing of the waste. (DO NOT sell chemical containers to workers or communities).
- Laboratory waste (chemicals) - Returned to supplier or disposed of at a permitted facility that is capable of disposing of the waste.
- Industrial chemicals (laboratory waste) - Returned to supplier or disposed of at a permitted facility that is capable of disposing of the waste.
- Used oils / hydrocarbons fuels / liquids are to be collected in sealed containers (stored on concrete slabs) and removed from site for recycling by a reputable company.
- All waste in the temporary storage area for used lubrication products and other hazardous chemicals will be disposed of at a collection point from where it will be collected by a waste recycling company.
- Generator bays will be constructed with the necessary pollution control measures (drip trays).
- Hydrocarbon contaminated sludge (collected in oil traps) - Removed from the oil traps and removed from site for recycling (if possible) or disposal at a suitably permitted facility.
- Equipment used in the mining process will be adequately maintained in the workshops of the company so that during operations it does not spill oil, diesel, fuel, or hydraulic fluid.
- By keeping contaminated and clean water separate and establishing controlled runoff washing bays, the flow and end destination of decontamination washing water will be controlled.
- A Standard French drain system will be developed for sewage and grey water disposal.
- Sewage - No sewage outfall may be located within 100m of a water feature. No sewage may be discharge into a water body.
- The cement structures for the fuel supply including service apron/wash bay will remain as part of farm improvement and the mine will only be responsible for maintenance and waste management.

- Redundant structures, buildings and civil foundations (down to one meter below surface for subsurface infrastructure) will be removed for use elsewhere or demolished and discarded.
- All redundant infrastructure and services needs to be demolished including ruins, buildings, foundations, footings.
- Building rubble will be used as backfill in excavations or removed from site in the absence of excavations.
- All steel structures and reinforcing will be discarded or sold as scrap.
- Remove all power supply installations not to be retained by landowner in terms of section 44 of the MPRDA.
- Removing underground infrastructure to one meter below surface.
- Excavations created by removing subsurface infrastructure needs to be filled, levelled and compacted.
- Implementing screening as part of the cleaning activities before materials are moved from the mine.
- The infrastructure area will be screened for petrochemical spills and cleaned.
- The compacted movement areas will be screened for petrochemical spills and cleaned before it is ripped and levelled.
- Decontaminate oil and diesel contaminated soils and structures with biochemical agents prior to removal.
- Final walk through of complete mining lease area to ensure no mining related waste and of re-usable infrastructure remain on site.

The above risks and their levels are listed together with their associated mitigating actions in Table 1. At the time of final closure there will be no significant risks. Only one medium level risk the possible changes in the surface water quantities and flow patterns leading to erosion on the rehabilitated slopes will be present. When more information becomes available during the post-mining period, appropriate actions will be taken if proved necessary.

Table 1: Risks, risk levels and mitigating actions in terms of a safe post-mining environment

Risk	Risk Rating	Mitigation Actions
Erosion gulley's	Refer to objective 2 productive land use	
Collapsing slope	DC PM	Design stable slopes. Re-shaping slopes to stable conditions following identification of instable areas through observations and regular inspections
Uncontrolled access to a potentially unsafe area	DC PM	Eliminate unsafe areas in the post-mining area as far as possible by back filling excavations. Limiting and controlling access while rehabilitation activities are in progress
Oil, fuel and lubricant spills during demolition activities	DC PM-NA	Cleaning as per current approved procedure. Disposal thereof recognized disposal facilities.
Post-mining surface water quantities are more/less than pre-mining or changed flow patterns.	DC PM	Create contours on excavation slopes. Monitoring through observations and regular inspections. Implementing final topography changes if required
Incomplete removal of waste	DC PM	Final walk through of complete prospecting lease area to ensure no mining related waste remaining on site.
Waste classes not kept in separate streams	DC PM	Communication and training on the importance of separating waste streams

Documentation and monitoring results will be provided as objective evidence of achieving the objective of minimum legacies as listed in Table 2. The criteria with the contents of these documents must comply with are also given in this table.

