

Rehabilitation, Decommissioning and Mine Closure Plan Including Environmental Risk Assessment

**Oranje Sand CC
Lot 1075 Olyvenhoutsdrift Settlement, near Upington**

Reference No.: NCS 30/5/1/1/2/1 (10678)MP

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1 INTRODUCTION

1.1 Background

This document 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 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 remediation of latent or residual environmental impacts which may become known in the future, including the pumping and treatment of polluted or extraneous water, 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

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
- 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 3 of this review. Section 3 also describes how these objectives are planned to be met and elaborate on the implementation of certain risk mitigation actions, 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.

1.3 Context of the Mining operation

1.3.1 Mining Permit

The mining area is situated over a section of the Unnamed Tributary on Lot 1075 Olyvenhoutsdrift Settlement. The operation is to be carried out under cover of Mining Permit to be issued to Oranje Sand CC (Reg. 2011/043787/23) with file reference NC 30/5/1/3/2/10678MP.

The operation is situated in the Dawid Kruiper Local Authority of the Kenhardt administrative district of the Northern Cape.

Lot 1075 Olyvenhoutsdrift Settlement in the Division Kenhardt, Province Northern Cape is registered in the name of the Dawid Kruiper Local Municipality by virtue of Title Deed T88536/2000. The area is situated off the R359 road approximately 7km south-west of Upington with an approximate middle locality of S28.52438° E21.24194° (Refer to Co-ordinate no. 12 on **Diagram 2**).

1.3.2 Project Description

Mining will be in the form of a simple process that only include loading and hauling of river sand from a sand quarry. No processing will take place as the raw sand will be sold as a FoT product and only limited stockpiling will take place.

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. No buildings and infrastructure will be required as the operation will be run from the company headquarters where all logistics will be available.

Operational phase

During operations mining will only consist of loading and hauling of river sand. Only temporary product stockpiles will be developed as sand will be transported to the company headquarters for stockpiling and distribution as it is loaded.

One excavator or FEL will be used in the mining process for loading of sand onto the haul trucks.

As part of this phase training of personnel in the implementation of the EMP will be undertaken and the implementation of the environmental awareness plan as part of the EMP will be an ongoing process.

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 area is situated off the R359 public road south-west of Upington, which provides good access to the mining operation. The turn-off from the R359 to the mine is approximately 7m to the south-west of Upington. Refer to **Diagram 1**.

No water or electricity is used in the mining operation and no permanent infrastructure is present or will be required due to the small scale and simple mining method. Existing farm tracks will be used as haul roads and no new roads will be developed.

The only infrastructure and or services are stockpile and waste management or laydown areas created.

Refer to section 6 for mine layout and quantification of closure elements.

Diagram 1: Position of proposed site on a section of the Unnamed Tributary on Lot 1075 Olyvenhoutsdrift Settlement

