APPENDIX D

Final Rehabilitation, Decommissioning and Mine Closure Plan Including Environmental Risk Assesement

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10131MR

Portions of Portion 1 and 4 Farm Nous West 76

CONTENTS

1 INTRODUCTION 1
1.1 The annual rehabilitation plan 1
1.2 Final rehabilitation, decommissioning and mine closure plan 1
1.3 Environmental risk assessment report 1
2 CONTEXT OF THE PROJECT 2
2.1 Issues that have guided the development of the plan 2
3 MINE PLAN AND SCHEDULE 3
3.1 Mine plan 3
3.2 Project Description 3
3.2.1 Construction phase 4
3.2.2 Operational phase 4
3.2.3 Decommissioning and closure phase 4
3.3 Mine design map 8
3.4 Environmental Authorisation (EMP) requirements 15
3.5 Basic rehabilitation methodology and closure strategy 17
3.5.1 Infrastructure and Logistics areas 17
3.5.2 Quarry and waste dumps 17
4 Risk Assessment 18
4.1 Risk sources 18
4.1.1 Infrastructure and Logistics areas 18
4.1.2 Quarry and waste dumps 18
4.2 Risk Identification 19
4.2.1 Potential Risks with regard to Safe excavations 19
4.2.2 Potential Risk of residual environmental impact 19
4.2.3 Potential Risks with regard to viable and sustainable land 20
4.2.4 Potential Risks with regard to stable, free draining post mining landform 20
4.2.5 Potential Risks with regard to benefits for the social environment 20
4.2.6 Potential Risks with regard to aesthetic impact 21
5 Risk ASSESSMENT 22
5.1 Risk impact rating 22
5.2 Risk Mitigation and Closure objectives 23
6 Estimated cost for requirements to fully decommission the site 30
6.1 Calculation of Closure cost 30
6.2 Calculation of Closure cost 31
6.3 Quantified Closure elements 33
6.4 Total estimated cost for requirements to fully decommissioned the mining site at final closure 35
7 The Public Participation Process 38
7.1 Principles and Objectives 38
7.2 Stakeholder Identification and Project Data Base 38
8 Way Forward 39

1 INTRODUCTION

This document serves to comply with regulation 6 of the NEMA Financial Regulations (2015) that states that 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.

1.1 The annual rehabilitation plan

The annual rehabilitation plan provide for concurrent or progressive rehabilitation 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.

The objective of the annual rehabilitation plan is to─

- review concurrent rehabilitation and remediation activities already implemented;
- establish rehabilitation and remediation goals and outcomes for the forthcoming 12 months, which contribute to the gradual achievement of the post-mining land use, closure vision and objectives identified in the holder's final rehabilitation, decommissioning and mine closure plan;
- establish a plan, schedule and budget for rehabilitation for the forthcoming 12 months;
- identify and address shortcomings experienced in the preceding 12 months of rehabilitation; and
- evaluate and update the cost of rehabilitation for the 12 month period and for closure, for purposes of supplementing the financial provision guarantee or other financial provision instrument.

Taking into acount the objective of the annual rehabilitation plan it is clear that it cannot form part of the environmental management programme to be submitted in terms of section 24N of the Act and the Environmental Impact Assessment Regulations, 2014 but will be submitted on an annual basis as part of the environmental audit report in terms of Regulation 34 (1)(b) of the NEMA EIA Regulations (2014).

1.2 Final rehabilitation, decommissioning and mine closure plan

According to the NEMA Financial Regulations the final rehabilitation, decommissioning and mine closure plan will form a component of the environmental management programme to be submitted in terms of section 24N of the Act and the Environmental Impact Assessment Regulations, 2014 and will be subjected to the same requirements of the environmental management programme with regards opportunities for stakeholder review and comment as well as auditing.

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.

1.3 Environmental risk assessment report

According to the NEMA Financial Regulations the environmental risk assessment report will also form a component of the environmental management programme to be submitted in terms of section 24N of the Act and the Environmental Impact Assessment Regulations, 2014 and will be subjected to the same requirements of the environmental management programme with regards opportunities for stakeholder review and comment as well as auditing.

The objective of the environmental risk assessment report is to─

- ensure timeous risk reduction through appropriate interventions;

- identify and quantify the potential latent environmental risks related to post closure;
- detail the approach to managing the risks;
- quantify the potential liabilities associated with the management of the risks; and
- outline monitoring, auditing and reporting requirements.

This document then fulfill the requirements of both the Final rehabilitation, decommissioning and mine closure plan and the Environmental risk assessment report

2 CONTEXT OF THE PROJECT

2.1 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 operations were placed in local newspapers to notify I&AP’s about the intended projects 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
- 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 4 and 5 of this plan. This plan also describes how these objectives are planned to be met and elaborate on the implementation of certain risk mitigation actions (section 6). 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.

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. 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.

3 MINE PLAN AND SCHEDULE

3.1 Mine plan

The Nous West Granite Mining Right area is situated over portions of Portion 1 and Portion 4 of the Farm Nous West 76. The operation is situated in the Namakwa District Municipality and Khai-Ma local authority of the Kenhardt administrative district of the Northern Cape.

- Portion 1 of the Farm Nous West 76 is registered in the name of Pieta & Fanie Boerdery CC by virtue of deed T65170/2007 and
- Portion 4 of the Farm Nous West 76 is registered in the name of Nelsrust Trust by virtue of deed T64629/1997.

The area is situated of the N14 main road 80Km east of Pofadder and 92Km west of Kakamas with an approximate locality for Block 1 at Latitude S28.69473° and Longitude E19.79381° and Block 2 at Latitude S28.65958° and Longitude E19.75528° (Diagram 1&2).

The Springbok, Upington Main Road (N14) provide excellent access to the mining operation. The turn-off from the N14 to the mine headquarters of Sizisa is 46 km east of Pofadder.
High voltage power lines run through the properties, but no end-user electricity outlet is available and electricity supply is by mobile generators.
Process and potable water is obtained from boreholes on the property with collection sumps for the recycling of process water used to cool the saws used for cutting of the granite blocks. Water is stored in plastic tanks. Most of the logistics for all this operation is supplied at the company HQ that were developed as part of farm improvements and that will not form part of this final rehabilitation, decommissioning and closure plan in terms of section 44(c) of the MPRDA.

3.2 Project Description

Dimension stone is a collective term for various natural stones used for structural or decorative purposes in construction and monumental applications. The defining feature of dimension stone is that unlike other mineral commodities which have value mainly as a result of their physical properties, the physical properties of a rock are merely the minimum qualification in determining whether it is fit for use in dimension stone applications. The ultimate success in marketing a natural stone as a dimension stone lies firstly in its appearance, and secondly in the possibility of producing rectangular blocks of suitable dimensions (hence the term dimension stone) to allow for successful production of the final product in the required sizes.
Dimension stone can be defined as “naturally occurring rock material cut, shaped or selected for use in blocks, slabs, sheets or other construction units of specialised shapes and sizes”. A dimension stone block thus has value as a result of its dimensions and appearance, underlain by a set of minimum physical properties (among these are various strength parameters, workability, ability to take a polish, and resistance to physical and chemical weathering) (Ashmole I, Motloung M, 2008).
This defining feature, together with the set of minimum physical properties required has important implications in terms of the environmental impacts of dimension stone mining, as well as the management thereof. Indeed, when it is the intention to merely blast and remove stone for its physical properties (such as in crushed aggregate or ore mining), recovery can be almost 100% of the volume removed, while when the same stone is quarried with the intention of producing dimension stone blocks, recovery of saleable blocks is typically between 3% and 60%. This results in large quantities of waste rock which need to be disposed of, with resulting environmental implications.
The physical properties required of a successful dimension stone also have significant environmental implications – due to the requirement for inert materials which are not affected by weathering (and in today’s context, the effect of severe chemically polluted atmospheric environments), dimension stone residues are typically benign from a pollution point of view. Like natural aggregates, dimension stone is used in its natural state, and does not require concentration and extraction from an ore. It is these latter two processes that result in significant environmental impacts such as acid mines drainage and other toxic effects associated with many of the metal extraction industries.
This mining operation can be classified as quarrying the open, or surface excavation of granite. Quarrying start from the earth's surface and maintain exposure to the surface throughout the extraction period. For both access and safety, the excavation usually has stepped or benched side slopes.
Quarrying methods depend mainly on the desired size and shape of the stone and its physical characteristics and the main equipment used is diamond saws (Rotary saws). Diamond saws are large diamond-impregnated circular blades up to 2 m in diameter that are used to form vertical cuts in the rock by moving the machine along a guideline or rail. Extremely accurate cuts can be made in this way. Wire

saws are also used. These consist of several pulleys over which passes an endless carborundum or diamond-impregnated steel wire.

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

3.2.1 Construction phase

The company has a lease agreement with the landowner for all logistical facilities like workshops and secure storage as well as accommodation that serves as the company HQ and only satellite logistics are provided at the quarries. The infrastructure areas will be discussed as part of the specific quarry but will consist mainly of pre-fabricated buildings, mobile containers and temporary logistical facilities and no permanent infrastructure will be developed. Only existing farm tracks will be used and upgrading of the tracks will be done as part of the construction phase and maintenance as part of the operational phase.

3.2.2 Operational phase

Granite mining is depending on market demand for specific colors that can change within relative short period of time. Different quarries each with a specific color therefore needs to be available although not all of them will be active on the same time depending on the current market trend.

The operations at the separate quarries will be as part of the specific quarry but the mining method for all of them would be the same and consist of:

- The establishment of a flat floor through the use of diamond wire saws.
- The flat floor is then fitted with parallel rails which serve the rotary saws which cut blocks from the ore body with less waste than other systems. The saws have a diameter of 3-4m and for purposes of planning are deemed to have a cutting depth of 1.7m.
- The bottom of the blocks is separated by small diameter plug and feather technique.
- The raw cut block is lifted out of the hole and placed for transport by block carrying front end loader to the dressing area.
- At the dressing area, the block is neatened up through removal of any protuberances and the 1st grade blocks is then transported to the dispatch yard and the 2nd grade blocks to a separate stockpile area.
- Waste blocks and offcuts are transport by block carrying front end loader to the waste rock dump. Excavators are used to keep the top of the waste dump level to promote traffic ability.

3.2.3 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 soil 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.