Table 2: Objective evidence and closure criteria for safe post-mining environment

Closure objective	Document scope	Author	Success criteria (standard)
Slope stability	Inspection of the post-mining areas with the objective to identify unstable areas and formation of erosion gulley's	Independent EAP	Post-mining area declared stable by DMR mine health and safety
No negative effect on surface water flow and waste management practices do not leave/create legacies	Inspection of the post-mining surface area with the objective to identify erosion due to storm water and sheet flow	Independent EAP	Post-mining area declared stable by DMR
	Assessment of the completeness of removal of mine waste	Independent EAP	Final performance assessment report declares 100% removal of waste and equipment
Secured potentially Dangerous post-mining sites	Inspection of the post-mining surface area with the objective to identify unsafe areas	Independent EAP	Post-mining area declared safe by DMR

6.2.2 Create a stable, free draining post mining landform,

a) Risks relating to long term changes in land use:

It is important to note that for the mine to meet the key objective of economically viable and sustainable land, it is imperative that its other key objectives, viz. a safe post-mining area with limited residual impacts and optimal post-mining social opportunities are met. Should the attenuation measures for prevention of pollution as described above be implemented, the effect on soil and water will be insignificant. The activities and actions associated with achieving a stable, free draining post mining landform, which is compatible with the surrounding landscape and which is capable of a productive land use that achieves a land capability equal to that of pre mining conditions are listed below.

- The access road is a duel use road and the mine is only responsible for the maintenance of the road.
- Service roads needs to be maintained and handed over to the landowner in a good state of repair and all redundant fences needs to be removed and the boundary fence and gates repaired.
- All roads not required by landowner must be ripped (30cm deep).
- All remaining service roads needs to be graded with provision of efficient storm water control to prevent erosion of steep slopes and roadways and elsewhere are required.
- Although erosion and runoff are natural processes it should be managed by maintaining topsoil in any areas not in use and maintaining maximum existing vegetation coverage.
- Slow storm water runoff with contoured, low-gradient drains and channels.
- Storm water diversion and erosion control contour berms separate clean and contaminated water systems around the pit and infrastructure areas.
- Remove and stockpile 300mm topsoil in berms or heaps less than 1,5m high and turn soil or re-use every six months. Do not use as permanent storm water control feature.
- Remove and stockpile topsoil from roads, building platforms and stockpile areas prior to construction for use to restore disturbed areas.

- To ensure long-term stability, the restored soil cover should attempt to mimic the pre-mining distribution of soil texture and thickness.
- Any oil or fuel leaks caused during operations must be removed immediately with the saturated soil and placed in bags or drums for disposal at a suitable disposal site or "soil farm".
- Contaminated soil must be treated by first removing the source of contamination - removing the source of contamination should allow the system to recover without further cleanup required.
- Petrochemical spillages to be collected in a drip tray and drum to store excavated spill affected soil for disposal at a registered facility or onsite treatment.
- The most promising techniques for in on-site treatment involve bioremediation. Bioremediation involves the use of microorganisms to destroy hazardous contaminants.
- There will be no risk for acid mine drainage or poor quality leachates emanating from the mine or product deposits. Furthermore no product stockpile will remain on site.
- Backfill all overburden and low grade product and cover with growth medium.
- Any product stockpiles left or oversize boulders must be removed used to backfill excavations or to slope remaining side walls.
- Coarse natural material used for the construction of ramps must be removed and dumped into the excavations.
- Level the complete disturbed areas and restore the original profile to blend in with the natural topography.
- On completion of mining operations, the surface of the disturbed areas especially if compacted due to hauling and dumping operations, shall be scarified to a depth of at least 300mm and the previously stored topsoil will be returned to its original depth over the area.
- Unnecessary destruction of vegetation should be avoided by ensuring that traffic and personnel movement be restricted to demarcated areas. No traffic should be allowed on the rehabilitated areas.

A summary of the above risks and their mitigation actions is given in Table 3. Also shown in this table is the level of each risk. At the time of final closure there will be no significant risks. There will however a medium level risks in that the viability and sustainability of agriculture on the rehabilitated and profiled excavations will only be proven over time. Once results from a few consecutive surveys are available, the risk level can either be reduced, or actions required to reduce it further, or control the risk will become clear.