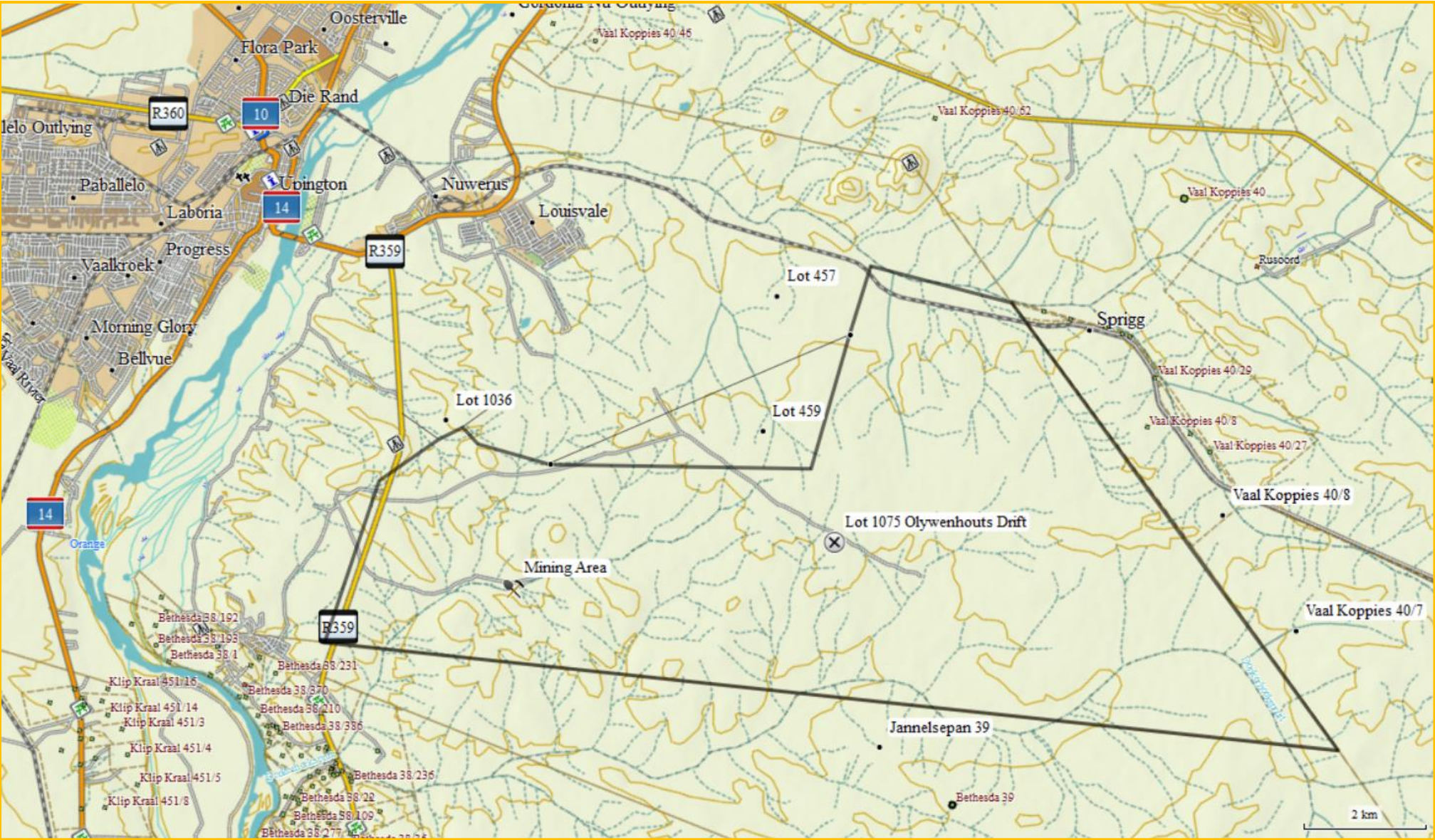


Diagram 2: Site Layout

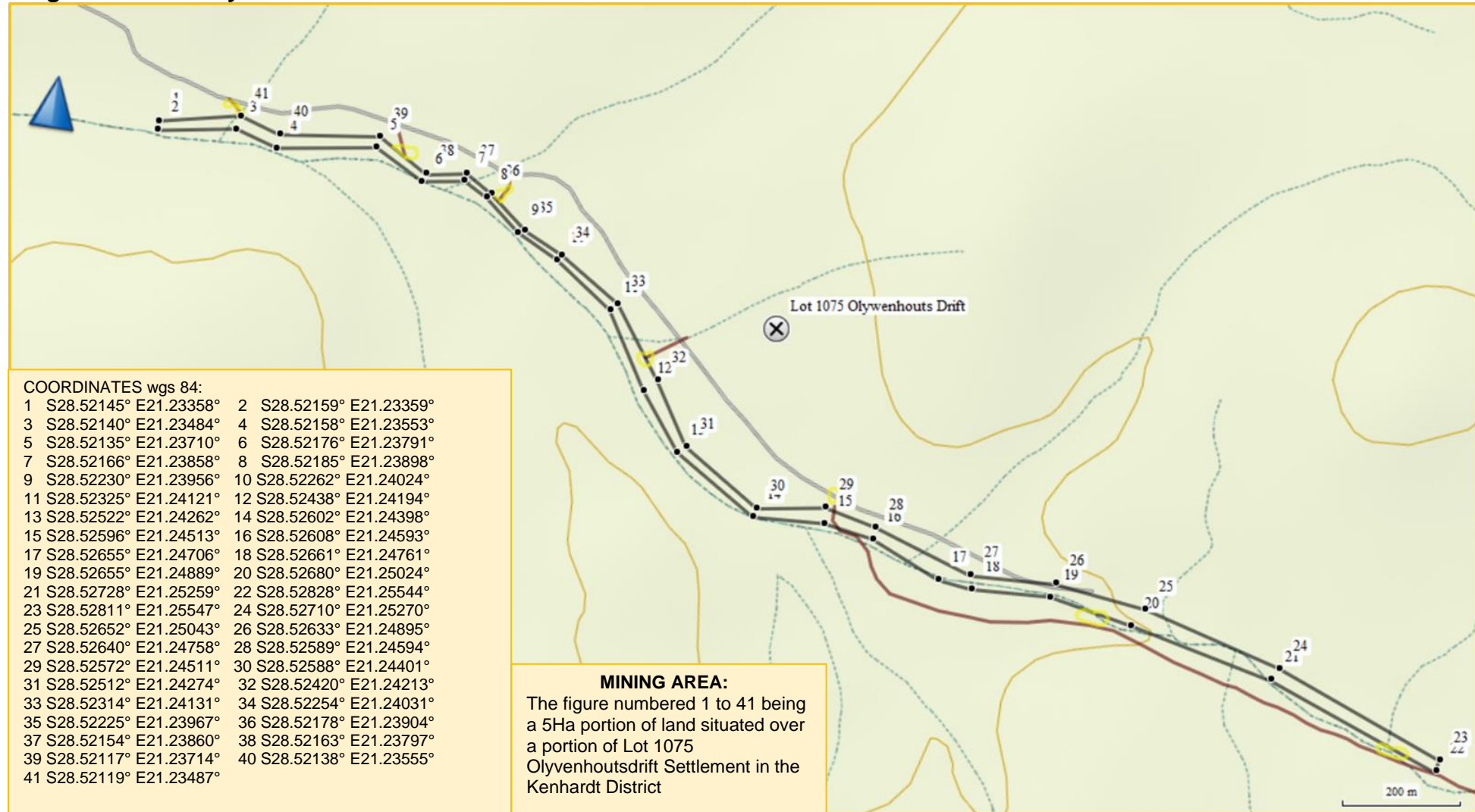
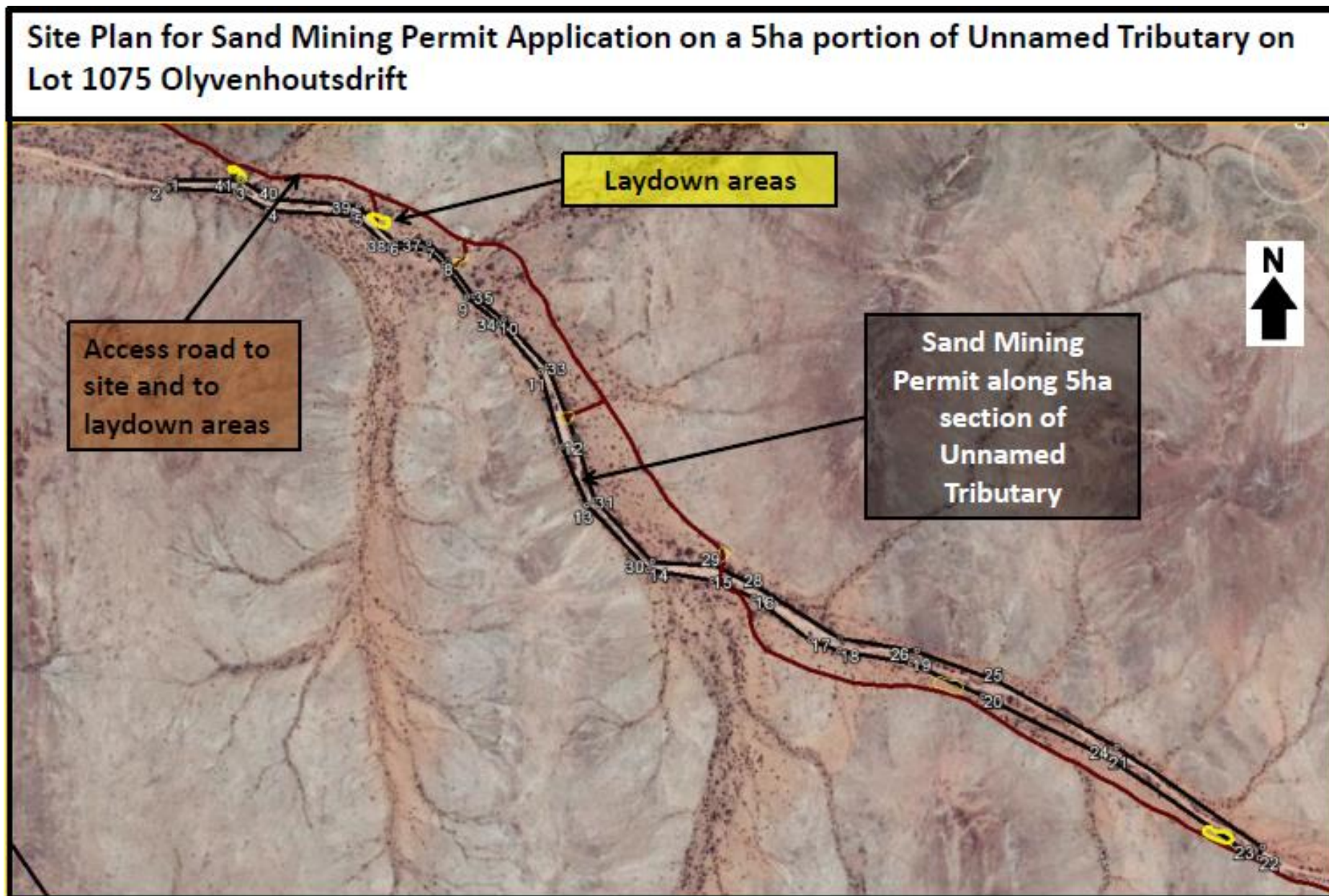