Diagram 1: Locality of mining area showing nearby Towns and Major routes

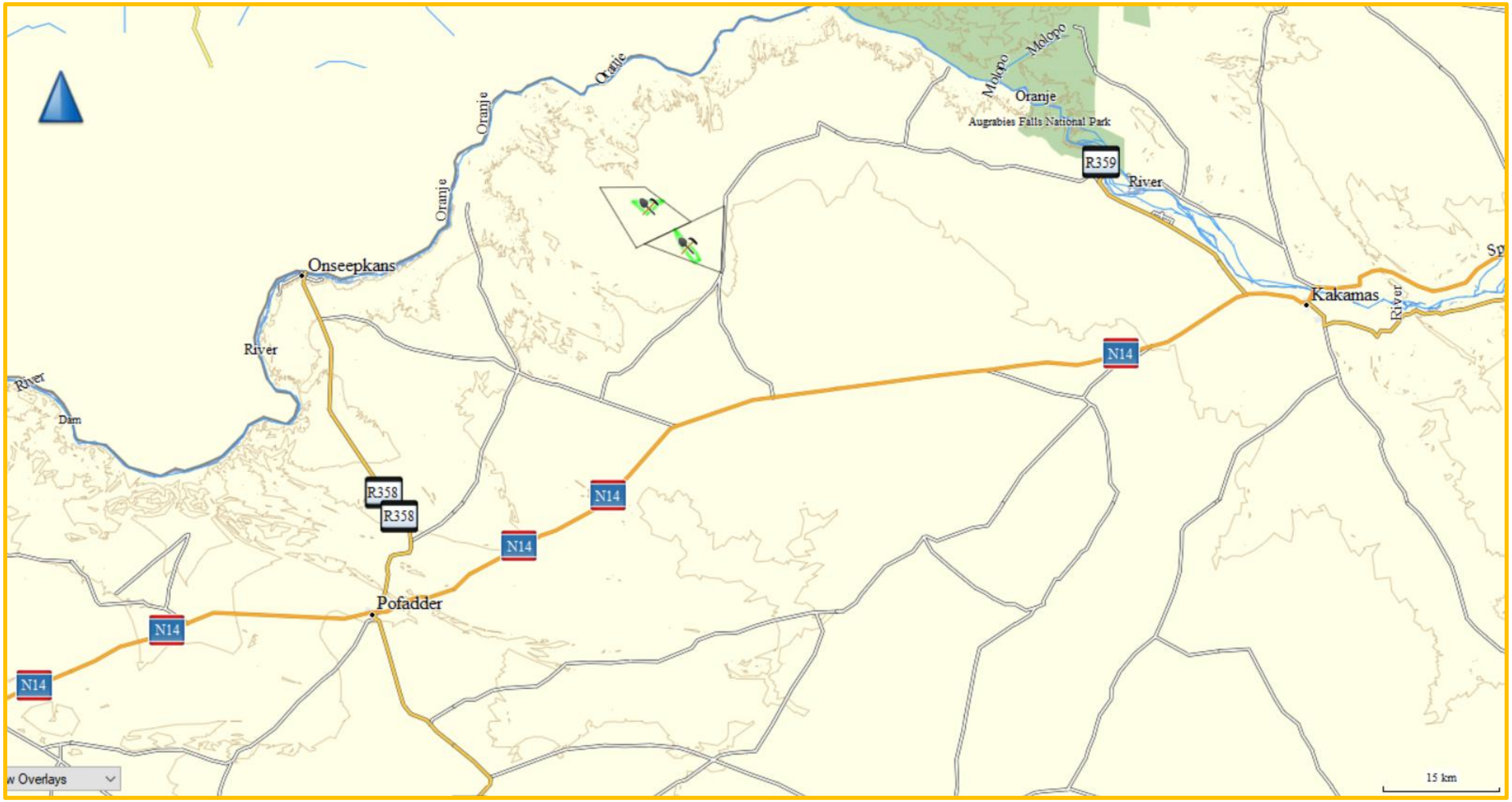
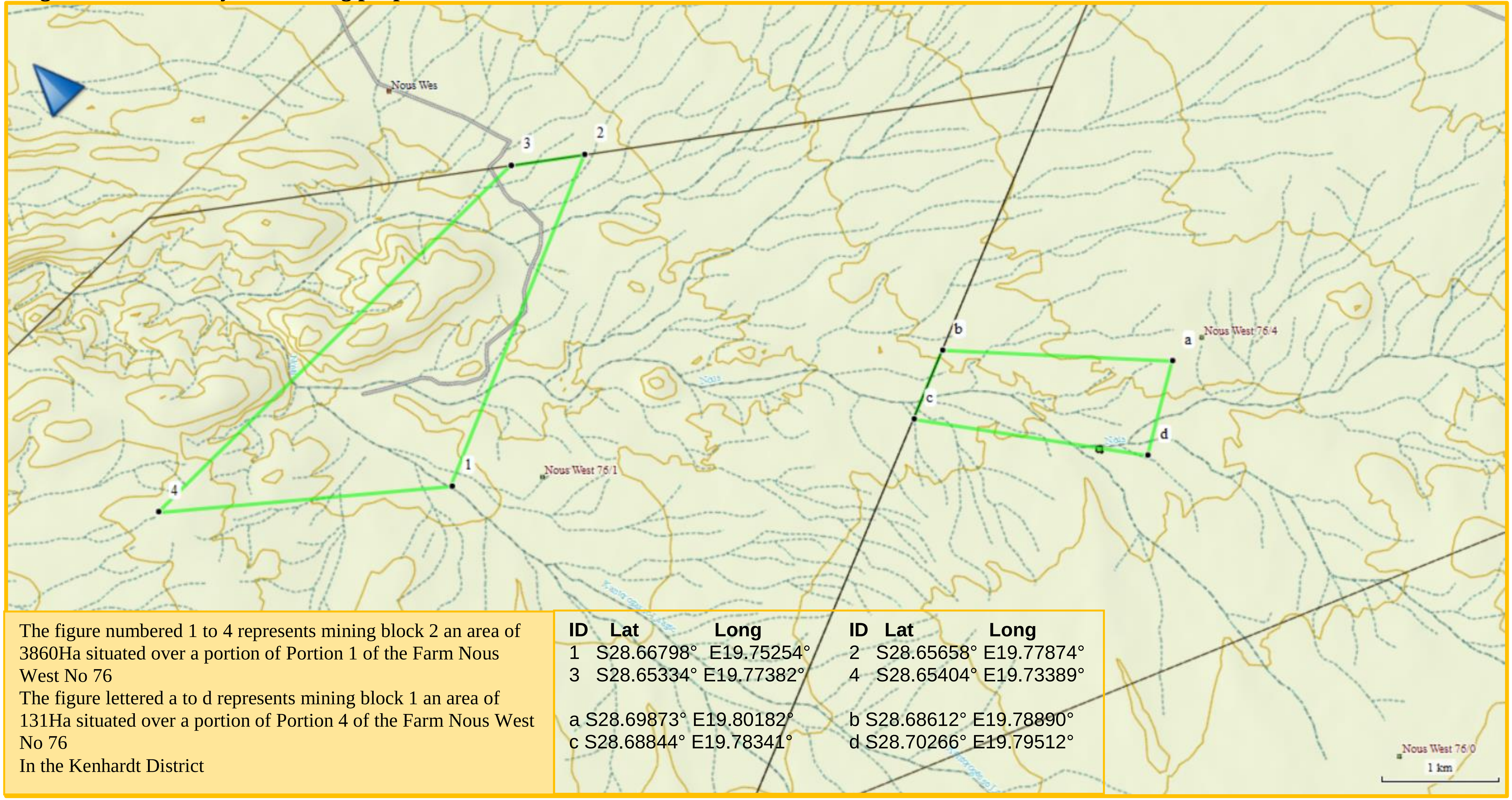


Diagram 2a: Mine Layout showing properties and co-ordinates



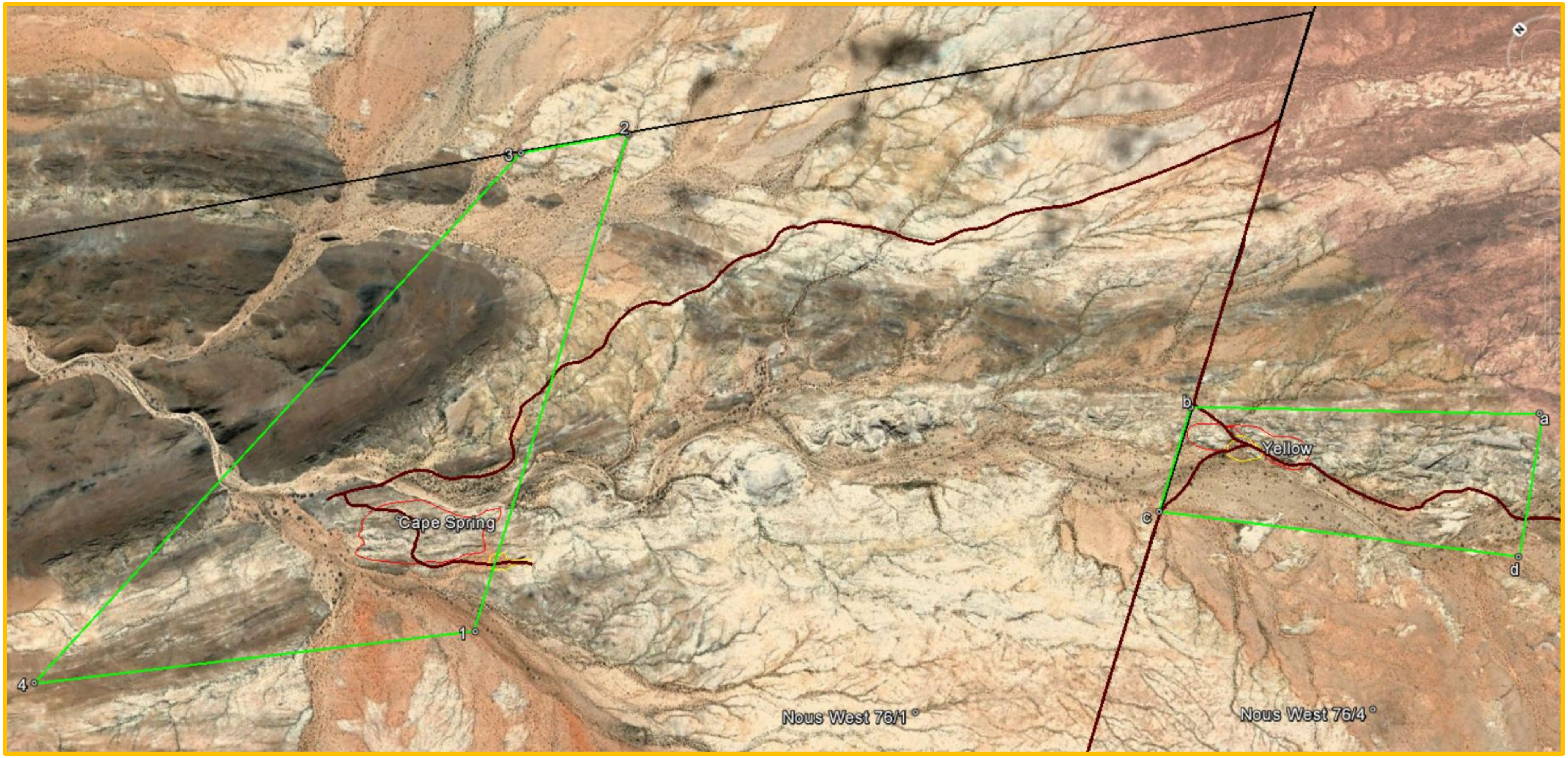
The figure numbered 1 to 4 represents mining block 2 an area of 3860Ha situated over a portion of Portion 1 of the Farm Nous West No 76