Table 3: Risks, risk levels and mitigating actions in terms of the economically viability and sustainability of the rehabilitated land

Risk	Risk Rating	Mitigation Actions
Industrial or agricultural use not viable on rehabilitated areas	DC	Shaping of slopes of any remaining excavations and creating micro habitats for seed collection with a higher moisture holding capacity suitable to withstand dry year conditions and limit sandblasting of seedlings. This will be followed by monitoring of erosion and re-vegetation and comparison thereof against that of the virgin landscape adjacent to the mined area. Mitigating steps against accelerated erosion and unsuccessful plant succession through patch dynamics if proven necessary.
	PM	

Yields (restoration) are compromised through improper farming practices	DC PM	Adherence to the recommended stocking rates for small stock units. Provide for reduced carrying capacity during restoration process. Mitigating steps against accelerated erosion and slow plant recovery if proven necessary by fencing and exclusion of areas from grazing.
Higher erodibility of slopes and profiled areas resulting in erosion	DC PM	This will only be a risk until re-vegetation is successful. Installation of conservative run-off and land-use plan. Create a rough surface to act as contours and prevent overgrazing and trampling due to agricultural activities.
Compaction of drill platforms limiting agricultural potential	DC PM	Rip (30cm deep) and allow to re-seed naturally. Limiting access to rehabilitated areas

The documentation which will be submitted as objective evidence of the state of the above risks at the time of closure is listed in Table 4. With the contents of these documents showing compliance with the closure criteria - also listed in Table 4 - it will be accepted that the mine has achieved the objective of economically viable and sustainable small stock agriculture.

Table 4 Objective evidence and closure criteria for economically viable and sustainable small stock agriculture

Closure objective	Document scope	Author	Success criteria (standard)
Viable and Sustainable Land use compatible with pre-mining land use	Report on the monitoring results with regard to succession tempo of total cover in comparison with virgin vegetation adjacent to mining area	Independent EAP	Total cover and species composition is comparable to that of the adjacent virgin area
	Monitoring results of erosion on steep slopes (20% gradient) and disturbed areas	Independent EAP	At the time of closure, soil loss has stabilised over the whole previously disturbed area

6.2.3 Provide optimal post-mining social opportunities

a) Risks relating to optimised benefits for the social environment

The impact of mine closure is limited and is not expected to alter the socio-economic circumstances of the study area significantly however those losing employment will experience significant impacts.

- Contract durations with service providers will be limited to address the risk of contractual agreements with service providers surpassing the mine closure date.
- Maintain positive and transparent relationships with stakeholders and maintaining communication channels.
- Provide stakeholders including government authorities with relevant information as per legislative requirements.
- Undertaking environmental management in accordance with the approved EMP and Closure Plan.
- Minimise noise disturbance: limiting earth moving to day time.
- Management of air emissions to minimise nuisance effects or health risk; implementation and maintenance of dust monitoring programs accompanied by dust suppression activities by spraying water and/or dust-allaying agents.

b) Risks relating to Minimal negative aesthetic impact

Minimal negative aesthetic impact will be achieved by the implementation of the tasks required to limit residual environmental impact listed above including the following:

- Identify infrastructure and services to remain after closure.
- During decommissioning and rehabilitation levels of dust generation need to be monitored and if dust levels rise above acceptable limits dust should be controlled in the interest of improved worker health and safety. In this instance periodic wetting of the maneuvering areas can be considered (No used oil or diesel is to be used for dust suppression).
- Involve all employees/contractors in the speed reduction campaign as road surface condition is more related to speed than to frequency of use.
- Minimise noise and light disturbance: limiting mining and decommissioning actions to day time.
- Minimise visual disturbance: implementation of mitigating measures from the public road views.
- No significant archaeological sites and mitigating measures were identified in the archaeological assessment completed for the prospecting area.

Risks and risk levels associated with the objective of optimum post-mining social activities are listed in Table 5. At the time of final closure there will be no significant risks.