Diagram 3: Site Plan showing access to site and laydown areas



1.3.4 Project description

1.3.4.1 Construction Phase

Development of infrastructure and logistics

- Access and service roads
Access to the mine workings is via the R359 main road and existing farm tracks (**Diagram 2 and 3**). The existing farm tracks will be used as haul roads and will only be upgraded to facilitate haul trucks.
- Water supply
No process water is used in the mining process.
- Electrical supply
No electricity is used on the mining area.
- Logistics
No infrastructure will be required due to the simple mining method and only limited waste management facilities will be supplied consisting of the following:
 - Domestic waste is collected in plastic containers and transported daily to the company headquarters.
 - A temporary storage area for used lubrication products and other hazardous chemicals needs to be provided for the collection of the small volume of waste before it is removed to the company headquarters.
 - Only one 200-litre container is needed for the small amount of waste.
- Maintenance Oil/grease/diesel management systems will consist of the following:
 - Parking area with drip trays for stationary equipment to be provided outside the drainage channel.

1.3.4.2 Operational Phase

This operation will only involve the loading and hauling of raw river sand. Only one front end loader will be used for loading and hauling and no processing will take place. The only surface disturbance except for the mining excavation within the drainage channel will be a small stockpile area and parking for equipment outside the drainage channel.

The depth of the mining operations will be less than 2m as only the top layer of sand is mined. The total area under excavation will approximately be 4 Ha and sand will be removed over the total area. Backfilling is not an option as the sand is completely removed as it is washed in from upstream.

No industrial or mine waste is generated during the mining process. All material consisting mainly of river sand is removed from the seasonal drainage channel to a depth of 2m and sold as a FoT product. No processing is taking place except for limited stockpiling so no mining waste or overburden and FRD will be created.

Domestic or any other waste generated during the mining operation will be stored in a temporary storage area provided as part of the parking area from where it will be removed to the company HQ.

Only minor repairs are done on site. A PVC lining and drip trays are used during maintenance and accidental spills are cleaned up immediately by removing of the contaminated sand. The small volume of contaminated sand is sold with the rest of the sand to be used in the building industry. Only one FEL is used in the mining process that is transported to the company headquarters for major repairs.

1.3.4.3 Decommissioning and closure phase

Planning for closure and restoration from the beginning of an operation makes the process easier; waste can be removed as it is created, excavation can be planned so that topography restoration is less complicated, and topsoil can be re-use at shorter interval. Site rehabilitation can make the land more valuable and attractive for resale. Additionally, establishing a closure strategy (and communicating that activity to the public) can help enhance the company's reputation as a socially-responsible operation. The decommissioning and closure phase at the end of the life of the mine will consist of implementing this final rehabilitation, decommissioning and closure plan.

2 REGULATORY REQUIREMENTS

2.1 Legal requirements

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 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.

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 closure 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 thereof.

This will be achieved by leaving the drainage channel 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 access points to the drainage channel will be backfilled with the original material removed and profiled to blend in with the topography of the surrounding environment.

This key closure objective is divided in three closure objectives as stated below.