The figure lettered a to d represents mining block 1 an area of 131Ha situated over a portion of Portion 4 of the Farm Nous West No 76

In the Kenhardt District

ID	Lat	Long	ID	Lat	Long
1	S28.66798°	E19.75254°	2	S28.65658°	E19.77874°
3	S28.65334°	E19.77382°	4	S28.65404°	E19.73389°
a	S28.69873°	E19.80182°	b	S28.68612°	E19.78890°
c	S28.68844°	E19.78341°	d	S28.70266°	E19.79512°

Diagram 2b: Mine Landscape showing mineral resource location of infrastructure (yellow) and quarries (red)



3.3 Mine design map

Diagram 3a: Yellow 1 Quarry Resource map

Phase l: A flat floor has already been developed as part of small-scale mining.

Phase 2: Assume the flat floor is obtained at level 703m. Such floor is lowered by just 2 cuts to level 700m yielding a production (ROM) of 33000m³.

Phase 3: Lower entire floor (all now at 700m) by further 6m to yield a further (ROM) of 84 000m³.

Phase 4: At this stage no sub surface mining is planned.

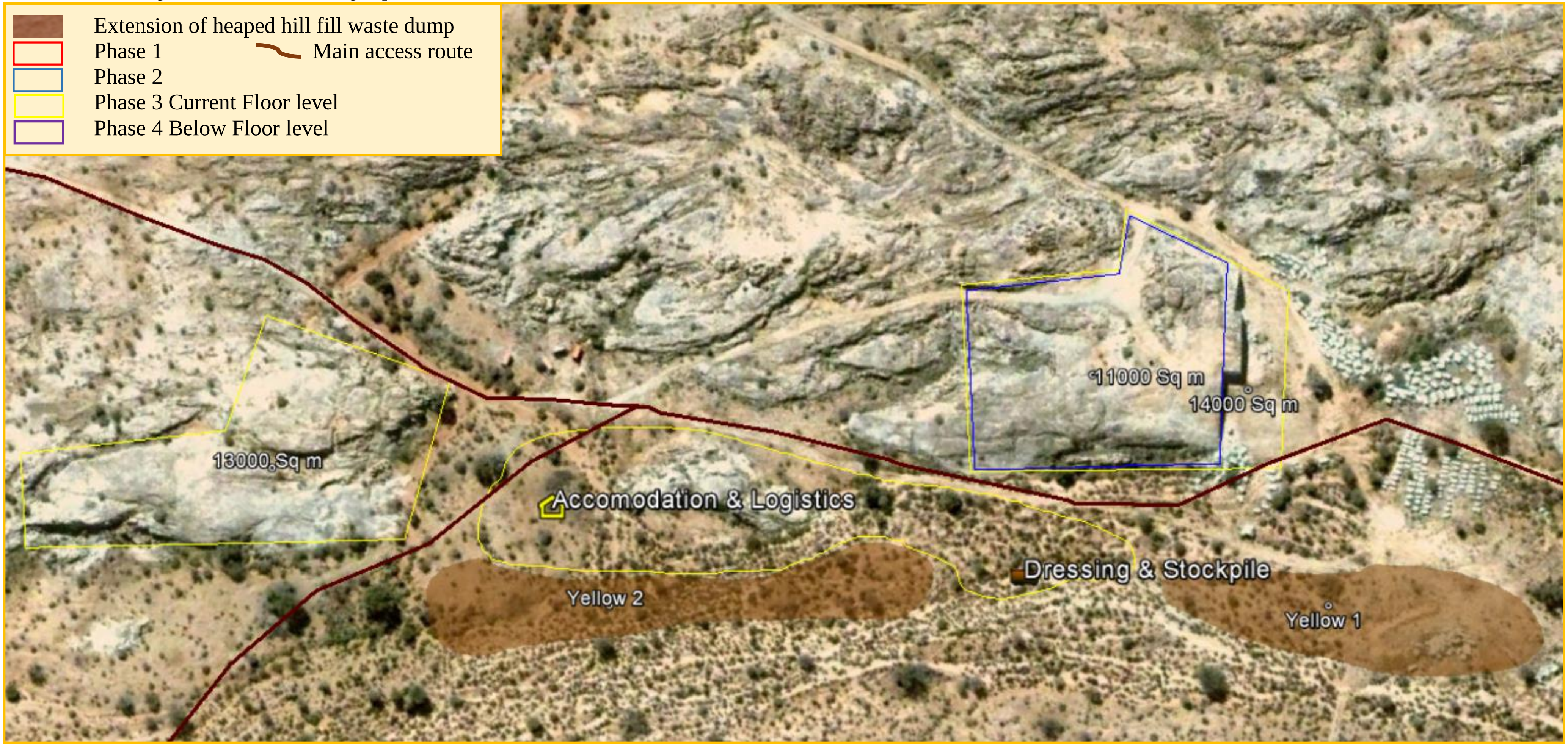


Diagram 3a-1: Yellow 1 Existing Quarry

Diagram 3a-2: Yellow 1 Quarry Resource map

Diagram 3b: Yellow 2 Quarry Resource map

Phase l & 2: A flat floor has already been developed as part of small-scale mining.
Phase 3: Lower entire floor by further 6m to yield a further (ROM) of 78 000m³.
Phase 4: At this stage no sub surface mining is planned.