Table 5 Risks, risk levels and mitigating actions in terms of optimum post-mining social opportunities

Risk	Risk Rating	Mitigation Actions
Dust generation during demolition activities Noise generation during demolition activities Traffic during demolition activities	DC PM - N/A	Maintenance of the existing complaints register Communication of dust, noise and increased traffic related activities to the affected community and the expected durations of these activities Continuation of current dust suppression activities
Dust from farm roads and disturbed land	DC PM	Continuation of current dust suppression activities

The documentation which will be submitted as objective evidence and the closure criteria against which the contents of these documents will be measured are summarised in Table 6. Achieving these criteria will be evidence of achieving the objective of optimum post-mining social opportunities.

Table 6 Objective evidence and closure criteria for optimum post-mining social opportunities

Closure objective	Document scope	Author	Success criteria (standard)
Limited environmental impacts during demolition activities	Summary of all complaints received during demolition activities and follow up actions	Mine SHE Head, audited by independent EAP	Nuisance levels consistently on par with legislative standards after completion of demolition activities All incidents older than 90 days investigated and feedback given to complainant

7 ESTIMATED COST FOR REQUIREMENTS TO FULLY DECOMMISSION THE SITE

With the repeal of Section 41 of the MPRDA (Act 28 of 2002) that requires that the owner of a mine must make financial provision for the remediation of environmental damage, regulations pertaining to the financial provision for prospecting, exploration, mining or production operations under section 44, read with sections 24 of the National Environmental Management Act, 1998 (Act No.107 of 1998) were issued in 2015.

According to regulation 6 an applicant must determine the financial provision through a detailed itemisation of all activities and costs, calculated based on the actual costs of implementation of the measures required for— (a) annual rehabilitation, as reflected in an annual rehabilitation plan; (b) final rehabilitation, decommissioning and closure of the prospecting, exploration, mining or production operations at the end of the life of operations, as reflected in a final rehabilitation, decommissioning and mine closure plan; and (c) remediation of latent or residual environmental impacts which may become known in the future, as reflected in an environmental risk assessment report.

According to regulation 7 the applicant or holder of a right or permit must ensure that the financial provision is, at any given time, equal to the sum of the actual costs of implementing the plans and report contemplated in regulation 6 and regulation 11(1) for a period of at least 10 years forthwith. In terms of regulation 11(1) the holder of a right or permit must ensure that a review is undertaken of the requirements for (a) annual rehabilitation, as reflected in an annual rehabilitation plan; (b) final rehabilitation, decommissioning and closure of the prospecting, exploration, mining or production operations at the end of the life of operations as reflected in a final rehabilitation, decommissioning and mine closure plan; and (c) remediation of latent or residual environmental impacts which may become known in the future, as reflected in an environmental risk assessment report.

In terms of regulation 11(2) the holder of a right or permit must, on completion of the actions contemplated in sub regulation (1), ensure that the adequacy of the financial provision is assessed and any adjustments that need to be made to the financial provision are identified within one year of the commencement of the operations authorised in the right or permit; or where the operations has commenced immediately after its financial year end that follows such commencement.

7.1 Assesment of financial provision

The assessment of the financial provision requirements for annual rehabilitation in terms reg. 6(a) is provided for as part of the annual rehabilitation plan that form part of the annual environmental audit of the implementation of the environmental authorization and closure plan in terms of the NEMA EIA regulations (2014).

No remediation of latent or residual environmental impacts which may become known in the future were identified at this stage.

Financial provision in terms of reg. 6(c) are covered by the requirements for the actual costs of implementation of the measures required for final rehabilitation, decommissioning and closure of the mining operations at the end of the life of operations as reflected in this final rehabilitation, decommissioning and mine closure plan in terms of reg. 6(b).

7.2 Quantified Closure elements

The following risk based criteria and assumptions were used to calculate the final rehabilitation, decommissioning and closure cost:

- Return of land to its pre-mining land capability where possible
- The cement structures used as part of the waste management facilities of the mine will not form part of this final decommissioning, rehabilitation and closure plan.
- Remove all assets