Objective 1 - To create a safe and rehabilitated post-mining environment

- Ensure safe mining area with no potentially dangerous areas like deep excavations.
- The site in the river bed is to be shaped and levelled at each stage of closure and rehabilitation.
- Topsoil to be stockpiled and replaced during decommissioning and closure, and rehabilitation.

Objective 2 - To minimise pollution or degradation of the environment

- Provide sufficient information and guidance to plan the sand mining activities in a manner that would reduce impacts as far as practically possible.
- Limit residual environmental impact with no surface water or soil contamination by ensuring that no fuel or oil spills occur in the mining area.
- Ensure that no solid waste or rubble is dumped on the site.

- Ensure that portable toilets are used.

Objective 3 – To minimise impacts on the community and to provide optimal post-mining social opportunities

- Ensure that workers remain within the mining permit area.
- Operate during normal working hours only.
- Minimise the generation of noise and dust.
- Respond rapidly to any complaints received.
- Minimal negative aesthetic impact
- Optimised benefits for the social environment

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 Risk sources

The risks sources and associated risks are listed below and the impact rating and mitigation actions of each risk are addressed in the risk assessment.

The risks associated with safety are deep and unstable excavations that can be detrimental to the safety and health of humans and animals. The risk can be regarded as insignificant given the extremely low rainfall in the area and small size of the excavations. The drainage channel is only in flood on average once a year and during flood events any excavations are filled naturally with sand washed in from upstream.

Due to the simple mining process that only include loading and hauling no unsafe areas like steep slopes that needs demarcation to prevent access by humans and animals will be created on site. No infrastructure, sub-surface voids, fine residue dams or evaporation ponds will be developed that can lead to potentially unsafe post-mining areas therefore no post mining access control would be required.

Another risk is the destruction of vegetation on the banks that will lead to scouring. The risk will be mitigated by shaping of the bank of the drainage channel and preventing destruction of vegetation on the banks to prevent scouring and restricting the depth of the excavations to less than 2m.

Another potential risk arising from the mining area after mine closure are changes in the quantity of surface water compared to pre-mining quantities that may negatively affect the area. To prevent significant negative effects the post-mining topography must be adjusted where possible to minimise the effect on water flow and increase potential for re-vegetation.

Actions to mitigate the risk of erosion and scouring is to ensure stability of the bank of the drainage channel by re-shaping and backfilling of the access point with suitable material where required.

No industrial or mine waste is generated during the mining process and all material consisting mainly of river sand will be removed from the site and sold as a FoT product. No processing will take place so no mining waste or overburden and fine residue dumps will be created with limited product stockpiles present on site.

There will also be a risk with regard to waste management practices leaving legacies and will require implementing of mitigation and management actions to limit the residual impact after mine closure.

3.2 Basic rehabilitation methodology

Objective 1 - To create a safe and healthy post-mining environment:

- Safe mining area (no potentially dangerous areas like deep excavations or securely fenced off)
 - Limit the depth of the excavation to a maximum of 2m deep.

- Maintaining the affected environment in a stable condition that will not be detrimental to the safety and health of humans and animals.
- Reinstatement original profile of the riverbank by back filling of access point with the original material excavated.
- Promote re-vegetation of bank with natural riparian vegetation.
- Minimise risk of erosion from either increased base flow or mining operations followed by prompt rehabilitation and maintenance of erosion events.
- Limited residual environmental impact (No surface and/or groundwater contamination, waste management practices not creating or leaving legacies with a landscape that reduces the requirement for long term monitoring and management)
 - No waste in the form of dumps or structures will remain on surface after mine closure
 - No development of infrastructure and services will take place and facilities at the company headquarters will be used.
 - Unwanted steel, sheet metal and equipment needs to be removed from the mining area on a daily basis and no salvage yard will be established.
 - No temporary storage area for used lubrication products and other hazardous chemicals will be developed and waste must be disposed of at a collection point at the company headquarters on a daily basis.
 - Existing farm roads must be used for mining operations and where not possible the new roads or will be kept to a minimum.
 - Provision must also be made for efficient storm water control to prevent erosion of roadways.
 - Equipment used in the mining process will be adequately maintained in the workshops available at the company headquarters so that during operations it does not spill oil, diesel, fuel, or hydraulic fluid.
 - Accidental petro-chemical spills if any must be cleaned up immediately by removing the spillage together with the polluted soil and by disposing of them at the soil farm of the company HQ.

Objective 2 - 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:

- Preventing attenuating or diverting any of the natural flow.
- Remove sand to the demarcated stockpile area with no stockpiling within the drainage channel
- Maintaining river-bank stability to be able to withstand high flow conditions.
- Prevent canalisation of the flow that can lead to scouring or erosion.
- Levelling of the river bed to prevent impeding and damming upstream.
- Topsoil must be removed from virgin areas to be disturbed and vegetation cleared, keeping disturbance to the native vegetation to an absolute minimum.
- Any topsoil removed from roads and stockpile area must be stored separately for later reuse.
- Topsoil borrowing from the virgin areas to cover disturbed areas will not take place.
- All topsoil which is removed prior to any activity will be stockpiled in berms (no higher than 1m) along with its resident seed bank and vegetation cover to an area above the proposed development.
- This berm will then serve a storm water control function in the unlikely event of surface water run-off.
- Movement of vehicles will be restricted to demarcated areas so as to keep the footprint of the mining operation to the absolute minimum.
- Movement of equipment must be restricted to existing roads and no ad hoc driving or turning outside demarcated loading and hauling areas will be allowed.
- All equipment and other items used during the mining operation needs to be removed from the site at final closure.
- All compacted areas due to stockpiling, loading and hauling will be ripped with erosion control measures.
- All stockpiles and leftover product must be removed or used to backfill the excavations
- Minimise the loss of land with agricultural potential: minimize footprint of disturbances to facilitate recovery of degrading patches into active patches through colonization of the patch by dispersing species (patch dynamics)
- Minimising footprint of disturbed areas including stockpile platforms and loading and hauling areas.
- Minimise loss of vegetation within the disturbance footprint: scarifying of all compacted areas as soon as possible for natural plant succession.
- Minimise disturbance of ecology due to loss of habitat and noise/visual/dust

Objective 3 – To minimise impacts on the community and to provide optimal post-mining social opportunities:

- Ensure that workers remain within the mining permit area.
- Operate during normal working hours only.
- Minimise the generation of noise and dust.
- Respond rapidly to any complaints received.
- Minimal negative aesthetic impact
 - Minimise visual disturbance.
 - 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, and will not be buried or burned on the site.
- Optimised benefits for the social environment
 - 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 EMPr 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.
 - Prevent long term changes in land use: revert back to grazing land where possible.