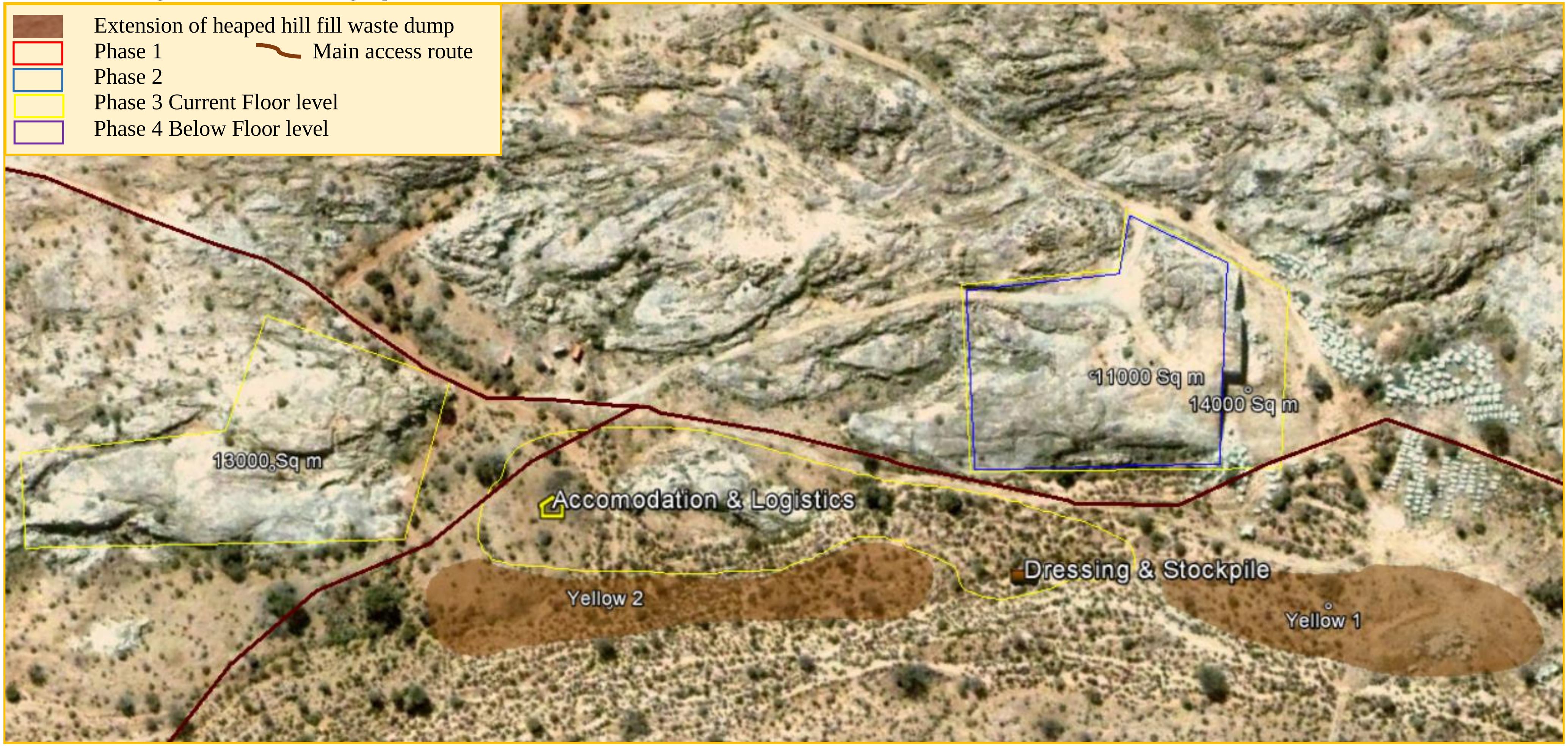


Diagram 3b-1: Yellow 2 Existing Quarry

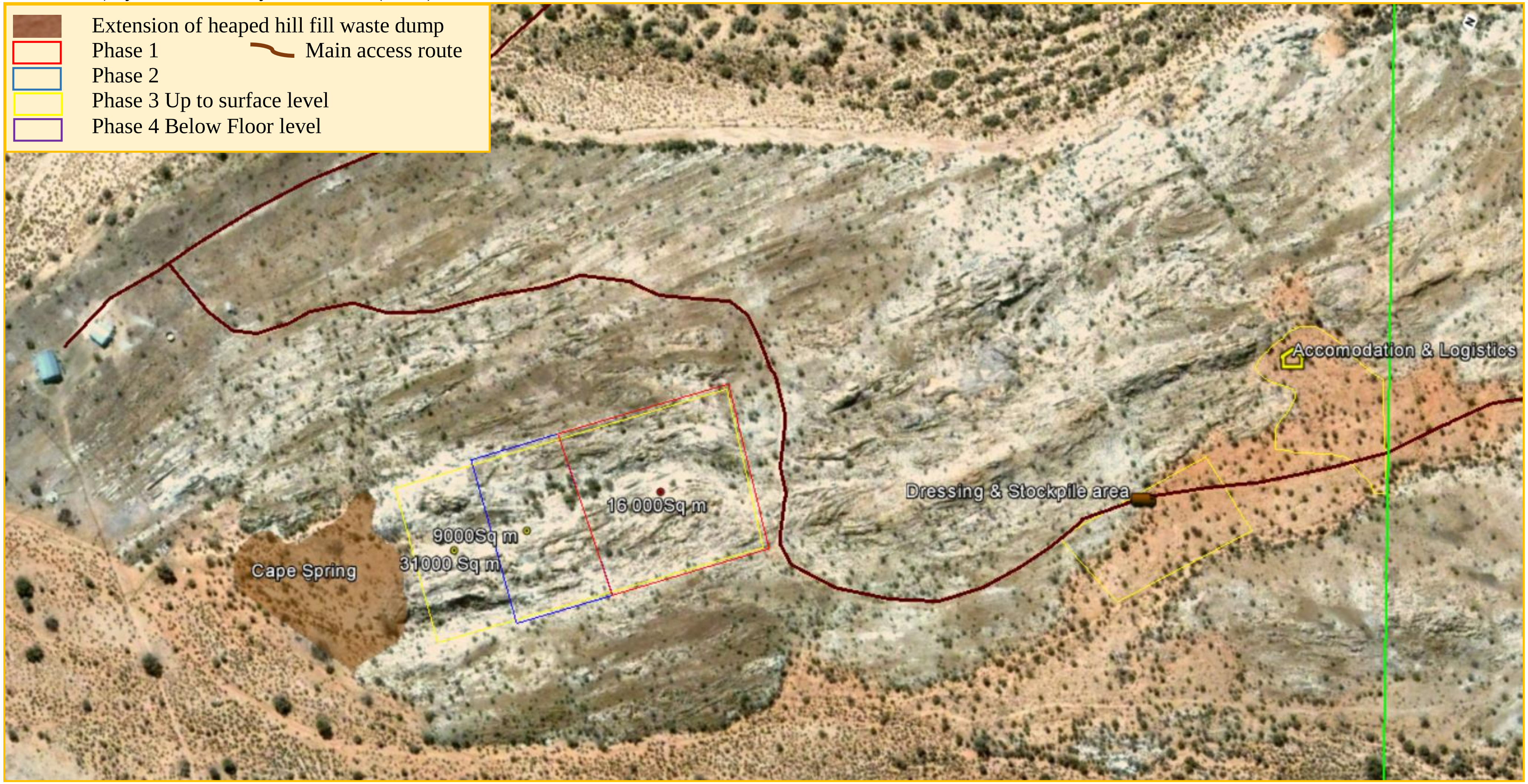
Diagram 3b-2: Yellow 2 Existing Quarry

Diagram 3c: Cape Spring Quarry Resource map

Phase l: Create a flat floor at level 650m. This material is regarded as overburden and dumped as waste with minimal saleable blocks obtained.

Phase 2: Assume the flat floor is obtained at level 648m with most of this material regarded as overburden and only yielding a production (ROM) of 65 000m³.

Phase 3: Assume the flat floor is obtained at level 646m with most of this material regarded as overburden and only yielding a production (ROM) of 180 000m³. Phase 4: Lower entire floor (all now at 646m) by further 10m to yield a further (ROM) of 310 000m³.



3.4 Environmental Authorisation (EMP) requirements

The key closure objective described in the plans submitted as part of the EMP 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 main closure objective 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. This key closure objective is now divided in three closure objectives as stated below with their supported suite of key mitigating activities. The closure objectives and mitigating activities stated below are still in agreement with those in the original 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 the sections below can be summarised as follow:

- 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 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
    - Prevent long term changes in land use by implementing prompt rehabilitation and maintenance of disturbances when possible as part of annual rehabilitation plan.
  - ➢ Stable, free draining post mining landform
    - Prevent alteration or diverting natural drainage lines and reduced natural runoff.
    - Prevent concentration of runoff, mixing of clean runoff with contaminated runoff and creation of large open water bodies.
- Objective 3 – To provide optimal post-mining social opportunities
  - ➢ Optimised benefits for the social environment
    - Positive and transparent relationships with stakeholders and maintaining communication channels, providing stakeholders including government authorities with relevant information as per legislative requirements.
    - Undertaking environmental management according to approved EMP and Closure plans and regular auditing of the environmental management system.
  - ➢ Minimal negative aesthetic impact
    - Mitigate the nuisance effects of air emissions (dust), visual intrusion and the cumulative effect of a raise in the ambient noise levels
    - Prevent disturbance of archaeological sites and implement mitigating measures according to the archeological assessment.

From the point of view of the environmental impact created, dimension stone mining is a relatively benign industry. There are no emissions besides those of the diesel powered earthmoving equipment utilised in its extraction and a small amount of blasting gases. Contamination of water resources is only likely in the event of petrochemical spillages from storage facilities and equipment, and these can largely be either prevented or cleaned up effectively.

Similarly, mining methods themselves generally have a low impact on the surrounding environment due to the need to carefully extract large blocks or slabs without damage to the stone. Recent advances in dimension stone mining technology have also had the effect of reducing environmental impacts. Particularly in granites, improvement in diamond wire sawing and rotary saw efficiency has significantly reduced the use of explosives in the extraction of blocks. This has resulted in higher recovery of saleable blocks and therefore less waste to be disposed of, as well as reducing the emissions of blasting gases (S02 and NOX), noise and ground vibration.

According to Ashmole and Motloung (2008) the major environmental impacts are of a visual nature, while in sensitive areas, habitat destruction and the destruction of archaeological heritage may become significant impacts but as the environmental impacts is often highly visible in comparison with the environmental impacts of other industries the attitude of the general public is based on the erroneous assumption that adverse visual impact is the same as severe environmental impact. In this regard, the study in Australia suggesting that mining was responsible for 1.1% of presumed extinctions of endangered plant species, compared with 38.2% attributed to grazing and 49.4% to agriculture could also be true for the semi-arid regions of South Africa although the public perception sees mining as a far greater threat to biodiversity than agricultural uses of the land.

Ashmole and Motloung (2008) also state that due to the attitude of the general public with regards to the dimension stone industry, granite and slate mines have been classified as medium risk operations, the same risk category as large gold, silver and uranium mines, and a higher risk than anything other than coal, metal sulphide, asbestos and antimony mines. However, all other dimension stone sources are classified as low risk operations.

The environmental impacts of dimension stone are generally not significant, are mainly of temporary duration, and can be effectively managed. While there is an economic cost to limiting environmental impacts, these costs are not significant in dimension stone mining if proper planning and consideration is applied from the exploration stage through to mine closure. In fact, it has been noted that truly environmentally conscious operation requires that activities be conducted with the future in mind, and that this will not only minimize the environmental effects of each activity, but will also result in significant cost savings. In the context of the dimension stone industry, these cost savings are not limited to costs of restoration, but may also be real cost savings in operating costs when proper planning over the lifecycle of a deposit is applied.

Concurrent or progressive rehabilitation of disturbed areas is good practice and should be undertaken as this offers a number of advantages such as limiting the mine's environmental liability and limiting costs at closure as rehabilitation is included in the operational activities of the mine.

Rehabilitation measures to be implemented include improving the visual appearance of the disturbed areas, establishing a cover to provide erosion control, improving runoff water quality by minimising silt loads and controlling dust.

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.

While some disturbed areas can be rehabilitated on a progressive basis during operation, others cannot be rehabilitated until mining is complete. For this reason, some rehabilitation is generally still required during and after closure. Remedial initiatives to minimize environmental impact during and after mining can be divided into three main categories:

- Firstly, the removal of surface infrastructure that cannot be used for other purposes.
- Secondly, the remediation and rehabilitation of old pits to remove the hazard they present to people and animals. Earthworks and contouring the mine area to as close as possible to the pre-mining landscape. This includes filling pits, trenches and small excavations; making pit side's safe and covering the surface area with subsoil and topsoil as necessary; and mitigation or restoration of all surface disturbances and revegetation of the pit slopes and waste rock dumps.
- Lastly, the removal and isolation of potential pollutants from the environment. Containment and treatment of contaminated water and correct storage and removal of hazardous materials. Waste rock present specific problems, as they are unsuitable for other uses. For this reason, all waste rock and even low-grade product produced are destined to remain in the environment.

The aims of rehabilitation should therefore look at limiting the long-term liabilities that will be borne by future generations. The aim of most engineered structures is to "withstand the ravages of nature". Lessons learned from old mining activities will be used to plan rehabilitation in such a way that natural processes such as erosion do not result in significant pollution.

Where possible, natural systems will be used to control water pollution and vegetation cover should limit windblown dust pollution. Gradients will be reduced to levels where erosion is minimal, and natural revegetation is possible.

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.

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 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 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. Aftercare and maintenance required can only be identified post decommissioning and depending on success of rehabilitation and mitigating measures.

3.5 Basic rehabilitation methodology and closure strategy

3.5.1 Infrastructure and Logistics areas

At some of the quarry satellite logistics will be supplied together with waste management facilities. The main post closure objective for the infrastructure areas 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. 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 steel structures and reinforcing will be discarded or sold as scrap. Building rubble will be buried together with any remaining waste blocks. The compacted salvage yard, lay down and movement areas will be screened for petrochemical spills and cleaned before it is ripped and leveled. All redundant water pipes, pumps, power lines and cable associated with raw water and electrical 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. All temporary waste storage areas need to be cleaned out and waste removed. Waste material of any description, including receptacles, scrap, rubble and tyres, will be removed entirely from the complete area and disposed of at a recognised landfill facility. It will not be buried or burned on the site.

3.5.2 Quarry and waste dumps

Granite mining operations commonly have a permanent impact on rock masses that influences the topography on the site and can impact post-mining slope stability.

As the ore body is traced deeper and deeper into the ground a series of benches for both access and safety needs to be used. Sometimes rock surrounding the ore has to be removed so that the sides of the pit do not become dangerously steep. The waste rock is dumped away from the pit onto a surface waste dump. The opportunities for land use following open-pit mining are limited, because it is very expensive to fill the pit and the impact on topography can only be partially mitigated during rehabilitation. Post mining topography for most of the area will follows the original landform shape except where changes due to quarrying or waste dumps has occurred.