- All vehicles, plant and workshop equipment will be removed for salvage or resale
- All fixed assets that can be profitably removed will be removed for salvage or resale
- Any item that has no salvage value to the mine, but could be of value to individuals, will be sold (zero salvage assumed in cost estimation) and the remaining treated as waste and removed from site
- All structures will be demolished and terracing and foundations removed to the lesser of 500 mm below the original ground level
- Inert waste, which is more than 500 mm underground, such as pipes, will be left in place
- A hazardous disposal site will not be constructed and all hazardous waste will be removed from site and transported to the company HQ
- All services related to the operation like overhead power supply will have to be demolished
- All compacted areas due to hauling and stockpiling must be ripped to 300 mm
- All disturbed and exposed surfaces will be covered with at least 150 mm of topsoil and re-vegetation must be allowed to take place naturally
- Existing tracks will be used and new tracks must be restricted to the absolute minimum.
- The stockpile and logistics area will not exceed the planned area footprint
- It is assumed that the post-mining pit stability will be addressed as part of the operation and necessary remedial actions implemented prior to closure
- Topography to follow the original landform shape.
- Where topsoil is not available, the cost for in-situ remediation will be the same as the estimate for top soiling

7.3 Calculation of Closure cost

For each closure element, various possible combinations of required rehabilitation work were identified and costs were calculated for each of these, based on quotations obtained from independent third party suppliers for earthmovmg equipment rental and various other consumables. Rates used are from the Contractors Plant Hire Association. Refer diagram 3 for footprint of closure elements.

Earth Moving Equipment	Rental Rate /hour	Fuel Cost & Delivery	Total Cost /hour
Front End Loader - 30 Ton	R687.00	R429.00	R1,116.00
Bulldozer Cat D9R	R1,124.14	R429.00	R1,553.14
Excavator - 45 Ton	R687.00	R429.00	R1,116.00
Excavator - 30 Ton	R392.00	R286.00	R678.00
Excavator - 20 Ton	R322.00	R234.00	R556.00
Cat 14 H Grader	R453.00	R234.00	R687.00
Articulated Dump Truck - 30 Ton	R392.00	R182.00	R574.00
Tipper Truck 6m³	R255.00	R156.00	R411.00
Tipper Truck 10m³	R309.00	R182.00	R491.00
Manual Labour /hour	R25.00		

Cost Factor	Closure Element	Cost calculation				
1	**Demolish and remove Buildings/Infrastructure including subsurface structures and bunded fuel storage - Salvage useable material, break structure and dispose in waste dump**	**Cost/h**	**Service hours**	**Labour**	**Total**	
	Tipper Truck 10m³ transport building rubble to excavation	R491.00	4.00	0	R1,964.00	
	Excavator - 20 Ton Demolish concrete and loading	R556.00	8.00	0	R4,448.00	
	Cleanup	R25.00	8.00	4	R800.00	
	Total				**R7,212.00**	
2	**Remove waste from temporary storage and scrap from salvage yard**	**Cost/h**	**Service hours**	**Labour**	**Total**	
	Tipper Truck 10m³ transport to waste disposal site	R491.00	8.00	0	R3,928.00	
	Treat petrochemical in oil seperator - washbay	R0.00	R2,000.00	R0.00	R2,000.00	
	Treat petrochemical in oil seperator - fuel storage & apron washbay	R0.00	R1,000.00	R0.00	R1,000.00	
	Cleanup	R25.00	8.00	2	R400.00	
	Total				**R7,328.00**	
3	**Final cleanup - remove all mining related waste walk through with landowner**	**Cost/h**	**Service hours**	**Labour**	**Total**	
	Tipper Truck 10m³ transport to waste disposal site	R491.00	8.00	0	R3,928.00	
	Cleanup	R25.00	8.00	2	R400.00	
	Total				**R4,328.00**	
4	**Loading and transport of overburden and product stockpile for backfill > 80m**	**Load Vol m³**	**Loads/h**	**m³/h**	**R/h**	**R/m³**
	Excavator cycle	1.2	120	144	R678.00	R4.71
	ADT cycle	17	7	119	R574.00	R4.82
	Total cost/m³					**R9.53**
5	**Backfill and profiling pit slope 18° by means of dozing <80m**	**m²/h**		**Cost/h**	**R/m²**	**R/Ha**
	Bulldozer Cat D9R	250		1553.14	R6.21	R9,648.98
	Total cost/Ha					**R9,648.98**
6	**Spreading topsoil level area**	**m³/h**	**m³ Soil /m²**	**R/m³**	**R/m²**	**R/Ha**
	Loading and transport of topsoil		5	R9.53	R1.91	R1,906.00
	Shaping Grader 140 K	1020		R0.67	R0.13	R1,347.06
	Total cost/Ha				**R2.04**	**R3,253.06**
7	**Ripping and levelling**	**Speed**	**Ripper/Blade**	**h/Ha**	**R/h**	**R/Ha**
	Grader 140 K	8	3.5	0.36	R687.00	R245.36