4 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, 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 and preparing the area for natural re-vegetation. 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.

5 RISK ASSESSMENT

5.1 Risk impact rating

ASSESSMENT CRITERIA	
NATURE	
Positive	Beneficial to the receiving environment
Negative	Harmful to the receiving environment
Neutral	Neither beneficial or harmful
EXTENT (GEOGRAPHICAL)	
Site	The impact will only affect the site
Local/ district	Will affect the local area or district
Province/region	Will affect the entire province or region
International and National	Will affect the entire country
CONSEQUENCE	
Loss/gain	The impact will result in loss or gain of resource
No loss/gain	The impact will result in no loss or no gain of resource
DURATION	
Construction period / Short term	Up to 3 years
Medium term	Up to 6 years after construction
Long term	More than 6 years after construction
PROBABILITY	
Definite	Impact will certainly occur (>75% probability of occurring)
Probable	Impact likely to occur (50 – 75% probability of occurring)
Possible	Impact may occur (25 – 50% probability of occurring)
Unlikely	Impact unlikely to occur (0 – 25% probability of occurring)
REVERSIBILITY	
Reversible	Impacts can be reversed though the implementation of mitigation measures
Irreversible	Impacts are permanent and can't be reversed by the implementation of mitigation measures
IRREPLACEABLE LOSS OF RESOURCES	
High	The impact is result in a complete loss of all resources
Medium	The impact will result in significant loss of resources
Low	The impact will result in marginal loss of resources
No Loss	The impact will not result in the loss of any resources
CUMULATIVE EFFECTS	
High	The impact would result in significant cumulative effects
Medium	The impact would result in moderate cumulative effects
Low	The impact would result in minor cumulative effects
SIGNIFICANCE RATINGS	
Very High	Major to permanent environmental change with extreme social importance.
High	Long term environmental change with great social importance.
Medium	Medium to long term environmental change with fair social importance.
Low	Short to medium term environmental change with little social importance.
Very low	Short-term environmental change with no social importance
None	No environmental change
Unknown	Due to lack of information
DEGREE TO WHICH IMPACT COULD BE AVOIDED/MANAGED/MITIGATED	
High	The impact could be significantly avoided/managed/mitigated.
Medium	The impact could be fairly avoided/managed/mitigated.
Low	The impact could be avoided/managed/mitigated to a limited degree.
Very Low	The impact could not be avoided/managed/mitigated; there are no mitigation measures that would prevent the impact from occurring.

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.

5.2 Risk Mitigation and Closure objectives

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 in section 3 needs to implemented, monitored and evaluated.

The aim with risk mitigation actions is to over time manage significant and medium risks to become insignificant, or at least medium and under control with management actions. Once achieved, a risk will continue to be monitored to confirm its insignificance rating as part of aftercare and maintenance as discussed in section 4.

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.

Financial provision is made in section 6 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.

The identified risks and their levels are listed together with their associated mitigating actions in Table 1.1 and 1.2.

Table 1.1: Risks, risk levels and mitigating actions: Construction Phase

IMPACTS AND ASPECTS	RISK LEVEL AFTER MITIGATION: PREFERRED AND ONLY ALTERNATIVE (SAND MINING ON 5HA PORTION OF UNNAMED TRIBUTARY ON LOT 1075 OLYVENHOUTSDRIFT SETTLEMENT)	MITIGATING ACTIONS
1. SOIL EROSION AND COMPACTION: The clearing of laydown areas for site establishment and clearing of existing vegetation will disturb the soil increasing the potential for soil erosion by wind and loss of soil in the event of rainfall. Soil compaction will result from repeated use of access tracks.	Low / Insignificant Risk	<ul style="list-style-type: none"> • After clearing, the affected area shall be stabilized to prevent any erosion or sediment runoff. Stabilized areas shall be demarcated accordingly. • Incremental clearing of ground cover should take place to avoid unnecessary exposed surfaces. • Reasonable measures must be undertaken to ensure that any exposed areas are adequately protected against the wind and stormwater run-off. • Top soil shall be removed separately and stockpiled separately from other soil base layers. • Stockpiles should ideally be located to create the least visual impact and must be maintained to avoid erosion of the material. • Topsoil storage areas must be convex and should not exceed 2m in height. • Topsoil must be treated with care, must not be buried or in any other way be rendered unsuitable for further use (e.g. by mixing with spoil) and precautions must be taken to prevent unnecessary handling and compaction. • In particular, topsoil must not be subject to compaction greater than 1 500 kg/m² and must not be pushed by a bulldozer for more than 50 metres. Trucks may not be driven over the stockpiles. • Reduce drop height of material to a minimum. • Temporarily halt material handling in windy conditions. • A speed limit of 30km/hour will be displayed and enforced through a fining system. All vehicle drivers using the access road and entering the site will be