The main objective is usually to make the pit walls safe and to landscape the waste rock dumps.

Ore bodies like granite that lend themselves to open-pit mining is not prone to causing water pollution and therefore water accumulating in the rehabilitated pit can usually be used for a number of purposes. Due to semi-arid conditions the opencast pits will not intercept shallow groundwater table zones with resulting water-make in the pit that will require pumping and storage in order to reduce inundation of active areas.

The post closure objective will be to restore the land to its pre-mining carrying capacity for stock farming taking into account the altered landform on the mining area due to mining activities and the absence of natural vegetation on the granite domes. Re-vegetation of 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 strive to replicate the pre-mining topography, wherever possible, or at least not to increase overall slope gradients without emplacement of adequately designed erosion control or runoff diversion structures.

4 RISK ASSESSMENT

4.1 Risk sources

4.1.1 Infrastructure and Logistics areas

- Access and Haul Roads
  - Access from the HQ to the mine workings is via a duel use public road system and 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.
  - 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
  - Process and potable water is obtained from boreholes on the property.
  - Storage consisting of a 5 000-liter plastic tank that can be re-used on another operation.
  - A collection sump for the recycling of process water used to cool the rock saws.
  - Electrical supply for the rock saws and logistics are generated by mobile gensets supplied with generator bay and spill prevention measures.
  - Underground water reticulation laid-on to the mine work area to feed water to the logistics.
- Accommodation and Logistics
  - Development and upgrading of infrastructure and waste management facilities are still in progress.
  - No steel or reinforced concrete buildings and structures are present on the mining area that will require demolition.
  - All waste rock structures used as part of accommodation, site office and secure storage needs to be demolish and waste blocks buried together with any remaining cement floors or footings.
  - Structures in the form of pre-fabricated buildings including the fuel tank that can be re-used on another location must be removed from site
  - The cement structures for the fuel supply including service aprons needs to be demolished together with any remaining cement floors or footings.
- Waste management facilities
  - As part of waste management facilities, a salvage yard, laydown area with parking and temporary waste storage facilities will be provided.
  - A small demarcated laydown area for equipment prior to movement to the company HQ.
  - A small salvage yard for temporary storage of scrap steel prior to movement to the company HQ.
  - Domestic waste is collected in plastic containers and transported weekly to the company HQ refuse site.
  - 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.
  - The workshop area needs to be upgraded with a temporary waste storage area, bio cell and laydown area.
  - Domestic waste is collected in plastic containers and transported weekly to the company HQ.
  - 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.
- Oil/grease/diesel management systems
  - The workshop, service and wash bay at the company HQ will be used.
  - The fuel supply tank is provided at the company HQ and fuel is trucked onto the site for the generators and equipment.
  - The fuel truck must be provided with a parking area with spill containment measures.
  - The generators must be supplied with generator bays with spill containment measures.

4.1.2 Quarry and waste dumps

- Opencast workings (including final voids and ramps)
  - Deep unsafe excavations

- High walls remaining

- Residue deposits overburden and spoils
  - The only spoils to be generated is the relative large volume of waste blocks.
  - Only one waste dump needs to be created per quarry and the creation of secondary waste dumps must be prevented by regularly moving waste block to the designated areas.
  - The existing waste dumps will be used during new operations
  - Secondary waste dumps need to be shaped and rehabilitated as part of the annual rehabilitation plan.
  - The valley fill waste dumps will not require shaping but ferric chloride must be used to shade exposed blocks
- Surface disturbance (compacted areas)
  - The sorting and dressing area together with stockpile area for low grade blocks to be demarcated and the footprint contained.
  - Regular sorting and dispatch of blocks to be done as part of housekeeping.
  - Blocks used for demarcation purposes to be removed to the demarcated waste dump at final closure.
  - The sorting and dressing area together with stockpile area for low grade blocks to be ripped and profiled with erosion control measures.
  - Blocks used for demarcation purposes or in the dressing yard to be removed to the demarcated waste dump.

4.2 Risk Identification

The potential risks arising from the mining operation are generic for any granite mine and listed below. The impact rating of applicable risks and mitigation actions are addressed in the risk assessment section below.

4.2.1 Potential Risks with regard to Safe excavations

- Collapsing slope(s) of mine pit can be detrimental to the safety and health of humans and animals.
- Potentially dangerous areas like deep mine pit or equipment left behind and uncontrolled access to a potentially unsafe post-mining area
- Post mining topography not compatible with original landform.
- Unsafe erosion gulley's

4.2.2 Potential Risk of residual environmental impact

- 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 and water installations including pumps and pipelines.
- Equipment and other items used during the mining operation left behind.
- Incomplete removal of re-usable infrastructure.
- Rubble from demolished infrastructure left behind.
- Waste classes not kept in separate streams and incomplete removal of waste
- Large volumes of large blocks and bouldery rubble that requires large dumping areas.
- Creation of waste rock residue deposits or stockpiles with infiltration of leachate due to inadequate basal sealing or leakage from sealed pollution control facilities.
- Stockpiles and leftover product left behind
- Increased erosion, dust generation and potential chemical contaminants reduce surface water quality or result in discharge that exceeds the maximum concentrations permitted.
- Vehicle wash bays and workshop facilities produce petrochemical and solvent contaminated runoff.
- Sanitary conveniences, fuel depots or storage facilities of potentially polluting substances can contaminate surface water.
- Oil fuel leaks onto virgin soil through the earthmoving and transport equipment and machinery or spillage of fuel during transfer from fuel bowser to equipment in the field.
- Inadequate capping or sealing of the boreholes – can lead to infiltration of potentially contaminated surface water leading to chemical or biological contamination of groundwater.
- Drainage of benches and concentration of rainfall leads to creation of large volume open water bodies in worked out pit and can lead to increased groundwater recharge and potential regional impact of low quality water.
- Pumping of process water from the pit sump can discharge poor quality water exceeding minimum standards.

4.2.3 Potential Risks with regard to viable and sustainable land

With granite mines complete disruption of the surface always occurs, which affects the soil, fauna, flora and surface water, thereby influencing all types of land use. Opencast mining and related infrastructure is a permanent destruction and rehabilitation cannot restore all pre-mining habitats. Granite quarries cannot be completely refilled and form permanent depressions that must be accommodated through imaginative utilisation during the post-closure period and the residual impact of open-pit mining is usually a completely different land use. Risks associated with economically viable and sustainable land include:

- Uncontrolled expansion of mining footprint by not restricting the area disturbed by mining and the associated activities/infrastructure - loss of land with agricultural potential. Uncontrolled development of roads - existing farm roads not used for mining operations and redundant internal roads left behind. Duel used roads still needed by the landowner and fences not maintained or repaired.
- 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 caused by not implementing prompt rehabilitation and maintenance of disturbances when possible as part of annual rehabilitation plan.
- Unsuccessful rehabilitation can reduce the post-mining land use options. Rehabilitated areas could be too unstable to support post-mining land use objectives compatible with surrounding areas.
- Disturbance of agricultural potential and subdivision of high potential arable land into uneconomic farming units. Inadequate planning or loose development can subdivide high potential land or habitats into un-viable small areas.
- Disturbance of ecology due to loss of habitat and cumulative impact of illegal collecting or land use during long-term or life of mine can degrade areas and reduce the viability of adjacent areas. Inadequate control of alien species can result in establishment of populations or seed sources that threaten adjacent areas.

4.2.4 Potential Risks with regard to stable, free draining post mining landform

Opencast pit creates area of lowered topography that can act as a sump for storm water runoff and intersects groundwater and if the operation extends to depths below the water table, it will affect the near-surface groundwater. Apart from reducing natural recharge to the shallow and deep groundwater zones, the increased runoff and altered storm hydrograph will also impact areas downstream or downslope where the flow is concentrated.

- Impact on surface water through modification of infiltration rates by increasing the extent of hardened surfaces.
- Inadequate topsoil restoration or creation of un-natural surface topography or slope form which could impact lower or adjacent slopes due to increased runoff velocity.
- Altered storm water runoff response due to large impervious areas and concentrated runoff in drainage systems. Concentrated storm runoff from the pit surrounds and infrastructure areas is erosive, causing sheet, rill and donga erosion features.
- River diversions also change the overall gradient and therefore the flow rates and impact flood discharge and erosion/sedimentation patterns at the site and downstream.

4.2.5 Potential Risks with regard to benefits for the social environment

- 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.
- Disturbance to sensitive environments such as land with historical or conservation value, urban areas, wetlands or rivers, high potential agricultural land, transport infrastructure, power transmission lines. Slow continuous damage to habitat e.g. wood collection are typical impacts on adjacent areas.
- Staff losing their jobs - mine closure can have devastating effects on communities that are reliant on mine-based income Job losses of secondary industries, businesses and contractor's 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

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

4.2.6 Potential Risks with regard to aesthetic impact

Terrain morphology plays a critical role in defining the visual envelope of mining developments and can either reduce or enhance visual impact. Apart from visual intrusion there is also the risk of reduced sense of place. Visual intrusion impact of mining activity on nearby roads, homesteads, settlements, tourist sites.

- Visual disturbance from the public road views – excavations or overburden dumps blocking the view. Large buildings, color contrast of disturbed areas against adjacent veld or dust emission plumes
- Nuisance effects of air emissions (dust) no implementation and maintenance of dust monitoring programs accompanied by dust suppression activities if required.
- Accumulation of spoils from rock saws (fines) can expose highly erodible fine sediment to wind transport and lead to dust generation and dispersal. Dust can retard vegetation growth and reduce the palatability of vegetation.
- Dust generated on haul roads reduces visibility in opencast pit, representing a safety hazard.
- The cumulative effect of a raise in the ambient noise levels or high noise levels in specific areas that exceed specified levels. Noise disturbance and light pollution as a result of night activities.
- Disturbance of archaeological sites not implement mitigating measures according to the archeological assessment. Progressive development can encroach upon or disturb archaeological sites, cultural heritage sites or graves.

5 RISK ASSESSMENT

5.1 Risk impact rating

Each impact or risk is assessed in terms of: nature (character status); extent (spatial scale); duration (time scale); probability (likelihood) of occurring; reversibility of the impact; the degree to which the impact may cause irreplaceable loss of resources; the significance (size or magnitude scale) prior to mitigation; the degree to which the impact can be mitigated; and, the significance (size or magnitude scale) after mitigation as per the criteria in Table 1 below.

Table 1: Impact Assessment Criteria

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.