7.4 Total estimated cost for requirements to fully decommissioned the mining site at final closure

Mining/Sampling Area	Unit	No Units	Unit Cost	Cost per Element
Cost Factor 1				
Demolish and remove Buildings/Infrastructure including subsurface structures and bunded fuel storage - Salvage useable material, break structure and dispose in waste dump				
Risk based criteria and assumptions with regard to rehabilitation The cement structures used as part of the waste management facilities of the mine will not form part of this final decommissioning, rehabilitation and closure plan. All other structures will be demolished and terracing and foundations removed to the lesser of 500 mm below the original ground level. Inert waste, which is more than 500 mm underground, such as pipes, will be left in place All services related to the mining operation, water supply lines and storage on site will have to be demolished				
Logistical facilities 0.5 Ha	Areas	1.00	R7,212.00	**R7,212.00**
Processing plant 0.5 Ha	Areas	1.00	R7,212.00	**R7,212.00**
			Sub-Total	**R14,424.00**
Cost Factor 2				
Remove waste from temporary storage and scrap from salvage yard				
Risk based criteria and assumptions with regard to rehabilitation A hazardous disposal site will not be constructed and all hazardous waste will be removed from site and transported to the nearest licensed facility. Waste will be dispose/recycled every 3 month and there will never be more than 3 month worth of waste in the temporary storage areas				
Salvage Yard	Areas	1.00	R7,328.00	**R7,328.00**
Temporary waste storage area	Areas	1.00	R7,328.00	**R7,328.00**
			Sub-Total	**R14,656.00**
Cost Factor 3				
Final cleanup - remove all mining related waste walk through with landowner				
Risk based criteria and assumptions with regard to rehabilitation Removal of all structures and infrastructure not to be retain by the landowner in terms of section 44 of the MPRDA. All fixed assets that can be profitably removed will be removed for salvage or resale. Any item that has no salvage value to the mine, but could be of value to individuals, will be sold (zero salvage assumed in cost estimation) and the remaining treated as waste and removed from site.				
Areas les than 10 Ha	Areas	1.00	R4,328.00	**R4,328.00**
			Sub-Total	**R4,328.00**

Cost Factor 4				
Loading and transport of overburden and product stockpile for backfill > 80m				
Risk based criteria and assumptions with regard to rehabilitation Return of land to its pre-mining land capability where possible It is assumed that the post-mining pit stability and profile will be addressed as part of the operation and necessary remedial actions implemented prior to closure. Backfilling is done as part of operations. Excavations will be developed in segments < 0.5Ha to provide for concurrent rehabilitation as part of the annual rehabilitation plan.				
Leftover Product or low grade product	m^3	100.00	R9.53	**R953.00**
			Sub-Total	**R953.00**
Cost Factor 5				
Backfill and profiling pit slope 18° by means of dozing <80m				
Risk based criteria and assumptions with regard to rehabilitation It is assumed that the post-mining pit stability and profile will be addressed as part of the operation and necessary remedial actions implemented prior to closure. Backfilling is done as part of operations. Excavations will be developed in segments < 0.5Ha to provide for concurrent rehabilitation as part of the annual rehabilitation plan.				
Backfill burrow pit boulders and overburden	Ha	1.00	R9,648.98	**R9,648.98**
			Sub-Total	**R9,648.98**
Cost Factor 6				
Spreading topsoil level area				
Risk based criteria and assumptions with regard to rehabilitation All disturbed and exposed surfaces will be covered with at least 150 mm of topsoil and re-vegetation must be allowed to take place naturally Where topsoil is not available, the cost for in-situ remediation will be the same as the estimate for top soiling				
Product drying, Stockpile and Dispatch Yard	Ha	1.00	R3,253.06	**R3,253.06**
Laydown and movement area	Ha	1.00	R3,253.06	**R3,253.06**
Salvage Yard	Ha	0.50	R3,253.06	**R1,626.53**
			Sub-Total	**R8,132.65**
Cost Factor 7				
Ripping and levelling Roads and all compacted areas				
Risk based criteria and assumptions with regard to rehabilitation All compacted areas due to hauling and stockpiling must be ripped to 300 mm Existing tracks will be used and no new roads will be developed. The stockpile and logistics area will not exceed the planned footprint.				
Product drying, Stockpile and Dispatch Yard	Ha	1.00	R245.36	**R245.36**
Laydown and movement area	Ha	1.00	R245.36	**R245.36**
Salvage Yard	Ha	0.50	R245.36	**R122.68**
			Sub-Total	**R613.40**
			Total estimated cost to fully decommissioned the mining site at final closure	**R52,756.03**