		<p>informed of the speed limit.</p> <ul style="list-style-type: none"> • Compacted areas that are not required for access shall be scarified after use during decommissioning and rehabilitation.
<p>2. WATER RESOURCE FUNCTIONALITY IN A FEPA RIVER:</p> <p>The removal of sand from the river bank at the access points could impact on flow regime, water quality and quantity, and aquatic biota. The Unnamed Tributary is however, non-perennial and impacts will have little effect on water resource functionality as a whole.</p>	<p>Low / Insignificant Risk</p>	<ul style="list-style-type: none"> • Topsoil at access point to be removed prior during construction phase, and replaced during rehabilitation. • After clearing, the affected area shall be stabilized to prevent any erosion or sediment runoff. Stabilized areas shall be demarcated accordingly. • Incremental clearing of ground cover should take place to avoid unnecessary exposed surfaces. • Top soil shall be removed separately and stockpiled separately from other soil base layers. • Stockpiles should ideally be located to create the least visual impact and must be maintained to avoid erosion of the material. • Topsoil storage areas must be convex and should not exceed 2m in height. • Topsoil must be treated with care, must not be buried or in any other way be rendered unsuitable for further use (e.g. by mixing with spoil) and precautions must be taken to prevent unnecessary handling and compaction. • In particular, topsoil must not be subject to compaction greater than 1 500 kg/m² and must not be pushed by a bulldozer for more than 50 metres. Trucks may not be driven over the stockpiles. • Temporarily halt material handling in windy conditions. • Rehabilitation of the river banks at each access point as soon as that section of the river has been mined. • Compacted areas are to be scarified. • Shaping of river bank to be returned to original profile.
<p>3. LOSS OF NATURAL VEGETATION AND ECOLOGICAL FUNCTIONING IMPACTING ON LOCAL BIODIVERSITY IN AN CBA2 & ESA:</p> <p>Existing disturbed areas have been identified for laydown areas for site establishment. Clearing of existing vegetation in the river bed will result in the loss of vegetation and localized ecological functioning, however this vegetation consists of mostly alien invasive species.</p>	<p>Very Low / Insignificant Risk</p>	<ul style="list-style-type: none"> • Identify existing disturbed patches for laydown areas, and demarcate areas for clearing. Refer to Diagram 3 which indicates that existing farm tracks will be used, and disturbed areas have been earmarked for laydown areas. • Remove alien invasive vegetation and ensure ongoing alien vegetation clearing in the area. • All trees and vegetation removed from the drainage channel must be removed so that it does not wash up against fence lines blocking the flow and increasing the possibility of damage. • Flood events can be more intense with possible damage to fences crossing the drainage channel as the flow rate of water will increase in areas mined but as mitigation the mine will be responsible for the repair to all fences directly downstream of the mining operation. • No indigenous plants outside of the demarcated work areas may be damaged. • Identify protected tree species, and leave these intact, such as Camelthorn trees. • The noise and vibration caused by the earthmoving equipment will disturb smaller animals (e.g. snakes). These will move away whilst operations are in progress. Should any animals be encountered these should be moved away by a suitably trained nature conservation officer, if necessary.
<p>4. POTENTIAL FOR SOIL AND RIVER SAND CONTAMINATION AND SOLID WASTE POLLUTION</p>	<p>Low / Insignificant Risk</p>	<ul style="list-style-type: none"> • Oils and lubricants must be stored within sealed containment structures if kept on site. • Any mechanical equipment maintenance must be undertaken on drip trays or UPVC sheets to prevent spills/ leaks onto the soil. • When not in use, a drip tray must be placed beneath mechanical equipment and vehicles. • Machinery must be kept in good working order and regularly inspected for leaks. • A spill kit will be available on each site where mining activities are in progress. • Any spillages will be cleaned up immediately. • Waste materials generated on site must be stored in suitable lidded containers and removed off site to a suitable disposal facility.

		<ul style="list-style-type: none"> Waste separation must be undertaken if practical for recycling Provide all workers with environmental awareness training. Provide a bin at the site. Regularly dispose of any solid waste at a municipal waste disposal site. Ensure all workers comply with the requirements of the EMP. Provide a mobile ablution facility.
5. VISUAL INTRUSION: Caused by the front end loader, topsoil stockpiles, cleared areas, and movement of trucks on site. The site is however, remote and rural in nature with no receptors (people) as it is located on private property.	Very Low / Insignificant Risk	<ul style="list-style-type: none"> The laydown areas shall be kept neat and tidy at all times. Equipment must be kept in designated areas and storing/stockpiling shall be kept orderly. Restrict working hours to normal work day hours with no work over weekends when holidays occur to minimize hauling trucks along access roads.
6. EMISSIONS (DUST, VEHICLES & NOISE): Noise and dust will be created by mining equipment (e.g. front end loaders) and vehicles, which will emit Greenhouse Gases.	Very low / Insignificant Risk	<ul style="list-style-type: none"> The Contractor shall adhere to the local by-laws and regulations regarding the noise and associated hours of operations. The Contractor shall limit noise levels (e.g. install and maintain silencers on machinery). The provisions of SANS 1200A Sub clause 4.1 regarding "built-up" area shall apply to all areas within audible distance of residents whether in urban, peri-urban or rural areas. Construction and demolition activities generating output of 85dB or more, shall be limited to normal working hours and not allowed during weekends to limit the impact of noise of neighbours. Should the Contractor need to work outside normal working hours, the surrounding neighbours shall be informed prior to the work taking place. No amplified music shall be allowed on site. On public roads adjacent to the site vehicles shall adhere to municipal and provincial traffic regulations including speed limits. Vehicles used on site for the construction related activities shall be maintained and in a good working condition so as to reduce emissions. Stockpiles must be maintained (covered where necessary) to avoid wind erosion of the material. Incremental clearing of ground cover should take place to avoid unnecessary exposed surfaces.
7. HERITAGE, PALAEOLOGICAL AND CULTURAL IMPACTS	Low / Insignificant Risk	No mitigation required – See Appendix E1 and E2.
8. CREATION OF EMPLOYMENT & JOB SECURITY WITH LOCAL AND REGIONAL ECONOMIC SPIN-OFFS	Medium (+) / NO RISK	Employment of local previously disadvantaged labour wherever possible, with provision of training (upskilling)