5.2 Risk Mitigation and Closure objectives

In addition to the goals and objectives for final decommissioning and mine closure 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 for the operational phase described in Table 1 below 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.

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 for the operational phase in Table 2 below.

Table 2: Risks, risk levels and mitigating actions: Operational Phase

IMPACTS AND ASPECTS	RISK LEVEL AFTER MITIGATION: PREFERRED AND ONLY ALTERNATIVE	MITIGATING ACTIONS
1. CHANGE IN TOPOGRAPHY: Granite mining operations commonly have a permanent impact on rock masses that influences the topography on the site and can impact post-mining slope stability.	**Medium/ Medium Risk**	The focus of topographic rehabilitation may not be obvious at the time of mine planning and must be addressed as the mine develops and the Closure Plan must be reviewed periodically for continued relevance in the light of changed mine path or long-term plans. Implementation of the following tasks to manage the risks associated with high wall stability of each quarry and slope stability of the waste dumps 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. ▪ Due to cutting with circular saws smaller and vertical benches of average 1m are created that can be planned so as to prevent an excessive highwall remaining. ▪ During construction terrain form will be used to shield the opencast pit from developed or sensitive areas as protection in the unlikely event of highwall or slope collapse. ▪ During production the height of highwalls will be reduced by separating benches to increase stability. ▪ Overall slope angle between 60° and 70° will fit in with the natural topography of the mountainous terrain and due to the massive and competent nature of the ore body will still be stable. ▪ At final closure geotechnical investigations will identify unstable rock conditions, slopes that require support in the short-, medium- and long-term. Geotechnical slope stabilisation methods including concreting (gunnite), rock bolting, wire mesh restraint, bench wrecking to lower highwalls, rehabilitative blasting etc. which will be investigated and implemented during decommissioning. ▪ A row of blocks will be packed in a straight line at the base of the high wall to reduce the overall height as an additional preventative measure, minimizing safety risks. After the rehabilitation phase no maintenance will be required as the blocks will be permanent fixtures that can only be moved via front end loaders. ▪ The final slope of the pit floor would be towards the drainage channel to prevent collection of storm water. ▪ During operations pump rainwater that collects in the pit and store for use as process water or dust suppression. ▪ Any remaining high wall will be fenced off at final closure in order to deter people or animals from falling over. ▪ At final closure of the operation all remaining product (blocks) from the demarcated stockpile will be restored to pits wherever possible to reduce highwall height and provide surface for rehabilitation or used to fill any remaining deep excavations if any. ▪ Waste dumps must be designed to meet minimum slope stability and safety standards and vegetated to reduce erosion and runoff. ▪ In view of the fact that the mountainous terrain consists of natural depressions along the slope, and the limited topsoil available the best option for waste dumps is filling and levelling the top of these natural depressions, called "valley fill". The natural angle of repose of 37° for granite waste dumps is

		compatible with the natural rocky terrain with steep slopes and no terracing will be required. ▪ Waste dumps on the sides of kopjes "sidehill fill", which have large slopes will be terraced once the dump has reached its final profile at the top level, by dumping additional material along the sides at progressively lower levels, and developing these terraces at differing angles. Final reclamation will thus only occur toward the end of the life of the quarry. ▪ In the case of waste dumps in the valleys "heaped fill" excavations with the final designed perimeter of the dump will be created to obtain cover material for the top of the dumps and profiling the slope of historic dumps to be re-used. The excavations will serve as a base for extending the waste dump. Thereafter, dumping will proceed above surface on the top of this buried dump at successive tiers with appropriate height around 6-10m, leaving terraces of 6m wide, and working from the perimeter toward the centre. This will allow for reclamation of the outside profiles at a much earlier stage, resulting in very little outstanding reclamation toward the end of the life of the dump. ▪ 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 strive to replicate the pre-mining topography, wherever possible, or at least not to increase overall slope gradients without emplacement of adequately designed erosion control or runoff diversion structures.
2. SOIL EROSION & SOIL COMPACTION: The potential for soil erosion by wind and stormwater run-off; soil compaction from repeated use of access tracks.	**Low / Insignificant Risk**	• 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 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 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. • The basic rehabilitation methodology will therefore strive to replicate the pre-mining topography, wherever possible, or at least not to increase overall slope gradients without emplacement of adequately designed erosion control or runoff diversion structures. • Provision must also be made for efficient storm water control to prevent erosion of roadways. • Soil erosion and compaction on the section of public road used by the Applicant (as shown on Diagram 3.4 in Section 3.5 of the EIR) is required to be monitored and timeously repaired. • Soil erosion on private haul roads is to be regularly monitored and repaired.
3. WATER RESOURCES: Process water is obtained from boreholes on the	**Medium-High / Significant Risk**	• Water used for cooling of saw blades together with the fine residue (cutting spoils) will be collected in a series of settling dams from where the water will be re-used.

property. A WULA for abstraction for full production volumes is being applied for. Storage consists of a 5000 litre plastic tank that can be re-used. Water reticulation is provided to the mine work area to feed water to the logistics, where water is recycled. No natural permanent surface water resources are located within the project site. Due to semi-arid conditions the opencast pits will not intercept shallow groundwater table zones. Any hydrocarbon spillages have low potential to contaminate groundwater.		• Ensure maintenance of boreholes and reticulation pipes for supply to each quarry. • Ensure adequate capping or sealing of the boreholes to prevent infiltration of potentially contaminated surface water leading to chemical or biological contamination of groundwater. • Ensure water abstraction is within allowable limits set by the Department of Water & Sanitation (DWS). Any conditions set by DWS in the license approval process will be included in the EMPr. • Ensure that an effluent purification and recycling system is installed at the ablution facilities located at the Yellow and Cape Spring Quarries.
4. LIMITED LOSS OF NATURAL VEGETATION AND ECOLOGICAL FUNCTIONING IN AN CRITICAL BIODIVERSITY AREA 2 (CBA 2): The proposed mining area footprint per quarry will result in an impact on localised ecological functioning, although limited as: bulk sampling, prospecting and mining has already occurred; the granite is mostly devoid of vegetation; access and haul roads exist; and, the company headquarters with logistical capabilities already exist. 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 machinery and trucks will continue to disturb local fauna, already accustomed to the existing mining activities.	**Low / Insignificant Risk**	• Refer to Diagrams of the mine areas above which show that existing access tracks will be used. • The mining area and stockpile areas must be demarcated and the footprint contained within the demarcated areas as shown in Diagrams above. • The annual rehabilitation plan must be implemented. • Remove alien invasive vegetation, and ensure ongoing alien vegetation clearing should this be required. • No indigenous plants outside of the demarcated work areas may be damaged. • The noise and vibration caused by the earthmoving equipment will disturb smaller animals. 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. • Ensure maintenance of the boundary fence around the Yellow Quarry.
5. POTENTIAL FOR SOIL & GROUND WATER CONTAMINATION, AND WASTE MANAGEMENT DURING OPERATIONAL PHASE: Waste collected in settling dams; waste rock; overburden; sub-economic economic lower grade ore; industrial waste (hazardous wastes, oil & greases); domestic waste; waste water, including effluent & sewage sludge	**Medium - Low / Medium-Low Risk**	• **Waste that is collected within the settling dams** - The physical properties required of a successful dimension stone and due to the requirement for inert materials which are not affected by weathering (and in today's context, the effect of severe chemically polluted atmospheric environments), dimension stone residues are typically benign from a pollution point of view. - Water used for cooling of saw blades together with the fine residue (cutting spoils) will be collected in a series of settling dams from where the water will be re-used. - Sludge collected within the settling ponds will be disposed of within the waste rock dump. • **Waste rock from the mining process** - Like natural aggregates, dimension stone is used in its natural state, and does not require concentration and extraction from an ore. It is these latter two processes that result in significant environmental impacts such as acid mines drainage and other toxic effects associated with many of the metal extraction industries. - Waste or un-saleable blocks will be dumped in the demarcated waste dump on a regular basis. - Bury all surplus loose, isolated waste rock and un-saleable blocks in designated sub surface pits and cover with growth medium. - Waste or low grade blocks can be subjected to secondary processing by cutting into smaller blocks,

		used as refill or landscaping, crushed for other applications (such as concrete production), or otherwise dealt with responsibly. • **Overburden, cover, and/or "soft" material including topsoil** - Stored overburden in the form of boulder rubble and other stone waste should not be left in piles, and should be used to cover waste dumps. - Soil removal creates permanent impacts that can be mitigated through restoration of soil cover, although the significance of the impact remains high. This is most apparent in steep rocky slopes where there is thin soil cover of limited areal extent which is seldom removed and stockpiled ahead of mining. However, rocky post-mining slopes can usually be rehabilitated with fine waste rock or tailings to provide the ecological niche provided by the thin patchy lithosoil (rocky soil). - 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 stormwater 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. - 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. • **Other non-specification waste such as sub-economic lower grade ore** - Any product stockpiles left or oversize builders must be removed and used to backfill excavations or to slope remaining high walls. - Waste or low grade blocks can be subjected to secondary processing by cutting into smaller blocks, used as refill or landscaping, crushed for other applications (such as concrete production), or otherwise dealt with responsibly. • **Industrial waste (i.e. including hazardous wastes and oils and greases)** - 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. - 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 steel structures and reinforcing will be discarded or sold as scrap. - All equipment and other items used during the mining operation needs to be removed from the site. - 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.