8 THE PUBLIC PARTICIPATION PROCESS

8.1 Principles and Objectives

The Public Participation Process (PPP) was designed to fulfil the requirements of several pieces of legislation applicable to mine closure. It forms an integral component of the mine closure process by affording Interested and Affected Parties (l&AP) the opportunity to identify environmental issues and concerns relating to the proposed closure, which they feel should be addressed. This is consistent with the provisions of the National Environmental Management Act (Act No. 107 of 1998), Section 2(4) (f), which states that "the participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured".

The objective of the prospecting operation is to develop a working PPP that informs key stakeholders', I&APs and the general public about mine closure objectives and activities during the life of the mine. The PPP was designed to provide sufficient and accessible information to I&APs in an objective manner to assist them to:

- Identify issues of concern, and provide suggestions for enhanced benefits and alternatives associated with mine closure,
- Identify risks not yet identified during the risk assessment exercise,
- Identify risks associated with mine closure and rehabilitation,
- Contribute local knowledge and experience,
- Verify that their issues have been considered.
- Comment on the Risk Assessment and Mine Closure Plan at the time of final decommissioning of the project, including the significance of potential risks that have been identified and associated impacts,
- Play an oversight role in the monitoring and evaluation of mine closure.

8.2 Stakeholder Identification and Project Data Base

Existing data bases were used to inform the list of stakeholders. Special consideration was given to ensure that organizations and individuals that had expressed interest in the activities of the operation, and those who are potentially affected by mine closure, were included on the data base. The following are principles which governed the PPP:

- Key stakeholder groups and the general public comprised the target audience in the development of the PPP.
- Providing information to lay people to allow them to contribute to and participate meaningfully in the process.
- Stakeholder participation is most effective when the proponent and the practitioner recognise, acknowledge and validate stakeholder values when designing a PPP (i.e. there should be no underestimation of the technical and professional competence of citizens).
- The recognition that in the current political climate of South Africa, consultation, empowerment and capacity building is particularly important.

The process of involving stakeholders had three main objectives:

- Steps should be taken to ensure that stakeholder input into the project is relevant and representative.
- Stakeholders should be made aware of their objectives and role in the process,
- An efficient communication and feedback mechanism should be developed during the process to ensure that all stakeholders are kept informed of progress.

Stakeholders were drawn from the sectors outlined below:

- National (DWAS, DMR), Provincial (DENC, DALR) and Local Government (Local and District Municipalities)
- Industry (commercial farmers)
- Corporations and businesses (service providers to operation)
- Operations staff

The operation set up a database of I&APs using existing project databases as a starting point. Names of persons and organisations will be added to or deleted from the database where appropriate.

9 WAY FORWARD

This final Rehabilitation, Decommissioning and Mine Closure Plan will be reviewed on an annual basis to align such approved financial provision set out in regulations 9 and 11, of the NEMA Financial Regulations. Concurrent rehabilitation and remediation will be provided for in the annual rehabilitation plan and will contain information that defines activities on an annual basis and how these relate to the closure vision, as detailed in this final rehabilitation, decommissioning and mine closure plan.

When final planned closure is applied for the operation will submit a final environmental performance audit report to DMR as lead agent for final perusal with the objective to issue a closure certificate. At that point, the closure process, and associated public participation program, will close.