Table 1.1: Risks, risk levels and mitigating actions: Operational Phase

IMPACTS AND ASPECTS	RISK LEVEL AFTER MITIGATION: PREFERRED AND ONLY ALTERNATIVE (SAND MINING ON 5HA PORTION OF THE UNNAMED TRIBUTARY ON LOT 1075 OLYVENHOUTSDRIFT SETTLEMENT)	MITIGATING ACTIONS
1. SOIL EROSION & SOIL COMPACTION: The sand mining process will disturb the river sand increasing the potential for fine particle suspension by wind. Soil compaction will result from repeated use of access tracks.	Low/ Insignificant Risk	<ul style="list-style-type: none"> After clearing, the affected area shall be stabilized to prevent any erosion or sediment runoff. Stabilized areas shall be demarcated accordingly. Incremental clearing of vegetation in river bed should take place to avoid unnecessary exposed surfaces. Reasonable measures must be undertaken to ensure that any exposed areas are adequately protected against the wind and stormwater run-off. Stockpiles should ideally be located to create the least visual impact and must be maintained to avoid erosion

		<ul style="list-style-type: none"> of the material. Reduce drop height of material to a minimum. Temporarily halt material handling in windy conditions. A speed limit of 30km/hour will be displayed and enforced through a fining system. All vehicle drivers using the access road and entering the site will be informed of the speed limit. Compacted areas that are not required for access shall be scarified after use during decommissioning and rehabilitation. Planting of indigenous vegetation in areas under rehabilitation.
<p>2. WATER RESOURCE FUNCTIONALITY IN A FEPA RIVER:</p> <p>The removal of sand from the river channel could impact on flow regime, water quality and quantity, and aquatic biota.</p> <p>The Unnamed Tributary is however, non-perennial and impacts will have little effect on water resource functionality as a whole, as there is no permanent surface water, and storm water run-off events are very seldom in the arid climate.</p>	Low/ Insignificant Risk	<ul style="list-style-type: none"> No equipment may be parked within the drainage channel when not in use. No stockpiling to take place within the drainage channel. Shaping of river bed to avoid diversion of stormwater towards banks to prevent erosion of river banks, and to prevent channeling of water that would increase erosive capacity of stormwater. Sand will be washed from upstream to the mining site over time.
<p>3. LIMITED LOSS OF NATURAL VEGETATION AND DISTURBANCE OF CBA2 & ESA AREA:</p> <p>The clearing of existing vegetation in the river bed will result in the loss of vegetation and localized ecological functioning. However, the existing vegetation is mostly alien invasive species and biodiversity will improve as a result. Transport of materials will be along existing access tracks resulting in little impact on ecological functioning at a local level during the operation phase. The Front End Loader will disturb local fauna.</p>	Low/ Insignificant Risk	<ul style="list-style-type: none"> Identify existing access tracks. Refer to Diagram 3, which indicates that existing farm tracks will be used. Demarcate areas for clearing in the river bed. The mining area and stockpile areas must be demarcated and the footprint contained within the demarcated area. Mining areas to be limited to blocks of 500m at a time with rehabilitation of the bank and access areas required before moving upstream to the next block. The annual rehabilitation plan must be implemented. Remove alien invasive vegetation, and ensure ongoing alien vegetation clearing in the area. All trees and vegetation removed from the drainage channel must be removed so that it does not wash up against fence lines blocking the flow and increasing the possibility of damage. Flood events can be more intense with possible damage to fences crossing the drainage channel as the flow rate of water will increase in areas mined but as mitigation the mine will be responsible for the repair to all fences directly downstream of the mining operation. No indigenous plants outside of the demarcated work areas may be damaged. Identify protected tree species, and leave these intact, such as Camelthorn trees. The noise and vibration caused by the earthmoving equipment will disturb smaller animals (e.g. snakes). These will move away whilst operations are in progress. Should any animals be encountered these should be moved away by a suitably trained nature conservation officer, if necessary.
<p>4. POTENTIAL FOR SOIL AND RIVER SAND CONTAMINATION AND SOLID WASTE POLLUTION</p>	Low/ Insignificant Risk	<ul style="list-style-type: none"> Oils and lubricants must be stored within sealed containment structures if kept on site. Any mechanical equipment maintenance must be undertaken on drip trays or UPVC sheets to prevent spills/ leaks onto the soil. When not in use, a drip tray must be placed beneath mechanical equipment and vehicles. Machinery must be kept in good working order and regularly inspected for leaks. A spill kit will be available on each site where mining activities are in progress. Any spillages will be cleaned up immediately. Waste materials generated on site must be stored in suitable lidded containers and removed off site to a suitable disposal facility.

		<ul style="list-style-type: none"> Waste separation must be undertaken if practical for recycling Provide all workers with environmental awareness training. Provide a bin at the site. Regularly dispose of any solid waste at a municipal waste disposal site. Ensure all workers comply with the requirements of the EMPr. Provide a mobile ablution facility.
5. VISUAL INTRUSION: Caused by the front end loader, topsoil stockpiles, cleared areas, and movement of trucks on site. The site is however, remote and rural in nature with no receptors (people) as it is located on private property.	Very Low / Insignificant Risk	<ul style="list-style-type: none"> The laydown areas shall be kept neat and tidy at all times. Equipment must be kept in designated areas and storing/stockpiling shall be kept orderly. Restrict working hours to normal work day hours with no work over weekends when holidays occur to minimize hauling trucks along access roads.
6. EMISSIONS (DUST, VEHICLES & NOISE): Noise and dust will be created by mining equipment (e.g. front end loaders) and vehicles, which will emit Greenhouse Gases.	Very Low / Insignificant Risk	<ul style="list-style-type: none"> Ensure sand hauling is during normal working hours and not on weekends No amplified music shall be allowed on site. On public roads the vehicles shall adhere to municipal and provincial traffic regulations including speed limits. Vehicles used on site for the construction related activities shall be maintained and in a good working condition so as to reduce emissions.
7. HERITAGE, PALAEOLOGICAL AND CULTURAL IMPACTS	Low / Insignificant Risk	No mitigation required – See Appendix E1 and E2.
8. CREATION OF EMPLOYMENT & JOB SECURITY WITH LOCAL AND REGIONAL ECONOMIC SPIN-OFFS	Medium (+) NO RISK	Employment of local previously disadvantaged labour wherever possible, with provision of training (upskilling)