		- Mobile generators will supply electricity to the machinery. Generator bays will be constructed with the necessary pollution control measures (drip trays). - Clean out content of oil traps and dispose of waste at registered and purpose designed landfill sites. - 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. - All temporary waste storage areas need 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. These liquid wastes cannot be disposed of on the waste dumps. • **Domestic waste (i.e. waste that is generated from the accommodation and offices)** - 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 waste will be dumped in a landfill provided for onsite. In addition, a small herd of pigs are being kept at the headquarters to eat the biodegradable waste. - Ensure that an effluent purification and recycling system is installed at the ablution facilities located at the Yellow Quarry and Cape Spring Quarry. • **Waste water (i.e. including process water and water from sanitation processes, as well as sewage sludge)** - 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. - 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 stormwater runoff with contoured, low-gradient drains and channels, as well as retention ponds. A series of ponds may also be used to remove sediment and other contaminants from water before reuse or reintroduction into natural waterways. - Stormwater diversion and erosion control contour berms separate clean and contaminated water

		systems around the pit and infrastructure areas. - Sewage - No sewage outfall may be located within 100m of a water feature. No sewage may be discharged into a water body. - Ensure that an effluent purification and recycling system is installed at the ablution facilities located at the Yellow Quarry and Cape Spring Quarry.
6. VISUAL INTRUSION: Caused by the machinery, topsoil and rock stockpiles, cleared areas, and movement of trucks on site. Tthe quarries already exist. The site is however, remote and rural in nature with no receptors (people) as it is located on private property.	**Medium-Low / Medium-Low Risk**	• The site shall be kept neat and tidy at all times. Equipment must be kept in designated areas and storing/stockpiling shall be kept orderly. • The natural red-brown colour of rock is a result of weathering of the outer 1-2mm of the rock surface, and the natural process can be mimicked by coating the rock surface with ferric chloride (FeC13) available commercially in large quantities, as it is extensively used in sewage treatment. Concentrations of around 40% give the best results and are ideal, as one of the products supplied commercially for sewage treatment is a 43% concentration of contained FeC13. Freshly sprayed areas need several days to dry as rain within the first 24-48 hours after spraying causes much of the ferric chloride to be washed off, requiring that the work be repeated. Due to these factors, it is preferential that spraying of rock surfaces with ferric chloride be conducted during the dry season. However, care must be taken, as experience has shown that where there is excessive dust collection on the rock surfaces, such as is the case with dumps close to haul roads, haematite tends to form around the dust particles rather than on the rock surface, resulting in substantial loss of coverage when the rains wash off the dust. This can be overcome by washing down these surfaces with water several days prior to spraying, or by treating these areas during dry window periods within the rainy season. • Mitigation of the visual impact of “heaped fill dumps” and “sidehill dumps” will include rock shading and limited topsoil application to the slope and revegetation on the top of the dump.
7. EMMISSIONS (DUST, VEHICLES & NOISE): Noise and dust will be created by the cutting of the granite into blocks; from the mining equipment (e.g. front end loaders) and hauling vehicles that also emit Greenhouse Gases.	**Low / Insignificant Risk**	• Health and safety equipment is required for workers. • The wetting of the saws helps reduce dust generation during cutting of the blocks. • No amplified music should be allowed on site. • 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. • 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. • Engines shall be turned off when the vehicle is temporarily parked or stationery for long periods.
8. HERITAGE, PALAEONTOLOGICAL AND CULTURAL IMPACTS: The stone walled kraal (D011) should be excluded from quarrying; no further archaeological studies or mitigation is required for the areas examined for this report; and no further palaeontological studies or mitigation is required. Refer to **Appendix C** in EIR.	**Low / Insignificant Risk**	• None required for insignificant findings • Demarcate the stone walled kraal (D011) as a no-go area.

6 ESTIMATED COST FOR REQUIREMENTS TO FULLY DECOMMISSION THE SITE

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, including the pumping and treatment of polluted or extraneous water, 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). 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, including the pumping and treatment of polluted or extraneous water, 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.
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).

6.1 Calculation of Closure cost

This calculation is not based on the standard rates provided for calculation of closure cost as the guideline is calculated using assumptions that are far removed from the mining methods or topographical characteristics of the waste (in particular that dimension stone waste is inert and offer no pollution potential, and that waste dumps located on a sound footing are stable at the natural angle of repose 37°).

Additionally the costs of a “sidehill fill” or “heaped fill” waste dumps that requires terracing and landscaping will be vastly different front a “valley fill” which only requires topsoil replacement on the top to allow for natural revegetation. Planting of vegetation and irragation and adding fertilisers is also not an option in semi-arid areas and the specific vegetation units where trees are mostly absent.
Due to the fact that rehabilitation procedures for the different quarries have different closure elements a detailed itemized costing were done for each of the quarries that involved the identification of the specific closure elements.

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 (Table 7). Rates used are from the Contractors Plant Hire Association.

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Table 3: Rates and tariffs used for Calculation of Closure cost

Earth Moving Equipment	Rental Rate /hour	Fuel Cost	Total Cost /hour
Front End Loader - 30 Ton	R687.00	R495.00	R1 182.00
Excavator - 45 Ton	R687.00	R495.00	R1 182.00
Excavator - 30 Ton	R392.00	R330.00	R722.00
Excavator - 20 Ton	R322.00	R270.00	R592.00
Cat 14 H Grader	R453.00	R270.00	R723.00
Articulated Dump Truck - 30 Ton	R392.00	R210.00	R602.00
Tipper Truck 6m^3	R255.00	R180.00	R435.00
Tipper Truck 10m^3	R309.00	R210.00	R519.00
Ferric Chloride 43% /Kg	R3.50		
Manual Labour /hour	R45.00		

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 10m^3 transport building rubble to waste rock dump	R519.00	8.00	0	R4 152.00	
	Excavator - 20 Ton Demolish concrete and loading	R592.00	16.00	0	R9 472.00	
	Cleanup	R45.00	8.00	4	R1 440.00	
	Total				**R15 064.00**	
2	**Remove waste from temporary storage and scrap from salvage yard**	**Cost/h**	**Service hours**	**Labour**	**Total**	
	Tipper Truck 10m^3 transport to waste disposal site	R519.00	16.00	0	R8 304.00	
	Treat petrochemical in oil seperator - washbay	R2 000.00	4.00	R0.00	R8 000.00	
	Treat petrochemical in oil seperator - fuel storage & apron	R2 000.00	4.00	R0.00	R8 000.00	
	Cleanup	R45.00	8.00	2	R720.00	
	Total				**R25 024.00**	
3	**Final cleanup - remove all mining related waste walk through with landowner**	**Cost/h**	**Service hours**	**Labour**	**Total**	
	Tipper Truck 10m^3 transport to waste disposal site	R519.00	8.00	0	R4 152.00	
	Cleanup	R45.00	8.00	2	R720.00	
	Total				**R4 872.00**	
4	**Loading and transport of soil**	**Load Vol m^3**	**Loads/h**	**m^3/h**	**R/h**	**R/m^3**
	Excavator cycle	1.2	120	144	R722.00	R5.01
	ADT cycle	17	7	119	R602.00	R5.06
	Total cost					**R10.07**
5	**Shape waste dumps (Terracing)**	**h/ 1.6m^3**	**m^3/h**	**Cost/h**	**Cost/m^3**	**Cost/m^2**
	FEL 30 ton	0.67	144.00	R1 182.00	R8.21	
	2 Tier Total cost/m^2@ 1.6m^3		1.6			**R13.13**
	3 Tier Total cost/m^2@ 2.8m^3		2.8			**R22.98**
6	**Spreading topsoil level area**	**m^3/h**	**m^3 Soil /m^2**	**R/m^3**	**R/m^2**	**R/Ha**
	Loading and transport of topsoil		5	R10.07	R2.01	R2 014.54
	Shaping Grader 140 K	1020		R0.71	R0.14	R1 417.65
	Total cost				**R2.16**	**R3 432.19**
7	**Spreading topsoil dump slopes**	**m^3/h**	**m^3 Soil /m^2**	**R/m^3**	**R/m^2**	**R/Ha**
	Loading and transport of topsoil		10	R10.07	R1.01	R1 007.27
	Excavator 20Ton	108		R6.69	R0.67	R6 685.19
	Total cost				**R1.68**	**R7 692.46**
8	**Sloping Sides gravel pit 18°**	**m^2/h**		**Cost/h**	**R/m^2**	**R/Ha**
	Excavator - 20 Ton	120		1182.00	R9.85	R11 642.70
9	**Ripping and levelling**	**Speed**	**Ripper/Blade**	**h/Ha**	**R/h**	**R/Ha**
	Grader 140 K	8	3.5	0.36	R687.00	R245.36
	Total cost/Ha					**R245.36**
10	**Loading and transport of 0.5m soil cover**	**Load Vol m^3**	**Loads/h**	**m^3/h**	**R/h**	**R/m^3**
	Excavator cycle	1.2	120	144	R722.00	R5.01
	ADT cycle	17	7	119	R602.00	R5.06
	Total cost/m^3					**R10.07**
	Total cost/m^2@0.5mcover					**R5.04**
11	**Rockshading wastedump**	**m^2/h**	**m^2/kg**	**R/kg**	**R/m^2**	
	Ferric Cloride		20	R3.50	R0.18	
	Labour	30		R45.00	R1.50	
	Consubables Sprayer @R400/month				R1.00	
	Total cost/m^2				**R2.68**	
12	**Rockshading rockface**	**m^2/h**	**m^2/kg**	**R/kg**	**R/m^2**	
	Ferric Cloride		10	R3.50	R0.35	
	Labour	50		R45.00	R0.90	
	Consubables Sprayer @R400/month				R1.00	
	Total cost/m^2				**R2.25**	
13	**Blasting of highwalls**	**Spacing m**	**depth m**	**R/m**	**R/hole**	
	Drilling Cost	0.6	4	R15.00	R60.00	
	Blasting cost per hole				R129.00	
	Total cost/m advance			**R113.40**	**R189.00**	
14	**Moving of blocks to designated areas**	**b/h<300m**	**Cost/h**	**Cost/block**	**Cost/m**	
	FEL 30 ton	12.00	R1 182.00	R98.50		
	Placing of blocks safety barrier				R49.25	

6.3 Quantified Closure elements

The closure elements were identified captured and quantified by making use of a GIS software programme and colon aerial photography. Diagrams 3 show the locality and footprint of the closure element and the quantification of the closure elements are provided below per quarry.

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

Yellow 0.75 Ha including workshop and fuel supply
Cape Spring 0.5 Ha including workshop and fuel supply

Cost Factor 2 - Remove waste from temporary storage and scrap from salvage yard

Yellow 1 Salvage Yard and 1 Temporary waste storage area
Cape Spring 1 Salvage Yard and 1 Temporary waste storage area

Cost Factor 3 - Final clean-up - remove all mining related waste final walk through

Yellow 15Ha Footprint of mining operation including sorting area, dressing yard and stockpile area
Cape Spring 10Ha Footprint of mining operation including sorting area, dressing yard and stockpile area

Cost Factor 5 - Shape waste dumps (Terracing)

Yellow 0.8 Ha (2 Tier) Historic Heaped Fill Waste Dump shaping and terracing required as part of production
Cape Spring Greenfields – 0.5 Ha New Side Hill Fill Waste dump planned no shaping required natural angle of repose 37°. Depending on surrounding topography and vegetation cover shaping of the toe will be required to facilitate natural revegetation

Cost Factor 6 - Spreading topsoil level area (dump top)

Yellow 0.8 Ha Historic (2 Tier) Heaped Fill waste dump levelling ongoing as part of dumping to facilitate trafficability
Cape Spring Greenfields – 0.5 Ha New Side Hill Fill Waste dump planned levelling ongoing as part of dumping to facilitate trafficability

Cost Factor 7 - Spreading topsoil dump slopes

Yellow 0.8 Ha Historic (2 Tier) Heaped Fill waste dump - spreading topsoil on dump slopes ongoing as part of levelling top to facilitate re-vegetation
Cape Spring Greenfields – 0.5 Ha Side Hill Fill waste dump planned no topsoil on toe required only rock shading

Cost Factor 8 - Sloping Sides gravel pit 18°

Yellow 1.2 Ha excavation for burry Heaped Fill waste dump can be done as part of production
Cape Spring Side Hill Fill waste dump no gravel pit to burry waste

Cost Factor 9 - Ripping and levelling Roads and all compacted areas

Yellow 0.7Ha
Cape Spring Greenfields – 0.5 Ha planned

Cost Factor 10 - Loading and transport of 0.5m soil cover

Yellow 0.3 Ha excavation 3m deep
Cape Spring Greenfields – Side hill Fill waste dump No excavation

Cost Factor 11 - Rockshading wastedump

Yellow 0.8 Ha Historic (2 Tier) Heaped Fill waste dump - spreading topsoil no rock shading required
Cape Spring Greenfields – 0.5 Ha Side Hill Fill waste dump planned only rock shading on toe

Cost Factor 12 - Rockshading rockface

Yellow	No high wall present for rock shading will be determined as mine develop
Cape Spring	Greenfields – No high wall present for rock shading will be determined as mine develop

Cost Factor13 - Blasting of highwalls

Yellow	No high wall present for blasting will be determined as mine develop
Cape Spring	Greenfields – No high wall present for blasting will be determined as mine develop

Cost Factor 14 - Moving of blocks to designated areas

Yellow	±3500 blocks used for demarcation to be moved at final closure 1.4Ha sorting area covered with ±3000 waste and low-grade blocks to be moved to designated areas will be addressed as part of the annual rehabilitation plan
Cape Spring	Greenfields – To be address as part of production and housekeeping

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

- 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.
- 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 nearest licensed facility.
- All services related to the mining operation, water supply lines and storage on site will have to be demolished; the closure cost is therefore included in this estimate.
- Existing tracks will be used and no new roads will be developed.
- The stockpile and logistics area will not exceed the planned footprint.
- It is assumed that the post-mining pit stability and waste dump profile will be addressed as part of the operation and necessary remedial actions implemented prior to closure.
- Shaping of historic waste dumps to be used needs to be done and ad hoc waste moved to the demarcated waste dump, the closure cost is therefore included in this estimate.
- Diversion of drainage channels due to historic waste dumps or agricultural practices will not be reinstated but mitigation to prevent damming of water will be implemented as part of annual rehabilitation.

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

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 of mining area 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 All services related to the mining operation, water supply lines and storage on site will have to be demolished; the closure cost is therefore included in this estimate.				
Mining/Sampling Area	**Unit**	**No Units**	**Unit Cost**	**Cost per Element**
Yellow Logistical facilities 0.72 Ha	Areas	1.00	R15 064.00	**R15 064.00**
Cape Spring Logistical facilities 0.5 Ha	Areas	1.00	R15 064.00	**R15 064.00**
			Sub-Total	**R30 128.00**
Cost Factor 2				
Remove waste from temporary storage and scrap from salvage yard				
Risk based criteria and assumptions with regard to rehabilitation of mining area 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				
Mining/Sampling Area	**Unit**	**No Units**	**Unit Cost**	**Cost per Element**
Yellow	Areas	1.00	R25 024.00	**R25 024.00**
Cape Spring	Areas	1.00	R25 024.00	**R25 024.00**
			Sub-Total	**R50 048.00**
Cost Factor 3				
Final cleanup - remove all mining related waste walk through with landowner				
Risk based criteria and assumptions with regard to rehabilitation of mining area 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.				
Mining/Sampling Area	**Unit**	**No Units**	**Unit Cost**	**Cost per Element**
Yellow	Area <10 Ha	1.00	R4 872.00	**R4 872.00**
Cape Spring	Area <10 Ha	1.00	R4 872.00	**R4 872.00**
			Sub-Total	**R9 744.00**

Cost Factor 5

Shape waste dumps (Terracing)

Risk based criteria and assumptions with regard to rehabilitation of mining area

It is assumed that the post-mining stability and waste dump profile will be addressed as part of the operation and necessary remedial actions implemented prior to closure.
Shaping of historic wastedumps to be used needs to be done and the closure cost is therefore included in this estimate.
Heaped fill dumps will be divided in <0.4Ha segments to facilitate shaping on a concurrent basis.
The first tier will be buried and the second tier will be ±6 m above natural surface level
Valley fill will only require shaping of the toe to assist natural revegetation taking into account the surrounding topography and vegetation cover
Diversion of drainage channels due to historic waste dumps or agricultural practices will not be reinstated but mitigation to prevent damming of water will be implemented as part of annual rehabilitation.

Mining/Sampling Area	Unit	No Units	Unit Cost	Cost per Element
Yellow (Heaped fill dump 2 Tier)	m²	8 000.00	R13.13	**R105 040.00**
Cape Spring (Side hill Fill)	no shaping required natural angle of repose 37°			
			Sub-Total	**R105 040.00**

Cost Factor 6

Spreading topsoil level area (Top of wastedump)

Risk based criteria and assumptions with regard to rehabilitation of mining area

It is assumed that the post-mining stability and waste dump profile will be addressed as part of the operation and necessary remedial actions implemented prior to closure.
Spreading of sub-soil is done as part of operations to improve traficability on the top of the wastedump.
Heaped fill dumps will be developed in segments < 0.4Ha to provide for concurrent rehabilitation as part of the annual rehabilitation plan.

Mining/Sampling Area	Unit	No Units	Unit Cost	Cost per Element
Yellow (Heaped fill dump 2 Tier)	Ha	0.80	R3 432.19	**R2 745.75**
Cape Spring (Side hill Fill)	Ha	0.50	R3 432.19	**R1 716.10**
			Sub-Total	**R4 461.85**

Cost Factor 7

Spreading topsoil dump slopes

Risk based criteria and assumptions with regard to rehabilitation of mining area

It is assumed that the post-mining stability and waste dump profile will be addressed as part of the operation and necessary remedial actions implemented prior to closure.
The sides of heaped fill dumps will be covered with topsoil but vally filled dumps will be evaluated in terms of natural topography and vegetation requirements at final footprint.

Mining/Sampling Area	Unit	No Units	Unit Cost	Cost per Element
Yellow (Heaped fill dump 2 Tier)	Ha	6.40	R7 692.46	**R49 231.74**
Cape Spring (Side hill Fill)	no topsoil on toe required only rock shading			
			Sub-Total	**R49 231.74**

Cost Factor 8

Sloping Sides gravel pit 18°

Risk based criteria and assumptions with regard to rehabilitation of mining area

Only heaped fill dumps wll require excavations to burry the first tier and obtain sub-soil for covering surface section of waste dump

Mining/Sampling Area	Unit	No Units	Unit Cost	Cost per Element
Yellow (Heaped fill dump 2 Tier)	Ha	1.20	R11 642.70	**R13 971.24**
Cape Spring (Side hill Fill)	no gravel pit to burry waste			
			Sub-Total	**R13 971.24**

Cost Factor 9				
Ripping and levelling Roads and all compacted areas				
Risk based criteria and assumptions with regard to rehabilitation of mining area Existing tracks will be used and no new roads will be developed. The stockpile and logistics area will not exceed the planned footprint.				
Mining/Sampling Area	**Unit**	**No Units**	**Unit Cost**	**Cost per Element**
Yellow	Ha	1.00	R350.00	**R350.00**
Cape Spring	Ha	1.00	R350.00	**R350.00**
			Sub-Total	**R700.00**

Cost Factor 10				
Loading and transport of 0.5m soil cover				
Risk based criteria and assumptions with regard to rehabilitation of mining area Excavations to burry waste only applicable to heapfill and area will not exceed the planned footprint.				
Mining/Sampling Area	**Unit**	**No Units**	**Unit Cost**	**Cost per Element**
Yellow (Heaped fill dump 2 Tier)	m^3	3 500.00	R10.07	**R35 245.00**
Cape Spring (Side hill Fill)	No excavations planned			
			Sub-Total	**R35 245.00**

Cost Factor 11				
Rockshading wastedump				
Risk based criteria and assumptions with regard to rehabilitation of mining area No rock shading required on heapfill dumps Shading on toe of valley fill to be evaluated at final footprint taking into account surrounding topography and visual impact				
Mining/Sampling Area	**Unit**	**No Units**	**Unit Cost**	**Cost per Element**
Yellow (Heaped fill dump 2 Tier)	no rock shading required			
Cape Spring (Side hill Fill)	m^2	5 000.00	R2.68	**R13 400.00**
			Sub-Total	**R13 400.00**

Cost Factor 12				
Rockshading rockface				
Risk based criteria and assumptions with regard to rehabilitation of mining area Shading on high wall to be evaluated at final footprint taking into account surrounding topography and visual impact				
Mining/Sampling Area	**Unit**	**No Units**	**Unit Cost**	**Cost per Element**
Yellow	No highwall rock shading will be determined as mine develop			
Cape Spring	No highwall rock shading will be determined as mine develop			
			Sub-Total	**R0.00**

Cost Factor 13				
Blasting of highwalls				
Risk based criteria and assumptions with regard to rehabilitation of mining area Blasting of high wall to be evaluated at final footprint taking into account surrounding topography and pit stability				
Mining/Sampling Area	**Unit**	**No Units**	**Unit Cost**	**Cost per Element**
Yellow	No highwall present for blasting will be determined as mine develop			
Cape Spring	No highwall present for blasting will be determined as mine develop			
			Sub-Total	**R0.00**

Cost Factor 14				
Moving of blocks to designated areas				
Risk based criteria and assumptions with regard to rehabilitation of mining area Placing of blocks in designated areas to be done as part of housekeeping in the anual rehabilitation plan. Removal of blocks used for demarcation and low grade product to the demarcated waste dump at final closure. Removal of safety barrier to be evaluated at final footprint and depth of mine pit				
Mining/Sampling Area	**Unit**	**No Units**	**Unit Cost**	**Cost per Element**
Yellow	Blocks	300.00	R98.50	**R29 550.00**
Cape Spring	Greenfields – To be address as part of production and housekeeping			
			Sub-Total	**R29 550.00**
Total estimated cost to fully decommissioned the mining site at final closure				**R341 519.83**

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 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.

7.2 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 (DWS, DMR), Provincial (DENC, DALR) and Local Government (Local and District Municipalities)
- SAHRA
- 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.

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.