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

Table 2: Objective Evidence and Closure Criteria

Closure objective	Document scope	Author	Success criteria to be achieved (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 to be 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 and scouring due to flood event and storm water and sheet flow	Independent EAP	Post-mining area to be declared stable by DMR
	Assessment of the completeness of removal of mine waste	Independent EAP	Final performance assessment report to declare 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 to be declared safe by DMR
Increase in biodiversity	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 will need to be comparable to that of the adjacent virgin area
Soil stability	Monitoring results of erosion on steep slopes (20% gradient) and disturbed areas	Independent EAP	At the time of closure, soil loss will need to be stabilised over the whole previously disturbed area

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 to be consistently on par with legislative standards after completion of demolition activities. All incidents older than 90 days to be investigated and feedback given to complainant
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6 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.

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

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
- All vehicles and equipment will be removed for salvage or resale
- A hazardous disposal site will not be constructed and all hazardous waste will be removed from site and transported to the company headquarters.
- Existing tracks will be used and new tracks must be restricted to the absolute minimum.
- All compacted areas due to hauling and stockpiling must be ripped to 300 mm
- The stockpile areas will not exceed the planned area footprint
- 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
- It is assumed that levelling of the river bed to prevent impeding and damming upstream will be addressed as part of the operation and necessary remedial actions implemented prior to closure
- The general approach adopted for the drainage channel is to prevent attenuating or diverting any of the natural flow and reinstating the original profile of the access points and ensuring the hydrological integrity of the area.
- Topography to follow the original landform shape.

6.2 Quantified Closure elements

Reinstate original profile of the riverbank by back filling of access point with the original material excavated
Promote re-vegetation of bank with natural riparian vegetation (ripping & levelling)
Maintaining river-bank stability
Prompt rehabilitation and maintenance of erosion events
Preventing attenuating or diverting any of the natural flow
Prevent canalisation of the flow
Levelling of the river bed to prevent impeding and damming upstream

1Ha Cost factor 1

0.5Ha Cost factor 2
part of annual rehab plan
part of annual rehab plan
part of annual rehab plan
part of annual rehab plan
part of annual rehab plan

Area covered by normal surface disturbance roads (ripping & levelling)	1Ha	Cost factor 2
Compacted area - Stockpile and hauling area (ripping & levelling)	2.5Ha	Cost factor 2
Final clean-up	5Ha	Cost factor 3

6.3 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 earthmoving equipment rental and various other consumables. Rates used are industry related.

Equipment

Excavator Cat 336D @ R 776.77/h X8hours + R2000.00 delivery & fuel	R8214.16/day
Grader Cat 140K	R 1 000.00/h
Tipper Truck 15m ³	R 500.00/h
B25 dumper Cat 740B	R1400.00/h
Loader Cat 962H	R 900.00/h
Manual labour	R 24.34/h

- **Cost factor 1 - Reinstate topography of access points**

Total Cost per Ha	R2053.54
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- **Cost factor 2 - Level and rip compacted areas**

Total Cost per Ha	R1000.00
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- **Cost factor 3 - Final clean-up**

Total Cost per Ha	R76.04
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6.4 Total estimated cost for requirements to fully decommission the mining site at final closure

Closure Element Mitigating measures	Unit	No Units	Unit Cost	Cost per Element
Remove all stockpiles	Ha	2.5	R2,053.54	R5,133.85
Compacted area - Stockpile and hauling area (ripping & levelling)	Ha	2.5	R1,000.00	R2,500.00
Area covered by normal surface disturbance roads (ripping & levelling)	Ha	5	R1,000.00	R5,000.00
Spread topsoil dumps over ripped areas	Ha	5	R2,053.54	R10,267.70
Reinstate original profile of the riverbank by back filling of access points with the original material excavated	Ha	1	R2,053.54	R2,053.54
Promote re-vegetation of bank with natural riparian vegetation (ripping & levelling)	Ha	2	R1,000.00	R2,000.00
Prompt rehabilitation and maintenance of erosion events	Refer annual rehab plan			
Preventing attenuating or diverting any of the natural flow	Refer annual rehab plan			
Prevent canalisation of the flow	Refer annual rehab plan			
Levelling of the river bed to prevent impeding and damming upstream	Refer annual rehab plan			
Final clean-up	Ha	5	R76.04	R380.20
Annual rehabilitation plan	Year 1			R14,750.00
Total financial provision required to fully decommission and rehabilitate the mining operation				R42,085.29

7 THE PUBLIC PARTICIPATION PROCESS

7.1 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 (I&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 sand mining operation public consultation process is to inform 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.

7.2 Stakeholder Identification and Project Data Base

Existing databases 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 govern the PPP:

- Key stakeholder groups and the general public comprise 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 have been taken to ensure that stakeholder input into the project is relevant and representative.
- Stakeholders have been made aware of their objectives and role in the process,
- An efficient communication and feedback mechanism has been followed during the process to ensure that all stakeholders are kept informed of progress.

Stakeholders were drawn from the sectors outlined below:

- National (DWS, DMR), Provincial (DENC, DALR)
- Local Government (Local and District Municipalities)
- National Department of Transport
- SAHRA

Names of persons and organisations will be added to or deleted from the database where appropriate.

8 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.